NorthConnex

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Volume 3

Environmental Impact Statement

Submissions and Preferred Infrastructure Report
Chapters 8

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Roads and Maritime Services

NorthConnex

Submissions and preferred infrastructure report

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8 Response to community submissions

This chapter presents the issues raised in submissions received from the community and responses to those issues. Issues and responses have been grouped together into similar or related themes and categories.

8.1 Strategic justification and project need

8.1.1 Need for the project

Fifty five submissions raised issues regarding the need for the project.

Issue description

Submissions relating to the need for the project raised issues regarding the requirement for the project to be built and the acceptability of the current form of the project.

In summary, the submissions raised the following issues:

- The project will provide the final link in the national road network around Sydney and return Pennant Hills Road to the local community.
- The project will be a major economic benefit and is long overdue.
- The project is critical for all those who use local roads and in particular Pennant Hills Road.
- Belief that an orbital surface road will not solve the traffic issue in northern Sydney.
- The project will be both economically and environmental beneficial to Sydney.
- The project will benefit the economy and environment in the long term.
- The tunnel is an expensive option but probably the only feasible one to address congestion and transportation of freight.
- Support for the project in its current form. The northern portals should not be moved further north and the tunnel should not be made shallower under homes to achieve a zero grade tunnel.
- The project will reduce traffic along Pennant Hills Road resulting in less air and noise pollution for surrounding suburbs.
- The tunnel will also result in more efficient operation of vehicle engines, reducing fuel consumption and the resulting air pollutants.

Response

Support for the project is noted.

Issue description

Submissions raised concerns regarding the need for the project. In summary submissions raised the following issues:

- The project is put forward as being needed but it is in fact driven by a money making enterprise.
- At least half the freight movement occurs at night, meaning there won't really be much benefit to freight from the project.
- The NSW Government is promoting the illusion that new roads will guarantee free flowing traffic.
- It will be five years before any benefit to Pennant Hills Road is realised.

- Infrastructure projects must be seen as an opportunity to improve the city as a whole, rather than just joining two roads together. They should consider integrating with public transport.

Response

The need for the project is outlined in Section 3.3 and 3.5 of the environmental impact statement. The need for the project has also been established through NSW and Australian Government strategic planning documents including the NSW State Infrastructure Strategy (NSW Department of Premier and Cabinet, 2012), the Metropolitan Plan for Sydney to 2036 (Department of Planning, 2010), the NSW Long Term Transport Master Plan (Transport for NSW, 2012) and the Nation Building Program (Commonwealth Department of Infrastructure and Transport, 2013).

Pennant Hills Road between the M1 Pacific Motorway and the Hills M2 Motorway forms part of the National Land Transport Network, and is one of the two remaining sections of the Network within Sydney that is not of a motorway standard. Vehicles using Pennant Hills Road between the M1 Pacific Motorway and the Hills M2 Motorway share the road with heavy vehicles transporting freight to, from or through Sydney to major cities and regional centres such as the Central Coast, Newcastle, Brisbane and Melbourne. As Sydney's population and economy continue to grow, there will be greater pressure to improve the efficiency of the National Land Transport Network to service expanding commercial centres and cater for local and district freight transport demands.

Heavy traffic flows and congestion along Pennant Hills Road during commuter peak periods and business hours results in low average peak travel speeds, unreliable travel times and disruptions to inter-regional traffic movements. These conditions result in social and environmental impacts, including community severance, traffic noise and exhaust emissions. Pennant Hills Road, which is already operating at or beyond capacity during peak periods, is expected to experience continued traffic growth in the future.

The project is needed to provide a safer and more efficient link between the M1 Pacific Motorway and the Hills M2 Motorway that would better service current and future road users. The operation of the project would provide an alternative and more efficient route for travel between the M1 Pacific Motorway and the Hills M2 Motorway, improving access, connectivity and reliability of inter-regional freight across the greater Sydney area. In providing an alternative route the project would also reduce interaction between freight and other road users, thereby reducing congestion and improving safety and amenity along Pennant Hills Road.

Public private partnerships (PPPs) are a common and successful approach to infrastructure delivery. This approach can deliver much needed infrastructure in advance of when delivery would otherwise be possible with solely Government funding.

8.1.2 Justification

Twenty submissions raised issues regarding the justification for the project.

Issue description

Submissions relating to the justification for the project raised concerns that the project has a narrow focus that is driven by economic profits and population growth, which is not sustainable in the long term.

Belief the former NSW Roads and Traffic Authority influenced decisions in advancing road projects. The NSW Government are misleading the affected community about the desirability of this project.

Response

The long term strategic vision for Sydney and NSW is outlined in the NSW State Infrastructure Strategy (NSW Department of Premier and Cabinet, 2012), the NSW Long Term Transport Master Plan (Transport for NSW, 2012), the Metropolitan Plan for Sydney to 2036 (Department of Planning, 2010) and the draft Metropolitan Strategy for Sydney to 2031 (Department of Planning and Infrastructure, 2013). A link between the M1 Pacific Motorway and the Hills M2 Motorway (NorthConnex) is identified in these long term planning documents.

The State Infrastructure Strategy outlines the State Government's short, medium and long term initiatives concerning infrastructure delivery and reform over the next 20 years. The State Infrastructure Strategy identifies strategic priorities to deliver incremental improvements to the State's urban road network. One of these strategic priorities involves completing the 'missing links' on Sydney's motorway network, including a link between the M1 Pacific Motorway and the Hills M2 Motorway.

The current Metropolitan Plan for Sydney to 2036 and the draft Metropolitan Strategy for Sydney to 2031 provide a clear and comprehensive blueprint for sustainably managing economic and population growth in the Sydney Metropolitan Region. Both of these strategic plans recognise the importance of forward planning and delivery of transport infrastructure to support and complement economic and population growth. In particular, the draft Metropolitan Strategy for Sydney to 2031 identifies the corridor between the M1 Pacific Motorway and the Hills M2 Motorway as a key corridor for protection. Investigation into the potential role, alignment and opportunities for this link is listed as an action under this objective.

Details of the NSW Government's direction for transport planning and investment for the next 20 years are provided in the NSW Long Term Transport Master Plan. The Master Plan provides a long term strategic vision for integrated land use and transport planning, to ensure sustainable delivery of transport infrastructure that anticipates and responds to Sydney's economic and population needs.

The Master Plan recognises that a missing orbital motorway connection exists between the M1 Pacific Motorway and the Hills M2 Motorway. In Chapter 7 of the Master Plan, this particular missing link is also identified as an important long term road freight corridor. Chapter 9 of the Master Plan provides a list of measures and a timetable for action. This section identifies that planning would be progressed for future motorway links including the M1 Pacific Motorway to the Hills M2 Motorway link, which would occur as a medium to long term priority.

Issue description

Submissions relating to the justification for the project raised issues regarding the SKM 2004 report and the 2007 Pearlman Review.

In summary, the submissions raised the following issues:

- Justification for the project was based primarily on selected extracts from the SKM 2004 report and Pearlman 2007 Review.
- These extracts are misrepresented, taken out of context, and make assumptions that may have misled the government, the community and the Department of Planning and Environment.

Response

The strategic justification for the NorthConnex project is provided in Chapter 3 of the environmental impact statement. The justification is based on the complete content of the 2004 report and the 2007 Pearlman Review. This justification is based on the relationship with State and national strategic planning documents, and the need for the project considering the existing road network, traffic and safety conditions.

The 2004 report and the 2007 Pearlman Review provided a robust process for the assessment of alternatives and options.

The 2004 report concluded that a tunnel road connection between the M1 Pacific Motorway and the Sydney Orbital Road Network within the purple corridor (generally following the alignment of Pennant Hills Road) best satisfied the planning and project objectives. It was also concluded that the purple corridor alignment option performed best in terms of the technical criteria considered in the assessment and that the purple corridor alignment performed better than the other corridor alignment options in terms of social and environmental impacts based on the assessment conducted.

The 2007 Pearlman Review found that there was no case for altering the conclusions reached in the 2004 report and that a road link based on the purple corridor alignment option was preferred.

Issue description

While the strategic need for the project is well justified, there would be substantial negative environmental impacts around the northern portal and ventilation outlet.

Significant questions remain about the viability of the project, its justification, as considered in competition with other projects and with its safety and impact on public and private amenity.

Concern that the project considers cost effectiveness as a priority over environmental responsibility and long term impacts.

Response

The project is based on an unsolicited proposal from Transurban and the Westlink M7 Shareholders to construct, operate and maintain the project. The Australian and State Governments have each committed up to $405 million to the project. The remainder of the cost of the project would be funded by Transurban and the Westlink M7 Shareholders and would be recouped from tolls on the project and changes to tolling for heavy vehicles on some Sydney motorways.

As part of the NSW Unsolicited Proposals process, Transurban and the Westlink M7 Shareholders were required to demonstrate to the NSW Government that the NorthConnex project is viable and that the financial capacity would be available to deliver the project. Based on its consideration of information provided by Transurban and the Westlink M7 Shareholders, the NSW Government has issued in-principle approval for the NorthConnex project to proceed to Stage 3 of the NSW Unsolicited Proposals process. Stage 3 involves design development and securing environmental planning approvals, leading up to negotiation of a final binding commercial offer for the project.

The justification and need for the project is provided in Chapter 3 of the environmental impact statement. This justification is based on the relationship with State and national strategic planning documents, and the need for the project considering the existing road network, traffic and safety conditions.

The 2004 report and the 2007 Pearlman Review provided a robust process for the assessment of alternatives and options.

The 2004 report concluded that a tunnel road connection between the M1 Pacific Motorway and the Sydney Orbital Road Network within the purple corridor (generally following the alignment of Pennant Hills Road) best satisfied the planning and project objectives. It was also concluded that the purple corridor alignment option performed best in terms of the technical criteria considered in the assessment and that the purple corridor alignment performed better than the other corridor alignment options in terms of social and environmental impacts based on the assessment conducted.

The 2007 Pearlman Review found that there was no case for altering the conclusions reached in the 2004 report and that a road link based on the purple corridor alignment option was preferred.

It is acknowledged that the project has the potential to result in impacts to the local community. These impacts, potentially including noise and vibration; air quality and visual impacts are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

Issue description

The objectives of the project are stated but some elements are unjustified. The current proposal does not meet the statement of project objectives because it does not minimise the adverse social and environmental impacts.

Response

The potential impacts of the project, potentially including noise and vibration; air quality and visual impacts are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

Table 11-2 of the environmental impact statement provides an analysis of how the project meets each of the project objectives.

Issue description

Submissions raised concerns of how the project will deliver significant benefits to local communities without having undertaken a cost benefits analysis.

Belief that the community has been misled by statements that the project's objective is to return local streets to local communities.

Response

The environmental impact statement presents the environmental costs and benefits of the project, including implications for the biophysical, built and social environments.

The significant benefits to the local community relate to the decrease in traffic (especially heavy vehicles) on Pennant Hills Road and the associated improvements to amenity. A detailed description of how the project achieves the project objectives is provided in Table 11-2 of the environmental impact statement.

Issue description

Submissions raised concerns around the project objective of improving public transport. Questions raised as to how this will be achieved without changing road conditions on Pennant Hills Road.

Response

A detailed description of how the project achieves the project objectives is provided in Table 11-2 of the environmental impact statement.

It is recognised that the project would contribute to improving conditions along Pennant Hills Road, compared with expected growth in traffic volumes and worsening congestion if the project were not to proceed. These improvements may facilitate or contribute to opportunities for enhanced public transport options along Pennant Hills Road. Any such public transport enhancements are, however, beyond the scope of the NorthConnex project, but may be pursued separately in the future by the relevant public transport authority/ provider.

The traffic impact assessment in Section 7.1 and Appendix E of the environmental impact statement shows that the majority of intersections along Pennant Hills Road would remain at a similar level of service or show an improvement in the level of service under the 'with project' scenario in both 2019 and 2029. A small number of intersections show a marginal deterioration in intersection performance. These are mainly associated with the interchanges where new traffic movements are necessary to facilitate connections to and from the project.

Issue description

A reduction in crash rates is not a justification for the motorway. This might be true on an economic basis but the majority of crashes on Pennant Hills Road are likely to be low speed rear end collisions with no injuries. Crashes on NorthConnex will be a higher severity.

Response

A reduced crash rate is not the justification for the project although it is an important consideration as part of the environmental impact statement.

The environmental impact statement provides an accurate representation of the potential crash rate based on statistics from other roads and motorways across Sydney. This information is provided in Table 7-38 of the environmental impact statement.

Based on this data, motorists using NorthConnex as an alternative to Pennant Hills Road would be four times less likely to be involved in an injury crash and five times less likely to be involved in a crash of any type. Motorists would also be less likely to be involved in a fatal crash.

8.1.3 Project funding

One hundred and ten submissions raised issues regarding the project funding.

Issue description

Submissions relating to funding raised issues regarding the financial viability of the project and transparency regarding financial matters.

In summary, the submissions raised the following issues:

- Any alliance profit sharing regarding the project should be publicly disclosed.
- The project is not financially viable. The only way to fund the project is to cross subsidise from other motorway tolls and cement the monopoly position.
- The financial projections of the project should be audited.
- Object to the use of State and Federal funds towards the project. The government does not get any return for its investment. Government funds should be used for real transport solutions. This subsidy shows that the tunnel is not financially viable.
- Risk to the credit rating of the NSW Government.
- A transparent cost benefit analysis needs to be performed and should occur as part of the environmental impact statement.
- Ensuring financial responsibility for inadequate peak oil traffic projections.

The National Infrastructure Co-ordinator in 2012 concluded that the NorthConnex project was uneconomic. This omission raises doubts about the assessment process. Will the government place a condition that asset debt in relation to the NorthConnex project will be paid back within the traffic forecast period to 2029?

Response

Alliance profit sharing and other commercial aspects of the NorthConnex project are beyond the scope of the environmental impact statement for the project and are not necessary considerations as part of an environmental impact assessment under the *Environmental Planning and Assessment Act 1979*.

The project is based on an unsolicited proposal from Transurban and the Westlink M7 Shareholders to construct, operate and maintain the project. The Australian and State Governments have each committed up to $405 million to the project. The remainder of the cost of the project would be funded by Transurban and the Westlink M7 Shareholders and would be recouped from tolls on the project and changes to tolling for heavy vehicles on some Sydney motorways.

As part of the NSW Unsolicited Proposals process, Transurban and the Westlink M7 Shareholders were required to demonstrate to the NSW Government that the NorthConnex project is viable and that the financial capacity would be available to deliver the project. Based on its consideration of information provided by Transurban and the Westlink M7 Shareholders, the NSW Government has issued in-principle approval for the NorthConnex project to proceed to Stage 3 of the NSW Unsolicited Proposals process. Stage 3 involves design development and securing environmental planning approvals, leading up to negotiation of a final binding commercial offer for the project.

The $810 million investment shared by the NSW and Australian Governments towards the project is considered to represent good value for money, in order to realise the benefits delivered by project and gain a $3 billion asset for the public.

The 2012 findings by the National Infrastructure Co-ordinator did not consider the current unsolicited proposal for the NorthConnex project. Whilst the National Infrastructure Co-ordinator found that the proposal by the NSW Government at that time was uneconomical, it also identified that options to reduce government contributions should be explored, such as private financing with the private sector taking some of the project risk.

The financial risk of the project rests with Transurban and the Westlink M7 Shareholders in relation to traffic projections. It is not the place of the NSW Government to determine over what time period the motorway operator should repay its debt.

Issue description

Submissions relating to funding raised issues regarding the acceptability of the unsolicited proposal process.

In summary, the submissions raised the following issues:

- The Government should determine the best long term solution then work with private enterprise to build the project. The driver behind this project is a financial outcome due to the unsolicited proposal.
- If the project is of 'State significance' then the State should solicit proposals from interested parties then review them for the best option. This would encourage competiveness and innovation and ensure that all proposals could be considered.
- The unsolicited proposal is not in the best interests of anyone. The environmental impact statement should have provided details of the unsolicited proposal at the beginning.

The commercial-in-confidence provisions that are claimed to be required to protect the company submitting the unsolicited bid override the public interest. For NorthConnex this is even more concerning as approximately $1 billion of tax payers' money is being contributed to the project. The public have a right to know if their money is being spent effectively and on a preferred option which provides value for money as well as protecting the health of the community and the environment.

Response

The NSW Government undertook a comprehensive alternatives and options assessment process commencing with the 2004 report. This report examined a number of strategic alternatives and options for the road corridor. The 2004 report concluded that the 'purple' option, which involved an underground connection between the M1 Pacific Motorway and the Hills M2 Motorway at Pennant Hills Road generally following the alignment of Pennant Hills Road, was the preferred option.

In 2007 a review of the finding of the 2004 report was undertaken by the Honourable Mahla Pearlman. The 2007 review affirmed the findings of the 2004 report.

On the basis of the 2004 report and the 2007 review, the 'purple' option is considered to be the best long term option for completing the 'missing link' between the M1 Pacific Motorway and the Sydney Orbital Road Network. It is reflected in long term strategic infrastructure planning documents including the NSW State Infrastructure Strategy (NSW Department of Premier and Cabinet, 2012) and the NSW Long Term Transport Master Plan (Transport for NSW, 2012), along with a suite of other future projects forming the NSW Government's strategic vision for infrastructure delivery across New South Wales.

Both the NSW Government and the Australian Government are working with Transurban and the Westlink M7 Shareholders to deliver the NorthConnex project.

The unsolicited proposal by Transurban and the Westlink M7 Shareholders to the NSW Government involves the construction and operation of a motorway standard road connection between the M1 Pacific Motorway and the Hills M2 Motorway and is wholly contained within the preferred purple corridor identified by the NSW Government. When an

unsolicited proposal is received by the NSW Government, strict transparency, probity and conduct requirements must be followed as detailed in Unsolicited Proposals: Guide for Submission and Assessment (NSW Government, 2014). These requirements have been followed in relation to the unsolicited proposal for the NorthConnex project independent of and prior to the environmental impact statement commencing. The fact the project is based on an unsolicited proposal is identified in Section 1.1 of the environmental impact statement. However, as this involves a significant commercial arrangement (and associated risk) which involves private businesses and their shareholders, much of the detail is required to remain commercial in confidence.

The NorthConnex project is the result of a design and construction tender procurement process, through which interested parties in the engineering and construction market were encouraged to submit competitive and innovative project designs. Three tenders were received and critically evaluated to identify the best design option for the NorthConnex project.

Issue description

Submissions relating to funding for the project raised issues regarding potential pressure and corruption.

In summary, the submissions raised the following issues:

- Extraordinary confidence in the project is being shown by the project team and insufficient concern for issues raised by the community during consultation activities.
- Vested interests in the construction industry lobby the NSW Government to ignore community impacts.
- Transurban have a vested interest in the project and should not be involved in the environmental impact statement.
- The government is being unreasonably pressured to accept the unsolicited proposal.
- That corruption, conflicts of interest and probity issues are involved and should be reported to ICAC or a Royal Commission of Inquiry established
- If the project was to go ahead in its current form there would be repercussions from this negligence to health impacts for the State government and Transurban, including ICAC hearings and a class action.

Response

Community engagement and the provision of information on the NorthConnex project has been transparent, comprehensive and objective at all times. The NorthConnex project team and technical specialists have been present at project information sessions and through the consultation mechanisms outlined in **Chapter 5** of this report to respond to community and stakeholder questions with the best available information during each stage of the project development.

The NSW Government is not bound to proceed with any unsolicited proposal it may receive. When an unsolicited proposal is received, strict transparency, probity and conduct requirements must be followed as detailed in Unsolicited Proposals: Guide for Submission and Assessment (NSW Government, 2014). These requirements have been followed in relation to the unsolicited proposal for the NorthConnex project independent of and prior to the environmental impact statement commencing.

The involvement of the proponent and the motorway operator is consistent with environmental impact statements for major infrastructure projects. The involvement of the

future motorway operator allows information to be made available in the environmental impact statement which would not ordinarily be available at this stage of the project.

Issue description

Concerns raised related to requests for the Federal and State governments to comply with their duty of care and use taxpayer funds to protect the health and environment of Australians before allowing for the profit considerations of business.

In summary, the submissions raised the following issues:

- The project is based on the most cost effective approach, rather than the best long term solution for residents and motorists.
- The proposal for the tunnel shows no respect or consideration for the surrounding residents or the tax payers partially funding the project.
- People and the environment should be considered ahead of costs and profits.
- Not providing filtration will have major long term consequences on human health, which will in turn have a detrimental effect on the economy.

There is potential for the community members to bring an action in public nuisance alleging that the operation of the tunnel outlets, without filtration equipment, would constitute a public nuisance, by virtue of the possible adverse health impacts.

It may also be possible to bring an action under section 252 of the *Protection of the Environment Operations Act 1997* seeking orders to restrain the motorway operator from operating the outlets without filtration equipment. This action would be based on an apprehended breach of section 124(b) of the *Protection of the Environment Operations Act 1997*, which prohibits the occupier of premises from causing air pollution if such pollution is caused by the occupier's failure to operate plant in a proper and efficient manner.

A class action would impact the cost benefit of the project.

The current proposal is not economically justified as it does not take into account the negative environmental impact.

Response

The project is based on the findings of the 2004 report and the 2007 Pearlman Review which undertook a robust assessment of alternatives and options for the project. This process concluded that the purple corridor forming a tunnelled link between the M1 Pacific Motorway at Wahroonga and the Hills M2 Motorway at the Pennant Hills Road interchange was the preferred option for the project. The NorthConnex project is within the purple corridor.

The environmental impact statement provides a robust assessment of the potential impacts of the project on the environment and the local community. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

In relation to the health of the local community, the air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project in its current form would meet ambient air quality criteria and would pose a very low risk to human health. Notwithstanding, consideration of alternative ventilation designs has been undertaken to identify all feasible and reasonable options, including air filtration, to further reduce the potential impacts from the ventilation outlets (refer to **Section 3.2** of this report). Based on a balanced consideration of environmental and land use impacts, engineering feasibility and cost, a five metre increase to the height of the

ventilation outlets was considered feasible and reasonable. A revised assessment and the potential improvements to air quality and human health outcomes compared to those presented in the environmental impact statement is provided in **Section 9.2** of this report.

Issue description

Submissions raised concerns that referring to the project as 'unsolicited' is dishonest on the part of the NSW Government.

The claim of the proposal being unsolicited is a contrivance.

Response

The State Government's unsolicited proposal process is a formal mechanism which is described on the Government's website (http://www.nsw.gov.au/your-government/unsolicited-proposals). Public-private partnerships (PPPs) are a common and successful approach to infrastructure delivery. This approach can deliver much needed infrastructure in advance of when delivery may otherwise be possible solely with Government funding.

In early 2012, the NSW Government received an unsolicited proposal from Transurban and the Westlink M7 shareholders (the Project Sponsors) to manage the design, construction, maintenance and operation of NorthConnex. The project is based on this unsolicited proposal.

The Australian and State Governments have each committed up to $405 million to the project. The remainder of the cost of the project would be funded by Transurban and the Westlink M7 Shareholders and would be recouped from tolls on the project and changes to tolling for heavy vehicles on some Sydney motorways. The proposed toll on the project would be generally consistent with the tolling structure on the Hills M2 Motorway.

As part of the NSW Unsolicited Proposals process, Transurban and the Westlink M7 Shareholders were required to demonstrate to the NSW Government that the NorthConnex project is viable and that the financial capacity would be available to deliver the project. Based on its consideration of information provided by Transurban and the Westlink M7 Shareholders, the NSW Government has issued in-principle approval for the NorthConnex project to proceed to Stage 3 of the NSW Unsolicited Proposals process. Stage 3 involves design development and securing environmental planning approvals, leading up to negotiation of a final binding commercial offer for the project.

Issue description

Has the additional cost that would be incurred for the construction of an access ramp to the 90 metre deep tunnel been considered?

Response

The costing for the project includes all elements of the design, including the shafts required from the tunnel support facilities and the ventilation facilities to the main alignment tunnels below.

Issue description

Submissions raised concerns of the role that Transurban and Roads and Maritime will play in the construction phase.

Response

Transurban and Roads and Maritime will both be involved in the construction phase. Transurban, together with the Westlink M7 Motorway shareholders, will remain involved as the ultimate motorway operator and financer of the project. Roads and Maritime will ensure that the project is constructed to the necessary design guidelines and will remain the proponent and the ultimate asset owner.

Issue description

The impacts of the diversion of heavy vehicles off the Westlink M7 Motorway associated with the increased toll needs to be taking into consideration as part of the environmental impact statement. Alternative funding arrangement would be needed.

Response

Increases to tolls on other Sydney motorways are part of commercial agreements between the NSW Government and the relevant motorway operator/s. This is beyond the scope of the NorthConnex environmental impact statement.

8.1.4 Tolling and heavy vehicle regulation

Nineteen submissions raised issues regarding tolling and heavy vehicle regulation.

Issue description

Submissions relating to tolling and heavy vehicle regulation raised the following issues:

- There appears to be an assumption that all heavy vehicles will use the tunnels despite the presence of the tolls.
- Means to discourage heavy vehicles from avoiding tolls and using residential roads must be developed. There is not enough detail in the environmental impact statement. A stronger commitment and details of these regulatory measures needs to be provided.
- The project will result in smaller trucks using adjacent side roads to avoid detection leading to increased traffic on local roads.
- The project will push trucks to continue to use Pennant Hills Road for the purpose of refuelling as there will be no service stations directly off the motorway from Ourimbah to Pheasants Nest.
- Concern that the tolls are high and motorists will refuse to pay tolls.
- The dangerous goods classification is faked by trucks not wishing to pay the toll.
- Suggestions include:
    - Inspection stations on residential roads monitoring heavy vehicles.
    - After construction, Roads and Maritime should override cross-street signalled intersections on Pennant Hills Road so that vehicles encounter more red lights.
    - Tolling should be added in a Westlink M7 Motorway style distance toll from the Hawkesbury river bridge to the Hills M2 Motorway, which would discourage people from exiting at Wahroonga and encourage more use of the tunnel. This could be accompanied by a low income cash back scheme similar to south west Sydney.

Response

The proposed toll on the project would be generally consistent with the tolling structure on the Hills M2 Motorway. The nature of the commercial and tolling arrangements between the NSW Government and the motorway operator are outside the scope of the environmental impact statement.

The effect of motorway tolls on motorists' behaviour and desire to use the NorthConnex project have been taken into account as part of the traffic forecasts conducted for the project. Human choices are simulated in the model for different combinations of attributes. For example, a freight vehicle driver with a priority delivery is likely to choose the quickest route regardless of distance or tolls; whereas a retiree visiting friends may choose the shortest route and avoid toll roads.

The model then assigns trips across the road network based on a calibrated assessment of:

- 'Value of time' (individual's perception of the value they put against their time for a particular journey).
- Vehicle operating costs.
- Tolls.
- Assessment of journey time (which takes account of distance, intersections and their performance, congestion and average speed for that time and day).

This is a tried and tested approach which the level of confidence of the accuracy of the model can be validated by current and historic observations of actual conditions. For Northconnex, the toll has been determined based on an alignment with Hills M2 Motorway and the Westlink M7 Motorway toll prices, forecast traffic, capital, operation and maintenance costs, the concession period and government funding contribution.

These traffic forecasts have underpinned the assessments presented in the environmental impact statement.

The benefits of the project for freight in terms of travel time savings and reduced vehicle running costs outweighs the cost of the toll. This alone is incentive for trucks to use the tunnel, rather than creating means to avoid the toll.

Because a key function of the NorthConnex project would be to provide an alternative to Pennant Hills Road for the movement of heavy vehicles, the NSW Government will be introducing regulatory measures to ensure heavy vehicles (other than dangerous goods vehicles or those with a genuine origin or destination along Pennant Hills Road) use the NorthConnex project rather than surface roads. These measures may include introducing, or changing the operation of existing, traffic control facilities, advisory and / or regulatory signage, route designations, notices, application of permits, or other traffic measures. Any regulatory measures that have the effect of regulating heavy vehicles would need to be consistent with the objectives of the National Heavy Vehicle Law, where applicable.

Suggestions to change the traffic signal timing or the number of traffic lights to deter vehicles from using Pennant Hills Road would not be a targeted measure as it would affect all road users, not just heavy vehicles and would have the effect of diminishing the potential outcomes of the project.

Regulatory measures under consideration also include a potential penalty for non-compliance, for certain classes of heavy vehicles using the surrounding road network. Enforcement measures might include structures, upon which equipment associated with enforcement may need to be mounted (such as cameras or other equipment).

Issue description

In summary, the submissions raised the following issues:

- Instead of the gantry at Kenley Park to regulate heavy vehicles on Pennant Hills Road, cameras should be installed on the Thornleigh overhead bridge at Station Street.
- Removing the current advertising distractions in exchange for cameras would be a safety improvement.
- This location would also curtail trucks seeking to avoid an alternative route to avoid detection.

Response

The nature of the heavy vehicle regulation and the physical infrastructure to enforce the regulation is still to be determined, however the environmental impact statement identifies that it may involve the construction of gantries around Kenley Park in the north and Hannah Street in the south. The position of the physical enforcement devices need to be carefully considered to reduce the potential for truck drivers to avoid detection by using other routes. As such, Station Street at Thornleigh may not be a suitable location.

The removal of advertising signage on the pedestrian overbridge at Thornleigh is outside the scope of the NorthConnex project.

8.2 Project development and alternatives

8.2.1 Strategic alternatives

Two hundred and thirty submissions raised issues regarding strategic alternatives to the project.

Issue description

Submissions relating to project development and alternatives raised issues regarding alternatives and project elements that have not been considered. The Auditor-General has previously stated that the NSW Government's failure to get people out of cars and onto public transport was the prime reason that Sydney would not meet its own air quality and greenhouse emissions targets.

In summary, the submissions raised the following issues:

- Existing rail and road corridors should be used.
- Existing trouble spots and bottlenecks within the road network should be fixed.
- Additional and enhanced public transport across NSW should be planned for.
- Priority should be given to public transportation options over roads in future planning.
- The NorthConnex project risks commuters shifting from public transport to private cars.
- Freight should be transported by rail and not by trucks.
- Cyclists have not been considered in the design of this project.
- Cycling infrastructure should be included along Pennant Hills Road to ease traffic congestion.
- Bus lanes should be established on Pennant Hills Road.
- Investment in public transport will ease traffic congestion.
- The tunnel should be restricted to electric vehicle use only.
- Pennant Hills Road should be modified much like the Eastern Distributor, with sections of underpasses, tunnels, open road and overpasses. Four lanes could remain as is with four lanes dedicated to through traffic.
- A surface route through the valley is preferable. Belief that a surface route would result in less environmental and social impacts ,and offer opportunities for integration with other roads
- A viaduct should be considered instead of a tunnel.
- Building a road tunnel is not a strategy to reduce the reliance on oil. Only electric rail is.
- More double decker buses should be used on Pennant Hills Road.
- Other solution should be investigated such as staggered school start times and truck curfews.
- A series of shorter tunnels with multiple portals and ventilation outlets should be considered.

Response

Before the NorthConnex project was proposed, an alternatives and options assessment including rail upgrades and consideration of various potential road alignments was carried out by SKM in 2004 (the 2004 report). Specifically, the 2004 report considered a number of strategic alternatives. This included a 'do nothing / do minimum' alternative which involved

upgrades to the existing road corridor, a rail and public transport upgrade alternative, and a road link between the M1 Pacific Motorway and the Sydney Orbital Road Network.

This investigation found that:

- The 'do nothing / do minimum' alternative would not provide a suitable long term solution from a strategic, regional, local planning or transport perspective.
- The rail and public transport upgrade alternative alone would not be unlikely to satisfy future growth in transport demand.

In recent years significant investments in rail-based freight and passenger transport have been committed and the Epping to Thornleigh Third Track project and the North West Rail Link are currently under construction.

Although these improvements will play an important role in servicing the region, public transport alone and in particular rail transport, is unlikely to completely satisfy future growth in transport demand. As traffic volumes grow, there will be greater pressure to improve the efficiency of the National Road Network to service expanding commercial centres and to cater for local and district freight transport demands and in doing so, support the State's economy.

Based on the above, a road link between the M1 Pacific Motorway and the Sydney Orbital Road Network was identified as the preferred solution from a strategic, regional, local planning and transport perspective. A surface route through the Lane Cove Valley or a viaduct option would result in unacceptable environmental and social impacts.

The principal objective of the NorthConnex project is to provide a seamless, high quality motorway-to-motorway connection between the M1 Pacific Motorway and the Hills M2 Motorway. While it has been designed to not worsen existing trouble spots and bottlenecks, the NorthConnex project is not intended to resolve existing performance issues with the broader road network. To the extent that work may be required to address existing trouble spots and bottlenecks, the relevant roads authority (either Roads and Maritime or the relevant local council) would consider necessary works as a separate project(s) at the relevant time.

NorthConnex is intended to primarily provide for through traffic and freight movements. There are no competing public transport routes or services for these movements and, as such, it is unlikely that commuters would shift from current public transport options to private cars as a result of the NorthConnex project.

Restricting the use of the tunnels to electric cars would significantly restrict the vehicles able to use the tunnels. This would impact the key benefit of the project to remove freight trucks from Pennant Hills Road and would impact the viability of the project.

Cyclists have been considered during the development of the design and as part of construction planning. Cycle interest groups, such as Bike North, have been consulted by the project team. Consultation with cyclist groups will continue during the detailed design and construction phases of the project. Section 7.1 of the environmental impact statement provides an assessment of the potential impacts of the NorthConnex project on cyclists and cycling infrastructure during construction and operation.

Construction of the Hills M2 Motorway integration works and the M1 Pacific Motorway tie-in works will require temporary exclusion of cyclists from parts of those motorways for safety reasons. Alternative cyclist access and passage arrangements would be provided at these locations, with current cyclist infrastructure reinstated once construction is complete.

Cyclists may be indirectly affected by the project, particularly through increases in heavy vehicle movements generated by the construction process. The Traffic Management Plan(s) proposed to be developed for the project would include specific measures aimed at minimising the risks posed to cyclists and other road users from these heavy vehicles.

During operation, cyclists would be excluded from the project tunnels due to safety reasons. No permanent changes to cyclist access or infrastructure are proposed along Pennant Hills Road, although temporary alterations may be required during construction. However, improvements in amenity and road safety along Pennant Hills Road as a result of the project are expected to benefit cyclists and other road users.

The project also involves the construction of dedicated grade separated cyclist facilities across the new on and off-ramps where the main alignment tunnels connect to the M1 Pacific Motorway and the Hills M2 Motorway. This is described in Section 5.2.8 of the environmental impact statement.

Issue description

Submissions relating to project development and alternatives raised issues regarding strategic alternatives that have not been considered.

In summary, the submissions raised the following issues:

- Extending the Westlink M7 Motorway through to the M1 Pacific Motorway would be a better option than the proposed project, since it would bypass residential areas, keeping roads safer and reducing pollution.
- Preference expressed for the M9 Motorway as a better option to relieve congestion. Planning for the M9 Motorway needs to continue.
- The findings of the 2007 Pearlman Review have not been heeded. NorthConnex will not provide a long-term solution.
- The 2007 Pearlman Review said the best route was a western route with a secondary Hawkesbury crossing. If we cannot have the NorthConnex and the outer orbital route, the community needs to be informed which project gives the greater long term benefit.
- An orbital surface route has not been considered. A surface route would also be able to have higher speed limits resulting in better time savings. The provision of the tunnels does not replace the need for a second Hawkesbury crossing.
- A more westerly route would allow for a more balanced cut and fill. Any short tunnels through ridges can be ventilated through the portals without outlets.
- NorthConnex should provide a comprehensive analysis of Type B corridor alignments.
- Improvements to the rail-freight network should be considered.
- Building the tunnel under the railway corridor, within Pennant Hills Road road reserve or under an unpopulated reserve area should be considered.
- Has the additional cost that would be incurred for the construction of an access ramp to the 90 metre deep tunnel been considered?
- The Masson Wilson Twiney 2006 report is not mentioned in the environmental impact statement.

Response

The 2004 report and the 2007 Pearlman Review considered the option of extending the Westlink M7 Motorway at Dean Park through to the M1 Pacific Motorway via a new crossing of the Hawkesbury River (referred to as the Type C corridor). The 2004 report also undertook a comprehensive analysis of Type B corridor options.

The 2004 report concluded that a tunnel road connection between the M1 Pacific Motorway and the Sydney Orbital Road Network within the purple corridor (generally following the alignment of Pennant Hills Road) best satisfied the planning and project objectives. It was also concluded that the purple corridor alignment option performed best in terms of the technical criteria considered in the assessment and that the purple corridor alignment performed better than the other corridor alignment options in terms of social and environmental impacts based on the assessment conducted.

The 2007 Pearlman Review found that there was no case for altering the conclusions reached in the 2004 report and that a road link based on the purple corridor alignment option was preferred. In addition, the 2007 Pearlman Review concluded that a long term option, being the Type C corridor, should be planned for.

Consistent with the recommendations of the 2007 Pearlman Review, the NSW Government announced in June 2014 that it had allocated funding for preliminary investigations to inform the identification and reservation of a corridor for the future M9 Motorway (Outer Sydney Orbital). The M9 Motorway would be consistent with the Type C corridor considered in the 2004 report, and supported by the 2007 Pearlman Review as a long term option. The preliminary investigations are underway, with planning for the M9 Motorway being conducted concurrently with delivery of the NorthConnex project.

The Masson Wilson Twiney 2006 report was in direct response to an alternative proposal brought the NSW Government to progress the yellow corridor option and is not directly relevant to the NorthConnex project. In any event, this report concluded that the Purple Option should remain the preferred option. This is consistent with the subsequent 2007 Pearlman Review.

8.2.2 Options development

Three hundred and seventy six submissions raised issues regarding the options development for the project.

Options development process

Issue description

Submissions relating to the options development process raised issues regarding:

- It is not within the public interest to accept unsound arguments in dealing with the establishment of the national highway network.
- A full and transparent options assessment process was not undertaken to assess alternative designs for the project. This should be undertaken and should include the results of community and stakeholder input.
- An independent options assessment process should be carried out to assess alternative locations for the ventilation outlet and portals.
- There are alternatives that will serve the needs of the community better and have other long term benefits.
- The project should be evaluated against other options and rational evaluation criteria such as net present value should be used in the evaluation. The government should include environment, human health, loss of property value and any other relevant factors in this evaluation.
- There is no assessment of alternatives in the environmental impact statement. Brief statements are provided which are dismissive of alternatives.

- The data used for the traffic modelling for the options development process was inadequate as it produced traffic flows and distribution for vehicles in the tunnel link which were not part of the data used to generate the model. The model also does not distinguish between light and heavy vehicles.

Response

The environmental impact statement addresses the matters specified in the Director-General's environmental assessment requirements and the requirements of the *Environmental Planning and Assessment Regulation 2000* relating to the analysis of feasible project alternatives. This has included:

- Consideration of not proceeding with the project.
- Consideration of feasible alternative project corridors (Type A, Type B and Type C corridors as assessed in the 2004 SKM report, with further consideration in the 2007 Pearlman Review).
- Consideration of feasible alternative project alignments within the preferred Type A corridor (as assessed in the 2004 SKM report, with further consideration in the 2007 Pearlman Review).
- Consideration of feasible alternative transport options, such as rail infrastructure and public transport initiatives (as assessed in the 2004 SKM report, with further consideration in the 2007 Pearlman Review).

The 2004 report provided a robust consideration and assessment of alternatives and options for the project including consideration of traffic volumes. The findings of the 2004 report were validated by the 2007 Pearlman Review.

The scope and level of detail in the analysis of feasible alternatives presented in the environmental impact statement for the project is comparable to information provided for other major infrastructure projects in New South Wales.

In contrast to other major infrastructure projects, however, the NorthConnex project has brought forward the more detailed design work which would ordinarily not occur until after environmental planning approvals had been granted. This design development, achieved through a competitive design and construct tender process before preparation of the environmental impact statement, has allowed a more detailed, definitive assessment of potential environmental impacts than would typically be provided for other major infrastructure projects. Other major infrastructure projects typically do not include the same level of design development as the NorthConnex project, nor do they present multiple detailed designs for the same project.

Notwithstanding that it would go beyond the level of alternatives analysis required of or typically presented in an environmental impact statement, it is relevant to note that neither Roads and Maritime nor Transurban and the Westlink M7 Motorway Shareholders have a right to use or otherwise publicly release the intellectual property comprised in the two unsuccessful tender submissions.

In broad terms, the three tenderers were required to develop the design for motorway tunnels and ancillary works and facilities as described in *F3-M2: State Significant Infrastructure Application Report* (AECOM, September 2013). This included location of project infrastructure within the project corridor shown in that document. To assist the tenderers in providing designs that minimised environmental and land use impacts, the following information was developed and provided during the tender period:

- The State significant infrastructure application and accompanying State Significant Infrastructure Application Report.

- The original Director-General's environmental assessment requirements, issued on 29 October 2013.
- An Environmental Constraints Report (AECOM, August 2013), which presented a preliminary desktop review of environmental and land use constraints along the project corridor. The report included consideration of:
  - Biodiversity.
  - Aboriginal heritage.
  - Non-Aboriginal heritage.
  - Sensitive land uses.
  - Traffic.
  - Contaminated land.
- Ecological field survey information (vegetation mapping and potential threatened species habitat assessment) around the northern and southern interchanges, and across Brickpit Park.
- A summary of results from Aboriginal heritage investigations conducted consistent with the requirements of Stage 2 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (RTA, 2011).

Information provided to the tenderers was complemented with a series of interactive sessions conducted during the tender period to discuss and to provide clarification as tender designs were developed. For interactive sessions relating to environmental and land use issues, qualified environmental specialists were in attendance to provide comment on relevant issues. Examples of issues that were discussed include:

- Ventilation design, including requirements for in-tunnel air quality and ambient air quality.
- Land acquisition, including minimisation of land take and associated land use issues such as severance and sterilisation.
- The location of project infrastructure, including ventilation outlets, emergency smoke extraction facilities and construction compounds. This included discussion of the criteria or guiding principles that should be applied to identifying locations for that infrastructure.
- Potential ecological impacts, including avoidance of endangered ecological communities and other sensitive areas, minimisation of native vegetation clearing, riparian ecology and potential requirements for ecological offsets.
- Potential impacts on non-Aboriginal heritage, including discussion and clarification of State and local heritage values.
- Construction impacts, including construction traffic, construction noise and construction dust generation.
- Groundwater infiltration, treatment and disposal.

Submissions made by each of the tenderers were evaluated based on several criteria, related to issues such as compliance with engineering design requirements, road network performance, safety, cost and resource efficiency and the ability to obtain environmental planning approval within a reasonable timeframe. To evaluate the tender designs with respect to ability to secure environmental planning approval, each was assessed based on a risk analysis framework developed in accordance with *AS / NZS 31000:2009 Risk Management – Principles and Guidelines* (Standards Australia / Standards New Zealand,

2009). The evaluation of environmental and planning issues associated with each tender design took into account:

- Statutory compliance, including legislative compliance, project completeness (level of project detail), alternatives and justification, and the need for Commonwealth approval.
- Construction environmental and land use impacts, including air quality, noise and vibration, traffic management, ecology, non-Aboriginal heritage, Aboriginal heritage, surface water and soils, groundwater, contaminated land, economic and business, land acquisition and access, hazards and risk, resource consumption, waste generation, and visual amenity and landscape.
- Operational environmental and land use impacts, including air quality, noise and vibration, traffic, hazards and risk, land use, ecology, non-Aboriginal heritage, Aboriginal heritage, surface water and soils, groundwater, contaminated land, economic and business, resource consumption, waste generation, and visual and landscape.
- Community and stakeholder response, including expected community and stakeholders views on land acquisition requirements, construction traffic generation, air quality and human health issues, other environmental and land use issues, and good environmental practice.

Overall, the tender design taken forward to form the basis of the environmental impact statement performs significantly better than other tender designs taking into account evaluation in the areas listed above. This included performing:

- Around the same as one tender design, and slightly better than the other tender design with respect to statutory compliance.
- Significantly better than both other tender designs with respect to construction environmental and land use impacts.
- Slightly better than one tender design, and significantly better than the other tender design with respect to operational environmental and land use impacts.
- Slightly better than one tender design, and significantly better than the other tender design with respect to expected community and stakeholder response.

A rigorous and comprehensive process has been followed to ensure that the project design on which the environmental impact statement has been prepared has minimised or avoided environmental and land use impacts, and is capable of being constructed and operated within acceptable environmental limits.

Issue description

Submissions related to the options development process raised concerns that the project does not provide connections for commuters to exit the motorway system and transfer to rail or bus services.

Response

The principal purpose of the NorthConnex project is to provide a motorway-to-motorway connection between the M1 Pacific Motorway and the Hills M2 Motorway. Connections to or enhancements of existing public transport infrastructure are beyond the scope of the current project.

However, it is recognised that the project would provide potential opportunities for future public transport improvements along Pennant Hills. Transport for NSW and Roads and Maritime have commenced separate, preliminary investigations into these potential improvements on Pennant Hills Road. Subject to the outcomes of these investigations,

separate projects to enhance or expand public transport services along Pennant Hills Road may be pursued in the future. Further details of some of the public transport improvement opportunities that are currently being considered are provided in Section 5.2.11 of the environmental impact statement.

The NSW Government is separately undertaking the Transport Access Program through Transport for NSW. This program involves an ongoing review by Transport for NSW to assess the feasibility of a number of proposed projects across the NSW public transport network aimed at delivering accessible, modern, secure and integrated transport infrastructure where it is needed most. In the vicinity of NorthConnex, the Transport Access Program has already delivered improvements to access arrangements at railway stations including Berowra, Pennant Hills, and Normanhurst.

Issue description

Submissions relating to the options development process questioned the compliance of SKM to the 2001 Terms of References and its contract.

Response

The 2004 report provided a robust process for the assessment of alternatives and options.

The 2004 report concluded that a tunnel road connection between the M1 Pacific Motorway and the Sydney Orbital Road Network within the purple corridor (generally following the alignment of Pennant Hills Road) best satisfied the planning and project objectives. It was also concluded that the purple corridor alignment option performed best in terms of the technical criteria considered in the assessment and that the purple corridor alignment performed better than the other corridor alignment options in terms of social and environmental impacts based on the assessment conducted.

In 2007, a review of the 2004 report was carried out by the Honourable Mahla Pearlman AO (former Chief Judge of the NSW Land and Environment Court) at the request of the Australian Government. The 2007 Pearlman Review found that there was no case for altering the conclusions reached in the 2004 report and that a road link based on the purple corridor alignment option was preferred.

A review of SKM's compliance with the 2001 Terms of Reference is beyond the scope of the NorthConnex proposal.

Corridor alignment options

Issue description

Submissions relating to the corridor alignment options provided support for the purple option as the best option for linking the M1 Pacific Motorway and the Hills M2 Motorway.

Response

Support for the purple option is noted.

Issue description

Submissions relating to the corridor alignment options provided support for the red option with the southern interchange located to the east of Epping. This option would:

- Attract motorists using the Pacific Highway and would improve congestion on two congested roads.

- Require a shorter tunnelling distance of less than six kilometres, with associated capital cost savings, compared with the nine kilometre tunnel in the environmental impact statement proposal.
- Possibly require less resumption of private homes than the Carlingford interchange site.
- Avoid any conflict with the routes of North West Rail Link and northern rail line, possibly reducing the need for the 90 metre deep NorthConnex tunnel, again with potential capital cost savings.
- Provide a more direct alternative to the whole Pacific Highway, including the northern stretch between Gordon and Wahroonga.

Response

The 2004 report concluded that a tunnel road connection between the M1 Pacific Motorway and the Sydney Orbital Road Network within the purple corridor (generally following the alignment of Pennant Hills Road) best satisfied the planning and project objectives. It was also concluded that the purple corridor alignment option performed best in terms of the technical criteria considered in the assessment and that the purple corridor alignment performed better than the other corridor alignment options in terms of social and environmental impacts based on the assessment conducted. The 2004 report acknowledged that the red option would provide similar benefits to the purple option in term of traffic effects, however the purple option performed best when considering a balanced assessment of transport, environmental and social objectives.

The 2007 Pearlman Review found that there was no case for altering the conclusions reached in the 2004 report and that a road link based on the purple corridor alignment option was preferred.

Issue description

The Pearlman Review endorsed the 'purple option' not the NorthConnex project specifically. The proposal is inconsistent with the preferred 'Purple' option which minimised the impact on properties, included several ventilation outlets and was overwhelmingly supported by stakeholders.

Response

The 2004 report and 2007 Pearlman Review concluded that the purple corridor best met the environmental and planning objectives for a link between the M1 Pacific Motorway and the Sydney Orbital Road Network. As part of the 2004 report, an illustrative design was completed in order to determine if there was a feasible engineering option within this corridor. The 2004 report notes (in Chapter 14) that this design 'is illustrative only and is one of many different arrangements which could be designed within the Purple corridor'. It further states that 'the detail shown is not meant to be described as the preferred concept proposal'.

The NorthConnex project is consistent with the purple corridor identified in the 2004 report. The preferred tender design has minimised the amount of property acquisition required and provides an efficient ventilation design. The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Issue description

The Pacific Highway between the M1 Pacific Motorway at Wahroonga and the Bradfield Highway at Artarmon is one of the most congested roads in Sydney.

The NorthConnex project should also have the objective of providing a viable, direct and appealing (to motorists) alternative to the Pacific Highway. The route selected fails to provide a direct and appealing alternative to the main northern entry / exit route from the end of the M1 Pacific Motorway to the Sydney CBD, the southern suburbs, Sydney airport and the city's inner west.

The avoidance of 40 sets of traffic lights appears to be the only advantage of using the NorthConnex project over continuing to use the Pacific Highway. There does not appear to be any travel time benefits, expect possibly during periods of heavy congestion.

With little material time saving and three extra tolls – Lane Cove Tunnel, Hills M2 Motorway and NorthConnex – NorthConnex as part of an alternative northern route between the CBD and the M1 Pacific Motorway is unlikely to be appealing to many motorists, particularly those using it on a daily basis.

It is not clear if Pearlman in the 2007 Review considered the effect that multiple consecutive tolls may have on private car user behaviour and their route selection.

Some motorists may choose to limit the toll cost and avoid the Pacific Highway choke point at Chatswood by using the Hills M2 Motorway and Lane Cove Tunnel only – connecting with this route at North Ryde. This would avoid the NorthConnex toll and the longer Hills M2 Motorway toll and reduce the travel distance significantly. In this context, the existence of NorthConnex would do little to alleviate Pacific Highway congestion between Gordon and Wahroonga.

Response

The primary objective of the NorthConnex project is to improve the efficiency of the freight movements on the National Land Transport Network by connecting the M1 Pacific Motorway to the Hills M2 Motorway. A fundamental feature of this connection is to provide a motorway-to-motorway connection at each end to allow free flowing traffic and avoid the need to stop and start at traffic lights.

An improved route from the M1 Pacific Motorway to the Sydney CBD is outside the scope of the project.

Notwithstanding, Section 8.1.4.3 of the Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) identifies the projected travel time savings on the Pacific Highway as a result of traffic redistribution from the NorthConnex project. These projected travel time savings consider the effect of the tolls throughout the network.

8.2.3 Tender process and alternative tender designs

Thirty four submissions raised issues regarding the tender process and the alternative tender designs.

Issue description

Submissions relating to the tender process raised issues regarding the NorthConnex project being the first road project in NSW delivered under the unsolicited proposal process.

Response

The NorthConnex project is not the first road project proposed and delivered in NSW under the unsolicited proposal process. The Sydney Harbour Tunnel, Hills M2 Motorway Upgrade and M5 Motorway West Widening projects were all unsolicited proposals.

The Unsolicited Proposals process in NSW, as outlined in Unsolicited Proposals: Guide for Submission and Assessment (NSW Government, 2014) (revised and updated since its original publication in 2012), is a consistent, transparent and streamlined approach for the receipt, assessment and determination of unsolicited proposals that may be developed and submitted by the private sector for works and/ or activities that would have historically been conducted by Government. Unsolicited proposals and the guidelines that govern their assessment are published on the NSW Government website (http://www.nsw.gov.au/yourgovernment/unsolicited-proposals). The unsolicited proposal received by Government from Transurban and the Westlink M7 Motorway Sponsors in relation to the NorthConnex project has been conducted strictly in accordance with published guidelines that govern unsolicited proposals.

Issue description

Alternative tender designs should be made public rather than hiding behind 'commercial in confidence'. This gives the community no confidence that other matters are not being hidden.

Concern with lack of transparency in the planning process in which criteria and weighting of the criteria for assessing alternate tender designs are not available. NorthConnex should publish the detailed criteria, weightings and system used to assess the tenders submitted for the preferred option.

There is no evidence that the NorthConnex project considered any alternative designs, other than the three tender designs. The tunnel should be open to a public tender.

Response

In contrast to other major infrastructure projects the NorthConnex project has brought forward the more detailed design work which would ordinarily not occur until after environmental planning approvals had been granted. This design development, achieved through a competitive design and construct tender process before preparation of the environmental impact statement, has allowed a more detailed, definitive assessment of potential environmental impacts than would typically be provided for other major infrastructure projects. Other major infrastructure projects typically do not include the same level of design development as the NorthConnex project, nor do they present multiple detailed designs for the same project.

Notwithstanding that it would go beyond the level of alternatives analysis required of or typically presented in an environmental impact statement, it is relevant to note that neither Roads and Maritime nor Transurban and the Westlink M7 Motorway Shareholders have a right to use or otherwise publicly release the intellectual property comprised in the two unsuccessful tender submissions.

The project team undertook a comprehensive tender evaluation process to select the preferred tender design. This process is described in Section 4.4 of the environmental impact statement.

The tender evaluation was separated into categories including engineering design, environmental and social performance and project cost (including upfront capital expenditure and ongoing operational expenditure). Each of these categories were divided into a number of sub-categories to allow comparison between the tenders. Relevant technical specialists were used to undertake the tender evaluation. Guidance and technical input was also provided by Roads and Maritime throughout the evaluation process.

The evaluation of engineering design requirements involved an assessment of the tenders against a set of mandatory functional requirements, the performance of the engineering

aspects of the tender designs and the identification of risks within the tender designs. This involved separate assessments for each engineering aspect such as road geometry, drainage, structural elements and ventilation systems.

The environmental and social category evaluation involved an assessment of the tenders for environmental and social performance (costs and benefits) and the identification of potential environmental and social impacts and risks.

The performance of each sub-category was considered for both the construction and operational phases of the project.

Each sub-category was scored according to how well the minimum requirements were met or exceeded. The score for each evaluation category was then weighted to provide an overall score and ranking of each tenderer.

The preferred tenderer was chosen based on the outcome of this thorough evaluation of the three tender submissions. This process provided a balanced consideration of engineering design requirements, project cost (including upfront capital expenditure and ongoing operational expenditure), and environmental and social impacts.

8.2.4 Preferred tender design refinements

One hundred and seventy nine submissions raised issues regarding the preferred tender design refinements.

General concerns

Issue description

Submissions raised concerns that the proposal is an unsolicited bid and does not take account of best practice from either a health or a technology perspective. Current international research and practical application provide clear evidence that this project is not world's best practice – nor does it take account of Governments' (State and Federal) 'Duty of Care' obligations under their respective Work, Health and Safety Legislation. Suggests that the design should be reviewed in its entirety or abandoned.

Response

The preferred design has incorporated all feasible and reasonable design measures including in relation to: geometry, pavement, lighting and signage, consistent with current Australian Standards, road design guidelines and industry best practice. In doing so, the design of the project has been developed to inherently minimise the likelihood of incidents and accidents. The design also provides a technologically advanced tunnel management system in order to actively manage any incidents within the tunnels.

These measures, along with consideration of workplace hazards during the construction of the tunnels, are described in Section 8.2 of the environmental impact statement.

In relation to the health of the local community, the air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Issue description

Submissions raised concerns that there should be no widening of the existing M1 Pacific Motorway.

Suggestions that the existing two lanes of M1 Pacific Motorway (for respective directions) can be combined into one lane, allowing the tunnel entrance and exit to utilise the other lane. In this case, no extension will be required and no new noise wall will be needed for the surrounding residential properties, including those along Hewitt Avenue.

Response

Combining the existing two lanes on the M1 Pacific Motorway to one lane in this location is not feasible due to the volumes of traffic anticipated. Restricting the lane capacity would result in increased traffic congestion and unacceptable intersection performance at the M1 Pacific Motorway / Pennant Hills Road intersection.

Issue description

The tunnel should be driven from western gullies linking to disposal areas, including Hornsby Quarry. The tunnel could then be ventilated to these uninhabited gullies without the need to construct ventilation outlets.

Response

Supporting tunnelling works from these locations would be likely to result in significant impacts such as vegetation clearance, the use heavy vehicles in local streets and the generation of additional spoil.

Such a ventilation system is likely to result in increased impacts from those described in the environmental impact statement due to the lack of dispersion from releasing the in-tunnel air at ground level. Significant energy usage would also be required to transport the air through tunnels to these locations.

Issue description

The benefits of the northern interchange (on and off-ramps to Pennant Hills Road) are not worth the cost and should be deleted from the project.

Response

The on and off-ramps provide an important function of allowing motorists from the Pacific Highway to the north and the east to enter the tunnel to travel south. Without this facility, these motorists would need to continue to use Pennant Hills Road.

Equilibria proposal

Issue description

Submissions relating to the preferred tender design refinements provided support for the Equilibria proposal as a viable alternative.

In summary, the submissions raised the following issues:

- A more detailed response with order of costs on the Equilibria proposal should be provided.
- The Equilibria proposal appears to meet the public benefit and infrastructure requirements.
- Respondents offered support for the Equilibria proposal.
- The Equilibria proposal provides a zero grade tunnel between the Hills M2 Motorway and the M1 Pacific Motorway. This would result in reduced vehicle emissions.

- The Equilibria proposal would meet strategic planning documents in relation to quality of investment, urban renewal, accessibility and connectivity, and balanced growth by providing much needed housing close to transport infrastructure.

The Equilibria proposal was brought to the attention of the proponents early in the community liaison process in 2013. There was no attempt to make any amendments to the project.

Response

It is understood that the Equilibria proposal involves widening and extending the NorthConnex project for around one kilometre further north, resulting in main alignment tunnels around ten kilometres in length. The concept proposes that traffic currently using the M1 Pacific Motorway would use the tunnel. A major residential development would be built on the existing M1 Pacific Motorway corridor from the Pacific Highway to around two kilometres north.

The proponents of the Equilibria proposal have advised that under the most recent iteration of their scheme:

- There would be better gradients in the tunnel.
- Around 2,000 residential dwellings would be created.
- An infrastructure subsidy of $350 million would be needed.
- A potential payment of $100 million to the NSW Government would be required for land released.
- Stamp duty of $74 million would be payable.
- Development sales would be around $1.8 billion.
- There would be a development profit of around $400 million.

The proposal has been considered by the NSW Government through a range of forums including the NSW Unsolicited Proposal process. Key reasons for not pursuing the scheme include:

- The technical requirements proposed by Equilibria for the modified NorthConnex tunnels have not been developed sufficiently to confirm technical and financial viability.
- The Equilibria proposal would force all dangerous goods vehicles to leave the M1 Pacific Motorway at Berowra and be re-routed through Hornsby Town Centre and other residential areas. Unless additional above ground ramps connecting the tunnels to the Pacific Highway were constructed.
- Any vehicles not wishing to pay the toll to travel through the NorthConnex tunnels would be forced to leave the M1 Pacific Motorway at Berowra. Alternatively, the northern section of the Equilibria proposal could be contemplated as an un-tolled motorway, with flow-on implications for the commercial viability of the proposal.
- In the event of a tunnel closure all vehicles would have to be re-routed along the Pacific Highway, through Hornsby Town Centre.
- The estimated cost of the infrastructure is severely under estimated and insufficient investigations have been conducted to demonstrate that the return on residential apartment sales would be sufficient to fund the additional cost of the Equilibria proposal, or that such funding would be available at an appropriate time to meet the commercial requirements of the proposal.
- The Equilibria proposal suggests total development sales of $1.833 billion for 2,000 units. This equates to a selling prices of a little less than $7,500 per square metre. This

is significantly higher than the current average of around $6,000 per square metre in this locality.

- Presently, the highest Floor Space Ratio (FSR) for high density residential (R4) contemplated in the draft Kur-ring-gai Local Environmental Plan is 1.3 to 1. The implied ratio of 2.0 to 1 does not align with the argument of reuniting Wahroonga. The proposed linear development would appear to create a similar division between the two sides of the motorway as currently exists.
- The land identified is primarily zoned as SP2 (infrastructure) in the draft Ku-ring-gai Local Environmental Plan 2013. The proposed Equilibria development would be prohibited under this zoning. The re-zoning of the identified land for this purpose may not be acceptable to Ku-ring-gai Council, especially for an increased density (FSR) of 2.0 to 1 or more.
- Staging would be very complex to maintain the functionality of the existing motorway during construction.
- There is no current commercial backing to fund extra infrastructure or to undertake the development.
- There is no credible evidence to justify the claimed reduction in vehicle emissions with a longer tunnel, despite the zero grade of the tunnel.
- A reduction in vehicle emissions will not be achieved, and the claim cannot be supported. Although a minor reduction in emissions would be achieved due to the reduction in grade in the Northbound tunnel (average 1.127% down to 0%). Vehicle emissions generated within the Northbound tunnel overall would be greater than those of NorthConnex. This is due to:
  - The longer mainline tunnel.
  - Additional entry and exit ramps.
  - Steeper and longer entry and exit ramps due to the zero per cent mainline tunnel grade.
  - Increased number of vehicles forced to use the tunnel.
- Vehicle emissions generated within the southbound tunnel would be significantly higher than those of NorthConnex. This is due to:
  - Increased mainline tunnel grade from -1.127 per cent average up to zero per cent.
  - The longer mainline tunnel.
  - Additional entry and exit ramps.
  - Steeper and longer entry and exit ramps due to the zero per cent mainline tunnel grade.
  - Increased number of vehicles forced to use the tunnel.
- There are likely to be delays in obtaining planning approval and construction of NorthConnex, given the need to amend and re-exhibit an environmental impact statement for the extended project. Delays in obtaining planning approval may be tolerable if an alternative proposal with clearly superior design, environmental outcomes or commercial performance were identified. The Equilibria proposal has not, on balance, been demonstrated as a clearly superior alternative, taking into account relevant factors.

A more detailed review of the infrastructure required for implementing the Equilibria proposal and the technical requirements for the extended tunnels has been carried out. In order for the extended tunnels to be viable in terms of traffic and safety, the following changes would need to be made to the NorthConnex project:

- The tunnels would need to be increased from the currently proposed nine kilometres to ten kilometres in length.
- The tunnels from the Pacific Highway north to the new portal position would need to be widened to a five lane tunnel (initially marked for four lanes).
- Additional north facing underground ramps between the new tunnel and the Pacific Highway would need to be constructed to provide access to the Hornsby / Ku-ring-gai local government areas.
- An additional ventilation outlet would likely be required as the proposal will generate more emissions and require increased airflow rate to dilute these emissions.
- The proposed location for the northern ventilation facility would require construction of a ventilation tunnel approximately 900-1,000 metres long and with a cross sectional area of approximately 50-70 m^2.
- An additional emergency smoke extraction facility would be required to ensure the distance between the emergency smoke extraction outlets does not exceed 3.5 kilometres.
- The provision of high rise development in the vicinity of the northern ventilation outlet would result in a significant increase in height of the outlet and extra supply fans to ensure effective plume dispersion above the proposed new high rise development.

The indicative cost to deliver the modified NorthConnex infrastructure necessary for the Equilibria proposal has been estimated to be around $1 billion which excludes allowances for extra land acquisition for new and modified surface facilities.

Based on consideration of the above, the Equilibria proposal does not warrant further consideration due to the operating issues identified and the high cost to implement the changes.

If implemented the extra costs would have to be funded by the NSW Government since there is no financer currently identified who would be willing to fund the changes or commit to purchasing the land for the development.

Direct links from the project to the Hills M2 Motorway and Pacific Highway

Issue description

Submissions relating to the preferred tender design refinements raised issues regarding the links between the project and the Hills M2 Motorway. This route is likely to become the major northern route to and from the Sydney CBD.

In summary, the submissions raised the following issues:

- There should be a direct link for traffic westbound on the Hills M2 Motorway to join the tunnel and a direct link for traffic southbound in the tunnel to join the eastbound Hills M2 Motorway.
- The lack of this direct connection will cause queuing in the tunnel and the Pennant Hills Road off-ramp.
- Connections east and west will remove traffic from Pennant Hills Road and the Pacific Highway.

Response

The NorthConnex project has been designed to allow for potential future construction of ramps onto and off the Hills M2 Motorway east of Pennant Hills Road, if required as identified in Section 4.3.2 of the environmental impact statement.

A review of an east facing connection between the purple corridor and the Hills M2 Motorway was conducted as part of the Stage 2 unsolicited proposal design development process. Analysis of the traffic implications associated with east facing ramps indicated that:

- East facing ramps connecting to the Hills M2 Motorway would only provide minor travel time benefits for motorists, compared with requiring this traffic to emerge from the main alignment tunnels and use the one existing traffic light to access the Hills M2 Motorway east of Pennant Hills Road.
- The minor nature of incremental travel time benefits would not be sufficient to attract additional users and provide any further material congestion relief to the Pacific Highway and Pennant Hills Road.

In addition, significant engineering and environmental constraints were identified (including the presence of Pennant Hills Golf Course and Devlins Creek) that would need to be overcome at significant cost in order to provide east facing ramps. On balance, these constraints and the limited traffic benefits of east facing ramps supported exclusion of this design option from the scope of the project at this time.

Section 7.1.4 of the environmental impact statement provides an assessment of operational traffic, including the likely performance of the tunnel and the performance of intersections along Pennant Hills Road. Based on a comparison of intersection performance with and without the project in 2019 and 2029, the project is not expected to impact on the performance of the Pennant Hills Road / Hills M2 Motorway intersection. The assessed mid-block performance of the tunnels indicates that the tunnels would operate as free flowing under forecast traffic volumes and during normal (non-emergency or breakdown) conditions.

The traffic assessment (Table 7-23 of the environmental impact statement) also provides origin and destination information for NorthConnex tunnel users at the southern interchange. This identifies that on an average workday by 2029 it is anticipated that traffic to and from the Hills M2 Motorway east of Pennant Hills Road is anticipated to be around 4,000 vehicles, representing only ten per cent of total tunnel traffic.

It is acknowledged that traffic growth and a change in motorist demand for this movement may warrant construction of this direct connection in the future despite the constraints identified above. As such, the project has been designed to enable the future provision of these ramps and stub tunnels would be constructed as part of the NorthConnex project for this future connection.

In the interim, the project allows for motorists travelling south on the project to continue their journey on the Hills M2 Motorway eastbound. Motorists would be able to leave the project via the southbound off-ramp to Pennant Hills Road and then join the Hills M2 Motorway via one set of traffic lights using the existing Pennant Hills Road eastbound on-ramp.

The design of the project does not preclude implantation of tunnel connections to and from the Hills M2 Motorway east of Pennant Hills Road in the future.

Issue description

Submissions relating to the preferred tender design refinements raised issues regarding the lack of a link between the project and the Pacific Highway at Wahroonga. The northern

interchange should be built so that traffic from Hornsby, Wahroonga and Turramurra can enter the motorway easily. It seems the plan is more about freight movement down the M1 Pacific Motorway and out west.

Response

Although there is no direct link from the Pacific Highway at Wahroonga into the NorthConnex tunnels, access to the southbound tunnel is facilitated via a left turn at the M1 Pacific Motorway / Pennant Hills Road intersection.

The principal purpose of the NorthConnex project is to provide a motorway-to-motorway connection between the M1 Pacific Motorway and the Hills M2 Motorway. Connections to other major roads, including the Pacific Highway and Pennant Hills Road are included to provide additional benefits and access to the NorthConnex tunnels.

Location of the portals

Issue description

Submissions relating to the preferred tender design refinements raised issues regarding the location of the northern tunnel portals.

In summary, the submissions raised the following issues:

- The tunnels should be redesigned to mitigate current design flaws.
- Relocation of the northern portals two kilometres north to the industrial area or into the Ku-ring-gai National Park. This would take the health risks away from a densely populated area and have the added benefit of reducing noise.
- This would also provide the opportunity to reduce impact to Blue Gum High Forest and the northern interchange compound.
- Relocation of the northern portals further north to allow for a more level gradient and less pollution. This would also produce an exit at a point where extra width might be available for merging traffic.
- All previous proposals had portals around the Pacific Highway / Pennant Hills Road intersections. NorthConnex have changed this with no notice.
- A fully costed proposal should be provided.

Funding sources are available to be able to move the outlet including a heavy vehicle toll on Pennant Hills Road, extending the concession period, additional government funding, shortening the southbound tunnel.

Suggestions included a cut and cover tunnel option to extend the tunnels as a cost effective solution. This would result in a flat tunnel to minimise emissions and increase energy efficiency, would move the portal and outlet to an industrial area and bushland, and would use the existing M1 Pacific Motorway (which as sufficient width) as a base. An independent options assessment process should be undertaken including consideration of this cut and cover option.

Response

The northern portals and northern ventilation outlet have been located taking into account a balance of relevant issues, including the performance of the surrounding road network, engineering practicality and constructability, cost efficiency, the desire to minimise land take and disturbance of existing development patterns, and minimisation of environmental impacts. Taking all of these factors into account, the proposed location for the northern

portals and northern ventilation outlet represent an optimised outcome that meets the functional objectives of the project and minimises or avoids potential environmental, health and social impacts.

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project in its current form would meet air quality criteria at external receivers and would pose a very low risk to human health. In this context, there is no basis to justify relocation of the northern portals and/ or northern ventilation facility to an alternative location.

Moving the portals further north would not eliminate the needs for the northern interchange compound to be utilised as a tunnel support site. Conversely, additional tunnelling would be likely to be supported from this compound.

Alternatively, if the northern portals and/ or northern ventilation outlet were to be considered further north, in the Ku-ring-gai National Park or the Hornsby / Asquith Industrial Area, no appreciable improvement has been demonstrated or identified in any of the abovementioned locational considerations. A more northerly location would:

- Not offer improved road network performance, and is in fact likely to contribute to undesirable traffic outcomes including re-routing all dangerous goods vehicles through the Hornsby Town Centre.
- Likely result in the need for an additional emergency smoke extraction facility and potentially a third ventilation outlet.
- Introduce more complex engineering and more extensive, disruptive and challenging construction.
- Relocate very small air quality and human health impacts, with no significant reduction in the magnitudes of those impacts.
- Potentially require a net increase in property acquisition requirements.
- Significantly add to the cost of the project, with no confirmed, viable additional financing. The funding sources suggested in the submissions have not been costed and may result in the project being financially unviable.
- Increase the ongoing operational cost of the NorthConnex project, and the environmental footprint of operations (including for example, increased energy consumption).

Additionally, there is no credible evidence to justify the claimed reduction in vehicle emissions with a longer tunnel, despite the potential to have a flatter grade tunnel.

The cost and funding of the NorthConnex project has been managed through the unsolicited proposal process between the NSW Government, and Transurban and the Westlink M7 Shareholders. Whilst alternatives and options to the project are discussed in Chapter 4 of the environmental impact statement , it assessed the environmental impacts of the preferred tender design and comparative costs did not arise in this context.

Issue description

Submissions relating to the preferred tender design refinements raised issues regarding the location of the southern tunnel portals.

In summary, the submissions raised the following issues:

- Relocation of the tunnel entrance linking Pennant Hills Road to the project northbound, from north of the Hills M2 Motorway to south of the Hills M2 Motorway.

- Relocation of the tunnel exit linking the southbound main alignment tunnel to Pennant Hills Road, from north of the Hills M2 Motorway to south of the Hills M2 Motorway.
- Concerns that the location of the southern portal will increase traffic congestion at the intersection of Pennant Hills Road and the Hills M2 Motorway.
- Suggestion that the exit and entrance portals for western bound and sourced traffic should be on the Hills M2 Motorway some distance west of the Pennant Hills Road intersection or within the Pennant Hills Golf Course.
- Suggestion of relocating the tunnel entrance further west at the lowest point before the off ramp to Pennant Hills Road. This is Crown Land would have no impact on surrounding residents.
- Suggestion of widening the top of the off ramp to Pennant Hills Road to allow for an extra lane to funnel the northbound tunnel traffic into the tunnel entry on Pennant Hills Road. This could be done without the need for traffic lights to stop northbound tunnel traffic at Pennant Hills Road.

Response

The principal purpose of the NorthConnex project is to provide a motorway-to-motorway connection between the M1 Pacific Motorway and the Hills M2 Motorway. Connections to other major roads, including the Pacific Highway and Pennant Hills Road are included to provide additional benefits and access to the NorthConnex tunnels.

Location of the entrance and exit ramps between Pennant Hills Road and the NorthConnex tunnels to the north of the Pennant Hills Road/ Hills M2 Motorway intersection is a more efficient and effective road network outcome than locating the entrance and exit to the south of that intersection. It is also necessary to allow entry by motorists who have exited from the Hills M2 Motorway to the east of Pennant Hills Road with the intention of entering the NorthConnex tunnels and exit by motorists who wish to join the Hills M2 Motorway eastbound (noting that there is no direct motorway-to-motorway connection between the NorthConnex project and the Hills M2 Motorway to the east of Pennant Hills Road).

The relocation of the northbound on-ramp and southbound off-ramp at the southern interchange to south of the Hills M2 Motorway would also result in significant engineering and construction complexities through the need to pass underneath the existing Hills M2 Motorway, and the acquisition of a significant number of additional properties. Steep grades would also be required for the on-ramp and off-ramp to emerge at the surface prior to the existing North Rocks Road intersection.

The performance of the Hills M2 Motorway / Pennant Hills Road intersection with and without the project is provided in Table 7-28 of the environmental impact statement. This shows that the intersection would operate at a similar level of performance in the PM peak period regardless of the project, and would improve in the AM peak. This is due the provision of a motorway to motorway connection, eliminating the need for northbound vehicles to exit the Hills M2 Motorway and turn left onto Pennant Hills Road.

The location of the main alignment portals have taken into account a balance of relevant issues, including the performance of the surrounding road network, engineering practicality and constructability, cost efficiency, the desire to minimise land take and disturbance of existing development patterns, and minimisation of environmental impacts. Taking all of these factors into account, the proposed location for the southern portals represents an optimised outcome that meets the needs and objectives of the NorthConnex project.

Design refinements

Issue description

Submissions relating to the preferred tender design refinements raised issues regarding the number of lanes within the tunnels.

In summary, the submissions raised the following issues:

- Suggestions that the proposed tunnels be widened from two lanes in both directions to three.
- Suggestions that the tunnel should be built as three lanes with the capacity for four as to continue at the same width as the M1 Pacific Motorway.

Response

Traffic forecasts indicate that no more than two lanes are required in each of the project main alignment tunnels at opening (2019) or up to ten years after opening (2029).

The main alignment tunnels would be built wide enough to accommodate three lanes in each direction if required in the future. At opening, the tunnels would be marked for two lanes, each 3.5 metres wide, with a 2.5 metre wide shoulder on the left hand side and a one metre shoulder on the right hand side.

If required, this would allow three lanes in each direction in the future, with each lane being 3.5 metres wide. Long term traffic forecasts do not currently envisage the need to provide three lanes in the tunnels. There is no justification for building the tunnels wide enough for four lanes in the future.

Issue description

Submissions relating to the preferred tender design refinements raised issues regarding the need for on and off-ramps part way along to access the tunnels.

Response

The potential for an intermediate interchange was contemplated in the 2004 report. The preliminary design of and need for an intermediate interchange was reviewed as part of the Stage 2 unsolicited proposal process. This review identified that:

- The difference in grade between the surface and the main alignment tunnels would likely result in environmental costs associated with significant additional lengths of tunnelling works to implement the intermediate interchange, or steep grades on the ramps resulting in operational inefficiencies and potential air quality impacts.
- Additional property acquisition would likely be required to facilitate the traffic arrangements around the interchange.
- The proximity of the works to the Northern Railway Line would introduce additional constructability challenges, engineering risks and project costs.

Further, a consideration of local and regional traffic conditions and forecast patronage of an intermediate interchange indicated there would only be limited traffic benefits associated with an interchange at this location.

On balance it was concluded that, although an intermediate interchange would provide some limited traffic benefits, these benefits were not sufficient to outweigh the additional impacts, the significant risks and the additional cost associated with constructing the intermediate interchange. The intermediate interchange was therefore not included in the scope of the project.

Issue description

Submissions relating to the preferred tender design refinements raised issues regarding changes from the State significant infrastructure application report. Specifically, the reasons the open cut section at Brickpit Park and Kenley Park proposed in the State significant infrastructure application report is no longer in the project.

Response

The State significant infrastructure application report was prepared based on the purple corridor option from the 2004 report and before the NorthConnex design and construct tender process commencing. The State significant infrastructure application report identified that the project may include an open section in a cutting at Kenley Park and Brickpit Park. The report also explicitly identified that the need for and suitability of this opening would be further considered as part of determining the preferred project design.

During the design and construct tender process, it was determined that an open cut section in this location was not required, and was not desirable. An open cut section through Kenley Park and Brickpit Park would have resulted in significant impacts to the Blue Gum High Forest and Sydney Turpentine-Ironbark Forest communities (both listed as critically endangered ecological communities), unnecessary impacts to important community facilities and the disturbance of a contaminated site.

Issue description

Submissions relating to the preferred tender design refinements raised issues regarding changes from the State significant infrastructure application report. Specifically, the reasonss the modifications to the M1 Pacific Motorway (F3 Freeway) beyond the northern interchange are no longer occurring within the existing road reserve.

Response

Based on the preferred tender design, it was determined that some limited property acquisition adjacent to the M1 Pacific Motorway (formerly the F3 Freeway) was required in order to facilitate and construct the tie-in from the NorthConnex project. While reasonable endeavours were made to limit the disturbance footprint of the project, some minor land acquisition in this location is unavoidable.

Issue description

An option should be provided to eliminate traffic lights for some movements around the M1 Pacific Motorway, Pennant Hills Road and Pacific Highway intersections. There is a belief that this would improve traffic flow and could be achieved at minimal cost.

Response

The re-configuration of the M1 Pacific Motorway/ Pacific Highway interchange, the Pacific Highway/ Pennant Hills Road intersection, or the M1 Pacific Motorway/ Pennant Hills Road intersection arrangements as suggested is beyond the scope of the NorthConnex project.

This suggestion would require a significant change to intersection layouts. For example, the provision of continuous straight through movements uncontrolled by traffic lights with opposing right hand turn movements at some intersections as suggested is potentially dangerous without physical separation between these movements.

The removal of the right hand turn from the Pacific Highway to the M1 Pacific Motorway northbound has also been suggested. This would require all vehicles intending to travel northward, to first travel south on Pennant Hills Road before joining the M1 Pacific Motorway from Pennant Hills Road (rather than directly from the Pacific Highway as is currently the

case). This could result in significant traffic safety, efficiency and congestion issues and increases to road traffic noise along the affected section of Pennant Hills Road.

8.2.5 Selection of surface infrastructure locations

Nine hundred and thirty submissions raised issues regarding the selection of the surface infrastructure locations.

Location of ventilation facilities

Issue description

Submissions relating to the selection of surface infrastructure locations raised issues regarding the location of the northern ventilation facility. Current best practice requires that ventilation outlets be located away from residential areas. Unlike other tunnel projects in Sydney, there are alternatives for locating the outlet in non-residential areas.

In summary, the submissions raised the following issues:

- The northern ventilation facility should be located on higher ground and not in a valley where there are low wind speeds.
- The ventilation facility should be located in an area where there are no residents, day care centre, schools or retirement homes. There are no comparable outlets from other tunnels in residential area.
- The northern ventilation facility should be relocated to the Hornsby / Asquith Industrial Area or the Ku-ring-gai National Park. Moving the outlet to these areas would cost a small fraction of the whole project. Although this may be more expensive upfront, it is likely that the reduced risk and other long term benefits will make it a more cost effective project if a net present value comparison is made taking into account all factors. The extra cost could be recovered by extending the toll contract.
- An independent options assessment process should be carried out to assess alternative locations for the ventilation outlets and portals.
- More outlets should be spread evenly along the tunnel.
- The northern ventilation facility should have a long extension pipe so that the emissions are vented a considerable distance from the residential area, into the bushland further north.

Funding sources are available to be able to move the outlet including a heavy vehicle toll on Pennant Hills Road, extending the concession period, additional government funding, or shortening the southbound tunnel.

Response

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health. In this context, there is no technical basis to justify relocation of the northern portals and/ or northern ventilation facility to an alternative location.

The most efficient location for ventilation outlets is close to the main alignment tunnel exit portals. This is because vehicles travelling through the tunnels create a piston effect, which draws air into the tunnel and pushes it forward in the direction of traffic flow. Locating the ventilation outlets near the main alignment tunnel exit portals maximises the benefit of the piston effect and minimises the need for additional energy consumption to operate tunnel jet fans and to transport the exhaust air from the tunnel to the outlet. This approach provides

environmental benefits through the reduction in energy consumption and greenhouse gas emissions from the project.

The locations of ventilation outlets for the project have been determined based on proximity to the main alignment tunnel exit portals, as well as consideration of other factors including land access and acquisition requirements, geology, engineering and construction constraints, potential landscape and visual impacts, and the location of other major infrastructure.

Alternatively, if the northern ventilation outlet was to be considered further north, in the Ku-ring-gai National Park or the Hornsby / Asquith Industrial Area, no appreciable improvement has been demonstrated or identified in any of the abovementioned locational considerations. A more northerly location would:

- Relocate very small air quality and human health impacts to other receivers, with no significant reduction in the magnitudes of those impacts.
- Potentially require a net increase in property acquisition requirements.
- Significantly add to the cost of the project, with no confirmed, viable additional financing and no measurable associated benefits. The funding sources suggested in the submissions have not been costed and may result in the project being financially unviable.
- Increase the ongoing operational cost of the NorthConnex project and the environmental footprint of operations (including for example, increased energy consumption) with no measurable associated benefits to air quality or human health.

Issue description

Submissions relating to the selection of surface infrastructure locations raised issues regarding the location of the northern ventilation facility. Specifically, the reasons the northern ventilation outlet is located some distance from the [northern interchange] portals when the environmental impact statement states they work best very close to the portal.

Response

As identified in Section 5.2.5 and Figure 5-18 of the environmental impact statement the northern ventilation outlet is located directly above the northbound main alignment tunnel portal. The ventilation outlets operate most efficiently and effectively when located close to the main tunnel alignment portals. The ventilation system has been designed to draw the comparatively small volume of air from on and off ramps into the main alignment tunnels for management as part of the larger component of main alignment tunnel ventilation air.

Issue description

Submissions relating to the selection of surface infrastructure locations queried why there are no ventilation outlets proposed for the two portals located near the Pacific Highway entry and exit near Lucinda Avenue.

Response

The ventilation system has been designed to prevent air and emissions from leaving the tunnel portals. The ventilation system is described in Section 5.2.5 of the environmental impact statement. For the tunnel off-ramps, air would be drawn back down the ramp for extraction via the ventilation facility. In-tunnel jet fans in the ramp tunnels (used to accelerate the movement of air through the tunnel) would maintain the air flow against the direction of traffic flow so it can be exhausted at the northern ventilation facility.

Issue description

Submissions relating to the selection of surface infrastructure locations raised issues regarding the location of the southern ventilation facility.

In summary, the submissions raised the following issues:

- The southern ventilation facility should be relocated. Alternative locations suggested include:
  - Centre of the Pennant Hills Golf Course.
  - Within the Pennant Hills Golf Course near the corner of Pennant Hills Road and the Hills M2 Motorway.
  - The southern side of the Hills M2 Motorway either near the Coral Tree Drive cul-de-sac or to a shared site with the switching station.
- According to the environmental impact statement, these would be more efficient locations, avoiding the need for an additional ventilation tunnel and extra fans.
- The southern ventilation facility should not be located where it will expel emissions into the confined valley at the eastern end of Coral Tree Drive where there are low wind speeds.
- Belief that Roads and Maritime own four parcels of land along the golf club side of the road.
- The ventilation facility should be located in an area where there are no residents, day care centres or schools.
- An independent options assessment process should be undertaken to assess alternative locations for the ventilation outlet and portals.

Response

Roads and Maritime already owns some land around the south-western corner of the Pennant Hills Golf Course in the vicinity of the southern interchange. The majority of this land currently forms the on-ramp from Pennant Hills Road to the Hills M2 Motorway. A narrow strip of land between the on-ramp and the golf course is also owned by Roads and Maritime. There is not sufficient space outside of the road carriageway for a ventilation facility within Roads and Maritime owned land in this location.

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health. In this context, there is no basis to justify relocation of the southern ventilation facility to an alternative location. These assessments are provided in Section 7.3 and Section 7.4 of the environmental impact statement respectively.

The most efficient location for ventilation outlets is close to the main alignment tunnel exit portals. This is because vehicles travelling through the tunnels create a piston effect, which draws air into the tunnel and pushes it forward in the direction of traffic flow. Locating the ventilation outlets near the main alignment tunnel exit portals maximises the benefit of the piston effect and minimises the need for additional energy consumption to operate tunnel jet fans and to transport the exhaust air from the tunnel to the outlet. This approach provides environmental benefits through the reduction in energy consumption and greenhouse gas emissions from the project.

The location of ventilation outlets for the project have been determined based on proximity to the main alignment tunnel exit portals, as well as consideration of other factors including land access and acquisition requirements, geology, engineering and construction

constraints, potential landscape and visual impacts, and the location of other major infrastructure.

With regard to the southern ventilation outlet, the location chosen is within land already owned by Roads and Maritime and is co-located with other operational infrastructure, while still being located as close as practical to the southbound tunnel portal. The adoption of this location has resulted in an efficient ventilation system and has minimised land acquisition requirements.

Alternatively, if the southern ventilation outlet was to be considered in Pennant Hills Golf Course or on the southern side of the Hills M2 Motorway, no appreciable improvement has been demonstrated or identified in any of the abovementioned locational considerations. These locations would:

- Relocate very small air quality and human health impacts to other residential receivers, with no significant reduction in the magnitudes of those impacts.
- Likely require a net increase in property acquisition requirements.
- Significantly add to the cost of the project, with no confirmed, viable additional financing and no measurable associated benefits.

The rationale for the location of the ventilation facilities is provided in Section 4.4.1 of the environmental impact statement.

Coral Tree Drive switching station

Issue description

Submissions relating to the selection of surface infrastructure locations raised issues regarding the location of the Coral Tree Drive switching station.

In summary, the submissions raised the following issues:

- Requests for the slight relocation of the Coral Tree Drive switching station to line up with the property line, resulting in a better visual impact.
- The switching station should be underground.

Response

The location of the Coral Tree Drive switching station is shown in Figure 5-33 of the environmental impact statement. The Coral Tree Drive switching station has been located to minimise potential visual impacts on the two adjacent residential properties, by positioning the bulk of the proposed structure across the cadastral boundary between those properties. Relocating the switching station to align with the cadastral property would reduce visual impacts on one of the properties, by moving those impacts entirely to the adjacent property. This is not considered to be a desirable outcome.

Placing this facility entirely underground would result in significant operational and maintenance complexities. In addition, the construction related impacts, including from the excavation works, would be significant. Greater impacts during maintenance activities would also be likely. For these reasons it is not practical to locate the Coral Tree Drive switching station entirely below ground.

The design and configuration of the switching station, including its potential orientation within the site, is subject to further development during the detailed design phase. The detailed design phase will take into account factors such as visual impacts on surrounding receivers.

Southern interchange elements

Issue description

Submissions relating to the selection of surface infrastructure locations raised issues regarding the location of the southern interchange elements. Specifically, the existing off ramps at the southern interchange should be adjusted to accommodate the traffic to blend into the Pennant Hills entry point into the tunnel rather than building a separate tunnel on the Hills M2 Motorway.

Response

The primary objective of the NorthConnex project is to improve the efficiency of the freight movements on the National Land Transport Network by connecting the M1 Pacific Motorway to the Hills M2 Motorway. A fundamental feature of this connection is to provide a motorway-to-motorway connection at each end to allow free flowing traffic and avoid the need to stop and start at traffic lights. Forcing vehicles travelling eastbound on the Hills M2 Motorway to exit at the existing Pennant Hills Road off-ramp and then enter the tunnels via the proposed Pennant Hills Road NorthConnex on-ramp would not achieve this objective.

Location of tunnel support facilities

Issue description

Submissions relating to the selection of surface infrastructure locations raised issues regarding the location of the tunnel support facilities.

In summary, the submissions raised the following issues:

- There are more appropriate sites for the Trelawney Street tunnel support facility nearby that would not impact residents, such as the Pioneer Avenue Industrial Area or the land around and including the Ibis Hotel and Kennards Self Storage, or areas adjacent to the Brickpit Park. These should be explored in greater detail.
- The proposed Trelawney Street site should be relocated to the western side of Pennant Hills Road which is already a more industrial / commercial area and would reduce impacts on residents.
- Tunnel support facilities should be located away from fire hazards such as service stations.
- The Trelawney Street site should remain as an emergency support and fresh air intake facility.
- The land owned by Department of Housing across Trelawney Street should be incorporated into the site to make trucks access and egress directly from Pennant Hills road easier.

Response

The selection of the sites for surface infrastructure and the tunnel support facilities is outlined in Section 4.4.1 of the environmental impact statement.

The locations of surface facilities have been carefully considered during the development of the design. Identification of initial areas in which to locate operational tunnel support facilities was based on three key criteria:

- Two tunnel support facilities are required to be located around third points along the main alignment tunnels.
- Ideally the tunnel support facilities should be located above, or as close as possible, to the main alignment tunnels.

- Ideally the tunnel support facilities would be located adjacent to or in proximity to a major road, to maximise opportunities to reduce traffic related impacts during construction.

There are only two locations at which the main alignment tunnels are close to a major road around one third and two thirds along the length of the tunnels. These locations are around the Wilson Road and Trelawney Street tunnel support facilities.

In the case of the Trelawney Street tunnel support facility, the Pioneer Avenue Industrial Area is located too far away from the main alignment tunnels to provide a viable alternative location for the operational tunnel support facility.

In the general Wilson Road and Trelawney Street areas, sites for the location of operational tunnel support facilities were identified based on:

- Avoidance of sites with significant ecological or heritage value.
- Avoidance of sites used for public recreation, conservation or open space, or areas likely to hold significant community value.
- Avoidance of sites occupied by sensitive developments, such as schools, hospitals and aged care facilities, or public and community infrastructure, including libraries and community centres.
- Preference to avoid sites with known or potential contamination or geotechnical constraints.
- Preference to avoid disturbing developments that are unique, in short supply or otherwise special to the locality.

Areas adjacent to Brickpit Park, while slightly further away from the main alignments than desirable, were nonetheless considered but excluded as viable options for location of an operational support facility. This decision was based on an elevated risk of encountering contaminated soil and/ or contaminated groundwater associated with the former use of the Brickpit Park site as a landfill.

For the Trelawney Street tunnel support facility, land to the east of Pennant Hills Road (residential land) and land to the west of Pennant Hills Road (the Ibis Hotel and Kennards storage facility) were identified as potential sites. On balance, it was determined that loss of the Ibis Hotel and/ or the Kennards storage facility would be undesirable based on the lack of supply of similar facilities in the region. The Trelawney Street tunnel support facility on the eastern side of Pennant Hills Road was selected over these sites as the preferred location for the operational surface infrastructure.

Incorporating the land opposite Trelawney Street into the site would result in the closure of Trelawney Street at Pennant Hills Road. This would be likely to result in unacceptable traffic impacts to the surrounding road network.

Issue description

Submissions relating to the selection of surface infrastructure locations raised issues regarding the location of the tunnel support facilities.

In summary, the submissions raised the following issues:

- The proposed Wilson Road tunnel support facility is located very close to residences, while other support facilities are away from any place of residence.
- The Wilson Road tunnel support facility should be moved by at least ten metres.
- The Wilson Road tunnel support facility should be on the other side of Wilson Road.

Response

The selection of the sites for surface infrastructure and the tunnel support facilities is outlined in Section 4.4.1 of the environmental impact statement. Other tunnel support facilities are located a similar distance from residences.

The size and location of surface facilities have been carefully considered during the development of the design. Identification of initial areas in which to locate operational tunnel support facilities was based on three key criteria:

- Two tunnel support facilities are required to be located around third points along the main alignment tunnels.
- Ideally the tunnel support facilities should be located above, or as close as possible, to the main alignment tunnels.
- Ideally the tunnel support facilities would be located adjacent to or in close proximity to a major road, to maximise opportunities to reduce traffic related impacts during construction.

The size of the surface facilities have been kept as small as possible, whilst still meeting operational requirements, in order to minimise the extent of property acquisition, disturbance of existing development patterns and to minimise potential environmental impacts.

There are only two locations at which the main alignment tunnels come close to a major road around one third and two thirds along the length of the tunnels. These locations are around the Wilson Road and Trelawney Street tunnel support facilities.

In the general Wilson Road and Trelawney Street areas, sites for location of operational tunnel support facilities were identified based on:

- Avoidance of sites with significant ecological or heritage value.
- Avoidance of sites used for public recreation, conservation or open space, or areas likely to hold significant community value.
- Avoidance of sites occupied by sensitive developments, such as schools, hospitals and aged care facilities, or public and community infrastructure, including libraries and community centres.
- Preference to avoid sites with known or potential contamination or geotechnical constraints.
- Preference to avoid disturbing developments that are unique, in short supply or otherwise special to the locality.

The Wilson Road site was selected based on a balanced consideration of these factors. Although use of the Wilson Road site would result in additional land acquisition

requirements, this site was identified as the preferred location of the southern tunnel support facility due to this site avoiding impacts to areas of high ecological and social value (such as Observatory Park) and being located directly above the main alignment tunnels.

Moving the facility by ten metres would either result in additional, unnecessary property acquisition, or result in the facility being located on part of Wilson Road. This would result in impacts to residences on the other side of Wilson Road. Moving the facility to the other side of Wilson Road is likely to shift the same impacts to other receivers with no identified change to the magnitude of those impacts.

8.2.6 Out of scope

One hundred and forty eight submissions raised issues that were outside the scope of the project.

General concerns

Issue description

The Federal and State governments must comply with their duty of care and ensure that all infrastructure planned for Australia is "world best practice" and in the best interest of Australians.

Response

The Australian and State Government both dedicate significant resources to planning the future infrastructure needs of NSW and Australia as a whole. These are documented in the various strategic planning documents such as the NSW Long Term Transport Master Plan (Transport for NSW, 2012) and the White Paper, Auslink: Building Our National Transport Future (Commonwealth Department of Transport and Regional Services, 2004).

In developing and prioritising infrastructure projects, the Australian and NSW Governments consider the affordability and financial viability of the projects, the benefits of the projects to the public and appropriate Australian and international design standards.

Issue description

Submissions provided suggestions to improve air quality in the area including:

- Trucks should be encouraged to update to latest models.
- Older trucks within major cities should have increased tolls and registration fees.
- Wood fireplaces in local government areas near tunnels should be banned.

Response

These suggestions to improve air quality are beyond the scope of the NorthConnex project. The NSW Government is separately progressing strategies to improving air quality through Action for Air (EPA, 1998).

Action for Air– the Government's 25 year air quality management plan – and the updates to that strategy in 2002, 2006 and 2009, recognise that managing and improving air quality in New South Wales requires a multi-layered approach and an 'integrated attack on air pollution'. Action for Air recognises that all stakeholders and pollution sources need to play a role in maintaining and managing air quality.

In the spirit of Action for Air, it is appropriate to focus the broader task of air quality management and improvement over time on those areas where the greatest benefit could be feasibly and reasonably achieved through the most cost effective means. Action for Air

includes a series of targets and focus areas, including the transport, commercial and industrial and domestic sectors, through which improvements in air quality could be achieved

Issue description

Roads and Maritime should commit for all future projects to updating the State significant infrastructure application report to reflect the preferred option for a project.

The Department of Planning and Environment requires all applicants to update their State significant infrastructure application report to reflect the actual project if significant changes occur.

Response

For State significant infrastructure projects, Roads and Maritime are committed to the preparation of accurate, transparent State significant infrastructure application reports and to update these reports, if required during the assessment process. This is consistent with the approach undertaken on the NorthConnex project.

The Department of Planning and Environment currently requires all applicants to prepare a thorough application report and to update the application report as required in order to adequately inform the environmental assessment requirements.

Issue description

The Department of Planning and Environment needs to develop guidelines or practice notes for proponents regarding acceptable material in community information and to clarify the requirements for presenting new information in relation to clause 192(2) of the *Environmental Planning and Assessment Regulation 2000*.

Response

The development of guidelines by the Department of Planning and Environment is outside the scope of the NorthConnex project. The Department of Planning and Environment have produced a number of guidelines and policies relating the environmental impact assessment and the assessment process.

Issue description

Roads and Maritime should ensure that in the future all unsolicited bids for public infrastructure are required to make publicly available the system, weighting and criteria used to assess potential options.

Response

The decision whether to release or otherwise selection criteria and weightings for other infrastructure projects is beyond the scope of the NorthConex project. This information can be subject to strict commercial in confidence and intellectual property requirements which may restrict the ability of Roads and Maritime to publically release this information. These decisions are made on a project specific basis.

Issue description

Submissions raised concerns that the area already has multiple infrastructure construction impacts with the Hills M2 Motorway, Hills M2 Motorway upgrade, light rail, heavy rail, Telstra tower, and now NorthConnex.

Concerns that the project has prioritised money and vote security over the environment and the community.

Response

The NSW Government has produced strategic planning documents which identify the need for infrastructure developments across the state. Projects are determined based on the needs of the community and the state in terms of economic development.

The environmental impact statement considered the cumulative impacts of the NorthConnex project with other relevant infrastructure projects such as the North West Rail Link and the Epping to Thornleigh Third Track projects. The environmental impact statement also considered construction fatigue of residents previously affected by the Hills M2 Motorway Upgrade project and the proposed Hills M2 Motorway integration works as part of the NorthConnex project.

Issue description

Submissions raised concerns regarding:

- The planning process and flaws in the assessment for the Lane Cove Tunnel, Cross City Tunnel and M5 East Motorway tunnel projects.
- The air quality levels and provision for filtration in the Lane Cove Tunnel, Cross City Tunnel and M5 East Motorway tunnel projects.
- Major design changes to the Lane Cove Tunnel wall after the planning approval process which was not subject to public scrutiny.
- Previous flaws in reports by NSW Health.

Response

Previous road tunnel projects and reports by NSW Health are outside the scope of the NorthConnex project. Key lessons from previous projects and reports have been used to assist in informing the design and scope of the NorthConnex project, however these projects all followed the necessary planning assessment processes at the time of development.

Air quality levels associated with these projects are currently being monitored. The results of this monitoring are publically available on the various projects' websites.

Issue description

Submissions raised concerns that the loss of amenities and fracturing of the community from the Pennant Hills Road widening remains with the community.

Response

Impacts from previous projects are beyond the scope of the NorthConnex project.

The NorthConnex project has been designed to limit the potential impacts to community facilities and to limit the potential for community severance. Along Pennant Hills Road, the reduction in traffic (especially heavy vehicles) has the potential to improve connections across Pennant Hills Road and foster a more cohesive community.

Issue description

Concerns that the submission made by The Hills Shire Council is not a valid exercise of the duties imposed on Council under the purposes of sections 7(a), 7(e) and 8(1) of the *Local Government Act 1993*.

Response

The carrying out of duties by The Hills Shire Council in accordance with relevant legislation is a matter for Council and is beyond the scope of the NorthConnex project.

A comprehensive response has been provided to the issues raised by The Hills Shire Council in **Section 7.2.2** of this report.

Issue description

Submissions raised concerns that the cost benefit analysis for the Hills M2 Motorway Upgrade project and the Epping to Thornleigh Third Track project were flawed. This suggests that the Department of Planning and Environment needs to engage a specialist in econometrics to support the assessment of major infrastructure applications.

Response

Cost benefit analyses for other infrastructure projects is beyond the scope of the NorthConnex project.

Specialist resources applied to the assessment of applications for State significant infrastructure is a matter for the Department of Planning and Environment. It is relevant to note that in addition to its own resources, the Department receives advice from other specialist government agencies and may choose to seek advice from third party specialists as it considers appropriate.

Issue description

Concerns regarding the financial position of Transurban.

Response

The financial position of Transurban is not a relevant matter for consideration as part of the environmental impact assessment of the NorthConnex project.

Issue description

Concerns regarding the impacts from the use of diesel traction instead of electric traction as part of the Epping to Thornleigh Third Track project.

Response

Potential impacts from the Epping to Thornleigh Third Track project are beyond the scope of the NorthConnex project.

Issue description

North West Rail Link should open as heavy rail service.

Response

The nature of the North West Rail Link is outside the scope of the NorthConnex project. The opening of the North West Rail Link as a single deck rapid transit service is consistent with Sydney's Rail Future (Transport for NSW, 2012).

Issue description

Restaurant/ lounge carriages should be provided to add an enjoyable dimension to rail travel throughout Sydney and NSW.

Response

The provision of restaurant or lounge carriages is outside the scope of the NorthConnex project.

Issue description

The NSW Government was elected with a promise to return planning powers to the local community. The NSW Government has failed to deliver on its election promise.

Response

Amendment to the planning legislation is outside the scope of the NorthConnex project.

The NSW Government is committed to delivering a new planning system for NSW – a modern and easy planning system for the 21st century that will put the community first

The NSW Government is currently considering options on the best means to implement its planning reform program.

Issue description

The road tunnel will not enhance the role of the business parks in the Global Economic Corridor. Ad-hoc development in north-western Sydney, especially North Ryde and Macquarie Park business parks are not based on sound environmental planning principles. There is no strategic planning.

Response

The purpose of NorthConnex is not to enhance the business park in the Global Economic Corridor. The primary purpose of NorthConnex is to improve the efficiency of through movements and the freight movements between the M1 Pacific Motorway and the Hills M2 Motorway.

Issue description

Request an immediate moratorium on development approvals in Ryde local government area and the sub-regions. An urgent inquiry into planning and development approvals in the Ryde local government area since March 2011 should be undertaken.

Response

A moratorium on development approvals, or an inquiry into planning and development approvals within the Ryde local government area is outside the scope of the NorthConnex project.

Issue description

Traffic in Ryde is already at capacity. Widening of existing roads is not justified.

Response

Existing traffic congestion in Ryde is beyond the scope of the NorthConnex project.

Issue description

Great benefit could be achieved by establishing a large stormwater storage facility which would allow the controlled release of rainwater following heavy storms.

Response

Provision of stormwater detention for the local area is beyond the scope of the NorthConnex project.

Issue description

Traffic from the Pacific Highway and Pennant Hills Road will have difficulty merging with a three lane tunnel once it is at capacity.

Response

The environmental impact statement is seeking approval to operate the tunnel at two lanes only. If three lanes are required in the future, this would be subject to separate assessment and approval.

Issue description

A trial should be conducted of overriding traffic lights between Seven Hills and Prospect so heavy vehicles don't have to stop at red lights during the night period.

Response

The phasing of traffic lights or any trials of different configurations between Seven Hills and Prospect is beyond the scope of the NorthConnex project.

Pennant Hills Road

Issue description

Submissions relating to the project but which are out of the scope of the environmental impact statement raised issues regarding the condition of Pennant Hills Road.

In summary, the submissions raised the following issues:

- The need for future improvement of conditions on Pennant Hills Road, including improved conditions for pedestrians and cyclists.
- Request to change the speed limit of Pennant Hills Road to 60 kilometres per hour and support the development of pedestrian and cycle paths to ensure Pennant Hills Road is suitable for local traffic again.
- The tunnel will effectively increase the capacity in the Pennant Hills Road corridor from six lanes to ten lanes. Suggestions for changes to Pennant Hills Road to take advantage of this extra corridor capacity include:
    - A dedicated cycling lane to encourage commuters to leave the car at home, similar to that built on Epping Road as part of the Lane Cove Tunnel. This would also be consistent with the stated objective of returning Pennant Hills Road to the community and improving amenity.
    - A parking lane.
    - A bus lane along the full length.
- Acknowledged that public transport improvements are outside the scope, however such improvements should be implemented quickly.

Response

There are currently no plans to alter or reduce the capacity or operation of Pennant Hills Road as part of the NorthConnex project. In future, there may be separate projects that consider changes or enhancements along Pennant Hills Road, and these would be subject to appropriate assessment, consultation and approval in accordance with the *Environmental Planning and Assessment Act 1979*.

As part of the NorthConnex project, only limited localised changes to Pennant Hills Road would be required to accommodate the new northern and southern interchanges. Beyond

these required changes, the project does not propose to make any other alterations to Pennant Hills Road.

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding the condition of Pennant Hills Road.

In summary, the submissions raised the following issues:

- The environmental impact statement demonstrates that intersection improvements are required along Pennant Hills Road but does not propose to undertake them.
- A study of necessary public transport and intersections treatments should be completed now.

Response

The current and future performance of the road network beyond the NorthConnex project is a separate matter beyond the scope of the current project. Roads and Maritime monitors and manages the operational performance of the arterial road network. The Pinch Point program targets peak hour traffic hotspots and investigates ways to relieve traffic congestion. Pennant Hills Road is one of the corridors that Roads and Maritime is investigating for potential improvements in future years.

The environmental impact statement has demonstrated that the operation of the NorthConnex project would not worsen the performance of Pennant Hills Road, and in many areas is expected to contribute to improvements in road network capacity, efficiency and safety.

There are currently no plans to alter or reduce the capacity or operation of Pennant Hills Road as part of the NorthConnex project. In future, there may be separate projects that consider changes or enhancements along Pennant Hills Road, and these would be subject to appropriate assessment, consultation and approval in accordance with the *Environmental Planning and Assessment Act 1979*.

As part of the NorthConnex project, only limited localised changes to Pennant Hills Road would be required to accommodate the new northern and southern interchanges. Beyond these required changes, the project does not propose to make any other alterations to Pennant Hills Road.

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised concerns that the environmental impact statement does not quantify the proportion of dangerous goods vehicles, including fuel tanker B-doubles, which would remain above ground on Pennant Hills Road.

Response

Vehicles carrying dangerous goods would not be permitted to use the project tunnels. These trucks would continue to use Pennant Hills Road, which is consistent with the existing situation.

For the purpose of the traffic impact assessment presented in the environmental impact statement, it is appropriate to categorise vehicles into light vehicles and heavy vehicles. Heavy vehicles were considered together, irrespective of the materials being carried by those vehicles.

In 2011, the Audit Office of New South Wales conducted a performance audit of the Office of Environment and Heritage and WorkCover NSW concerning the discharge of the regulatory responsibilities of those agencies in relation to the transport of dangerous goods (The Audit Office of New South Wales, May 2011). The audit report states that around 10 to 15 per cent of domestic freight constitutes dangerous goods. If all heavy vehicles travelling along Pennant Hills Road are conservatively assumed to be associated with domestic freight transport, then up to around 10 to 15 per cent of those heavy vehicles could be expected to be carrying dangerous goods. Based on the traffic counts undertaken by the project in December 2013 which indicated that there were around 11,400 heavy vehicles per day on Pennant Hills Road, this would equate to around 1,100 to 1,700 dangerous goods vehicles per day on Pennant Hills Road.

In addition to the 2011 Audit, NorthConnex arranged for a 24 hour survey to be conducted in September 2013 to count heavy vehicles entering and exiting to and from Pennant Hills Road at the Hills M2 Motorway interchange. The count identified which of these were displaying dangerous goods signage. The result was three per cent and four per cent of all trucks in the eastbound and westbound direction respectively.

This is lower than the 2011 audit conclusion. Differences may be as a result of:

- The audit was broader than Pennant Hills Road. Different routes, regions and suburbs may carry different proportions of dangerous goods vehicles.
- There may be some seasonality variance (although there is unlikely to be much variance across the week).

Based on the above it is expected that around five to 15 per cent of heavy vehicles would be expected to continue to use Pennant Hills Road.

Because a key function of the NorthConnex project would be to provide an alternative to Pennant Hills Road for the movement of heavy vehicles, the NSW Government will be introducing regulatory measures to ensure heavy vehicles (other than dangerous goods vehicles or those with a genuine origin or destination along Pennant Hills Road) use the NorthConnex project rather than surface roads. These measures may include introducing, or changing the operation of existing, traffic control facilities, advisory and / or regulatory signage, route designations, notices, application of permits, or other traffic measures. Any regulatory measures that have the effect of regulating heavy vehicles would need to be consistent with the objectives of the National Heavy Vehicle Law, where applicable.

Regulatory measures under consideration also include a potential penalty for non-compliance, for certain classes of heavy vehicles using the surrounding road network. Enforcement measures might include structures, upon which equipment associated with enforcement may need to be mounted (such as cameras or other equipment).

The anticipated transfer of traffic from Pennant Hills Road to the project would reduce congestion and intersection conflicts along Pennant Hills Road. As such, the project is expected to reduce the frequency and cost of crashes occurring on Pennant Hills Road when compared to future conditions without the project.

Issue description

Submissions raised concerns that the Government should prohibit any significant development northwest of Pennant Hills to address the existing congestion on Pennant Hills Road.

Response

Development approvals for other project are beyond the scope of the NorthConnex project. The Government is currently progressing a number of projects to service new development to the northwest of Pennant Hills Road including the North-West Rail Link and a number of road upgrade projects.

Hills M2 Motorway

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding the Hills M2 Motorway Upgrade project.

In summary, the submissions raised the following issues:

- Concerns raised during the planning for the Hills M2 Motorway Upgrade project were not addressed. For example:
  - Promised noise cameras were never installed.
  - Heavy vehicle noise strategy (a condition of approval) was not produced.
- Construction was noisy at night time, dusty and damaged the local creek and cycle track.
- Revegetation works were not sufficient.

Response

Impacts associated with the Hills M2 Motorway Upgrade project are outside the scope of the NorthConnex project.

Roads and Maritime has developed a Heavy Vehicle Compression Brake Noise Strategy for the Hills M2 Motorway Upgrade that identifies trial measures to minimise the impacts of compression brake noise on sensitive receivers. The Strategy has been submitted to the Department of Planning and Environment for approval.

The NSW Government has been working with other States and Territories in Australia to develop a coordinated approach to managing heavy vehicle compression brake noise. Management measures being investigated as part of the suite of measures to manage compression brake noise include noise cameras.

The Hills M2 Motorway Upgrade project was constructed in accordance with the conditions of approval and the environment protection licence. Appropriate controls were implemented to reduce impacts such as noise, dust and impacts to riparian areas.

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding existing noise along the Hills M2 Motorway and the Hills M2 Motorway Upgrade project.

In summary, the submissions raised the following issues:

- The volume of traffic on the Hills M2 Motorway has increased since the connection of the Westlink M7 Motorway. Trucks using exhaust brakes on downhill sections of the Hills M2 Motorway despite signage for them not to.
- Ineffective noise barriers as they are too low. Belief that if the traffic can be seen, it can be heard.

- Home was identified for architectural treatment during the planning of the Hills M2 Motorway Upgrade, but after visiting our home the Hills M2 Motorway Upgrade team decided against offering any treatment as the home already had air conditioning.
- Issues relating to the findings of the original Hills M2 Motorway environmental impact statement.
- The Hills M2 Motorway should have a speed limit of 80 kilometres per hour, not 100 kilometres per hour to reduce noise levels.
- Residents have already had to endure years of construction noise on the Hills M2 Motorway and now they will have to endure more.

Response

The existing operational noise impacts from the Hills M2 Motorway and noise attenuation measures as part of the Hills M2 Motorway Upgrade projector the original construction of the Hills M2 Motorway are outside the scope of the NorthConnex project.

At the environmental impact assessment stage, properties are identified as eligible for consideration of at-property treatment based on meeting certain criteria. Following planning approval, further detailed design is carried out together with more detailed noise modelling to confirm the reasonable and feasible operational noise mitigation measures to be applied to the project. The specifics of each property (such as existing wall, roof and window design and condition) are also important considerations at this point in determining the likely internal noise levels and the reasonable and feasible operational noise mitigation measures which can be applied.

In accordance with the Director-General's environmental assessment requirements, the environmental impact statement includes an assessment of road traffic noise changes along the Hills M2 Motorway associated with the connection of the NorthConnex tunnel and the additional westbound lane from Pennant Hills Road to Windsor Road. This assessment considers the existing noise levels along the Hills M2 Motorway, the effectiveness of the existing noise mitigation and the predicted relative change in traffic noise levels from the NorthConnex project.

Section 7.2 and Appendix F of the environmental impact statement provides this assessment and identifies locations where noise barriers would be increased in height along the Hills M2 Motorway. Properties eligible for consideration of at-property treatment are also identified.

Subject to obtaining planning approval further detailed design would be carried out together with more detailed noise modelling to confirm the reasonable and feasible operational noise mitigation measures to be applied to the project.

The majority of the Hills M2 Motorway has been designed for a 100 kilometre per hour speed limit. The operational noise assessment has been completed on this basis.

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding visual impacts from the Hills M2 Motorway Upgrade project.

In summary, the submissions raised the following issues:

- The bright orange noise walls disrupt the bushland views.
- Detrimental impacts to the value of homes.

Response

The visual impacts of the existing and approved Hills M2 Motorway are beyond the scope of the NorthConnex project.

However, it is relevant to highlight that the local community was consulted during the development of the Urban and Landscape Design for the Hills M2 Motorway Upgrade, which included an opportunity to comment on the design and colour choice for the noise barriers. Community feedback on the colour palate for the Hills M2 Motorway Upgrade noise barriers was included in the Urban Design and Landscape Management Plan. This feedback showed mixed attitudes to the colour scheme, with some members of the community in support and some opposed.

In relation to the NorthConnex project, the Community Communications Framework (Appendix D of the environmental impact statement) identifies that the Urban Design and Landscape Plan for the project would be developed in consultation with the community and the relevant local council/s.

Issue description

Submissions raised concerns that “community consultation” for major infrastructure projects is inadequate as evident in the recently completed Hills M2 Motorway upgrade project.

Concerns that the majority of community concerns were dismissed.

Response

The Submissions Report for the Hills M2 Motorway Upgrade project provided a thorough response to all community concerns raised. The then Department of Planning considered the responses with the Submissions Report in informing its decision to approve the project.

Perceived issues with the Hills M2 Motorway Upgrade Submissions Report process are outside the scope of the NorthConnex project.

Issue description

Submissions raised concerns suggesting that the government considers widening the Hills M2 Motorway west bound due to existing peak hour congestion along the two lanes from Pennant Hills Road to the Westlink M7 Motorway.

The Lane Cove Tunnel and Hills M2 Motorway would also benefit from this with increased traffic heading towards the city and Macquarie Park, allowing reduced tolling rates with more traffic, or an integrated time and distance tolling system.

Suggestions that the Lane Cove tunnel also be widened to three lanes from the Hills M2 Motorway to the Chatswood exit and speed increased to 100 kilometres per hour to encourage freeway travel.

Response

As part of the NorthConnex project, the Hills M2 Motorway would be widened to three lanes from the Pennant Hills Road interchange to the Windsor Road interchange. Widening of the Hills M2 Motorway beyond this point is outside the scope of the NorthConnex project.

Based on current traffic volumes and congestion levels, there is no justification for widening of the Lane Cove Tunnel. Regardless, widening of the Lane Cove Tunnel is outside the scope of the NorthConnex project. This tunnel is also designed for speeds of 80 kilometres per hour. As such, it is not possible or appropriate to increase the speed limit to 100 kilometres per hour.

The nature of tolling arrangements between the NSW Government and the motorway operator are outside the scope of the environmental impact statement.

Issue description

Submissions raised concerns regarding previous assurances from the Hills M2 Motorway proponents that there would be no extension of the motorway behind the property and no provisions for the widening of the Hills M2 Motorway.

Response

It is beyond the scope of the NorthConnex project to comment on or consider actual or implied commitments with respect to historical infrastructure projects.

Issue description

Submissions raised concerns that the original location of the Hills M2 Motorway was changed after the purchase of property. The recent widening then brought the motorway closer.

Response

The original design and construction of the Hills M2 Motorway, and the Hills M2 Motorway Upgrade project is outside the scope of the NorthConnex project.

Issue description

Access from Haines Avenue under the Hills M2 Motorway through the culvert has become difficult due to deterioration of a short steep section of the path. Works should be undertaken to stabilise this during construction.

Response

The culvert passing from Haines Avenue underneath the Hills M2 Motorway is to allow water flow from one side to the other. These structures are not intended, designed or built for use by pedestrians. The Hills M2 Motorway maintains these structures for their intended purpose.

M1 Pacific Motorway

Issue description

Submissions raised concerns that North Wahroonga residents are already subject to the day and night noise from trucks with loud exhausts on the M1 Pacific Motorway. The environmental impact statement does not recognise the current excessive noise levels caused by heavy vehicles exhaust braking on the M1 Pacific Motorway.

Concerns that residents have previously been misled by the NSW Government into believing they were building in a traffic free area. Political promises of no more freeways have been reneged with the establishment of the M1 Pacific Motorway in such close proximity to residential receivers.

Response

The existing operational noise impacts from the M1 Pacific Motorway are outside the scope of the NorthConnex project.

The project does, however, offer the opportunity to provide benefits to receivers within the project area who are already impacted by high noise levels. A number of the properties identified as potentially eligible for consideration of at-property acoustic treatment in the

NorthConnex environmental impact statement do not actually receive an increase in noise levels as a result of the project but because they are already impacted by high noise levels.

Plans to extend the M1 Pacific Motorway (F3 Freeway), to Wahroonga and an eventual southerly extension to the broader Sydney Orbital Road Network have been envisaged in strategic planning documents for a significant period of time. This road corridor is identified in the Ku-ring-gai Planning Scheme Ordinance produced in 1971.

Local road network

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding alternative traffic routes.

In summary, the submissions raised the following issues:

- An alternative traffic route for local West Pennant Hills roads needs to be addressed.
- Alternative south and east bound exits from West Pennant Hills Valley such as an upgrade to Aiken Road / Pennant Hills Road intersection and allowing right-hand turns as well as alternative Hills M2 Motorway and Pennant Hills Road crossing points should be considered.

Response

Changes to the local road network around West Pennant Hills are outside the scope of the NorthConnex project.

Roads and Maritime monitors and manages the operational performance of the arterial road network. The Pinch Point program targets peak hour traffic hotspots and investigates ways to relieve traffic congestion. Pennant Hills Road is one of the corridors that Roads and Maritime is investigating for potential improvements in future years.

Issue description

Submissions raised concerns regarding existing issues on Cavendish Street, Pennant Hills including the lack of a footpath, heavy traffic and speed of vehicles. Some sort of traffic calming is necessary. A stop sign at the Cavendish Street / Paling Street intersection would also assist in slowing the traffic.

The Pennant Hills Road / Pomona Street intersection is often blocked during AM and PM peaks, making turns difficult and often dangerous. There is a need to paint ‘keep clear’ lines and to provide a sign at this intersection.

Response

The potential impacts to the performance of intersections along Pennant Hills Road is provided in Table 7-19 and Table 7-21 of the environmental impact statement. This assessment has two scenarios, with all spoil being transported to a northern disposal site and all spoil be transported to a southern disposal site. In reality it is reasonably feasible that spoil disposal site in each direction would be utilised. As such, these tables present the worst-case construction traffic impacts from the project.

The assessment shows that the majority of intersections along Pennant Hills Road would operate at a similar level of performance regardless of the project construction vehicles. Although the majority of intersections would operate at or close to capacity, this is mainly associated with background traffic growth and not the introduction of heavy vehicles from the project.

Improvements to the local road network in the vicinity of Pennant Hills Road are outside the scope of the NorthConnex project.

Roads and Maritime monitors and manages the operational performance of the arterial road network. The Pinch Point program targets peak hour traffic hotspots and investigates ways to relieve traffic congestion. Pennant Hills Road is one of the corridors that Roads and Maritime is investigating for potential improvements in future years.

Improvements to local roads, such as the Cavendish Street / Paling Street intersection, are the responsibility of the relevant local council.

Issue description

Submissions raised concerns that the project does not address the Pacific Highway, including the problem of traffic entering the M1 Pacific Motorway from the Pacific Highway both north and south.

Response

The primary objective of the NorthConnex project is to improve the efficiency of the freight movements on the National Land Transport Network by connecting the M1 Pacific Motorway to the Hills M2 Motorway. Improvements to the M1 Pacific Motorway / Pacific Highway interchange are outside the scope of the project.

Roads and Maritime monitors and manages the operational performance of the arterial road network. The Pinch Point program targets peak hour traffic hotspots and investigates ways to relieve traffic congestion. The M1 Pacific Motorway / Pacific Highway interchange is identified as one of the projects currently under investigation as part of the Pinch Point program.

Issue description

Submissions suggested the provision of a ‘no through road’ sign on Hewitt Avenue. Cars should also be prohibited from making a u-turn at the cul-de-sac.

Response

The provision of a no through road sign on this local road is outside the scope of the project and is a matter for the relevant local council.

Impacts related to spoil disposal sites

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding the potential impacts from the use of Hornsby Quarry as a spoil disposal site.

The mountain bike trail in Old Man Valley near the Hornsby Quarry is very popular. If NorthConnex spoil is used to fill Hornsby Quarry this could lead to closure of the trails that are funded by Government bodies. Request that efforts are made to retain these trails, or NorthConnex fund new trails to replace them.

Response

The project identifies that Hornsby Quarry, along with a number of other potential sites, may provide the necessary capacity to receive the spoil generated by the project. At this time, work is ongoing to determine the final disposal site(s).

In the event that Hornsby Quarry is pursued as a spoil disposal site for the project, an appropriate environmental assessment would need to be carried out. Potential impacts to nearby infrastructure (such as the bike trail), and appropriate mitigation measures would be identified at that time.

Impacts to Blue Gum Creek

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding the existing condition of Blue Gum Creek.

In summary, the submissions raised the following issues:

- Blue Gum Creek is a severely eroded, weed infested series of stagnant pools degraded by stormwater runoff and lack of maintenance following the construction and widening of the Hills M2 Motorway.
- Localised flooding and property damage has occurred.

Response

The Hills M2 Motorway forms one part of the urbanised catchment of Blue Gum Creek. Historical degradation and poor water quality in Blue Gum Creek is a result of a combination of all developments within the catchment.

In the operation phase of NorthConnex, the water treatment plant has been designed to achieve a maximum water quality discharge equivalent to the 95 per cent protection level specified for freshwater ecosystem in accordance with the ANZECC guidelines (ANZECC & ARMCANZ, 2000). This water quality is expected to be of higher quality than the current water quality of Blue Gum Creek. As identified in Section 7.6.3 of the environmental impact statement, the increased water volume in Blue Gum Creek may provide benefits in relation to fish migration and may clean and oxygenate stagnant pools.

Strategic alternatives

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding the lack of consideration given to the B3 corridor.

In summary, the submissions raised the following issues:

- Consideration should have been given to the B3 corridor – the inward expansion of the F3 Freeway (now the M1 Pacific Motorway), presented as the preferred route in the RTA North West Road Needs Study of 1988.
- The 2007 Pearlman Inquiry was forbidden from considering this route.

Response

Revisiting the consideration of the historical B3 corridor is beyond the scope of the NorthConnex project.

The 2004 report identifies that the RTA North West Road Needs Study of 1988 concluded that a surface route between the F3 Freeway (now the M1 Pacific Motorway) and the Hills M2 Motorway along what was proposed as the B2/B3 corridor, through the Lane Cove National Park, would have unacceptable social and environmental impacts.

The terms of reference for the 2007 Pearlman Review were based on a review of the assumptions and findings of the 2004 report. Consideration of historical corridor options was beyond the scope of the 2007 Pearlman Review.

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, identify a lack of support for the Equilibria proposal.

Response

The submissions stating that they do not support the Equilibria proposal are noted. As outlined in **Section 8.2.4** of this submissions report, the Equilibria proposal is not considered to be a viable variation to the NorthConnex project.

Issue description

Submissions relating to the project but which are out of the scope of the environmental impact statement raised issues regarding the need for programs that stop further population growth in order to consolidate and provide higher quality living and environmental conditions to the current inhabitants.

Response

The provision of population growth programs is outside the scope of the NorthConnex project.

Issue description

Submissions raise concerns of the lack of a state-wide transport strategy for now and into the future. Many infrastructure decisions are being made without the benefit of robust end-user consultation and input.

Suggestion that a proper transport strategy be developed in a consultative process with all stakeholders that considers all transport options. These projects should be prioritised accordingly based on an open options evaluation.

State and Federal Government should use their $800 million to progress other projects including:

- Continuing with the Epping to Thornleigh Third Track project either between Thornleigh and Hornsby or from Rhodes to West Ryde with an additional rail bridge over the Parramatta River.
- Continuing with Pacific Highway Upgrades particularly at Grafton and Kempsey.
- Electrification of every rail line in NSW.
- High Speed Rail is required to every capital city, including Hobart via a rail Ferry across Bass Strait.

Response

The provision of other transport projects is beyond the scope of the NorthConnex project.

The Australian and State Government both dedicate significant resources to planning the future infrastructure needs of NSW and Australia as a whole. These are documented in the various strategic planning documents such as the NSW Long Term Transport Master Plan (Transport for NSW, 2012) and the White Paper, Auslink: Building Our National Transport Future (Commonwealth Department of Transport and Regional Services, 2004).

These documents contain a number of proposed rail infrastructure projects, including:

- Improvements to the freight rail line between Sydney and Newcastle which is being progressed through project such as the Epping to Thornleigh Third Track.
- Upgrade to the Pacific Highway between Newcastle and the Queensland border.

The provision of high speed rail to every capital city is a matter for the Australian Government.

Issue description

There does not appear to be any provision for a second bridge across the Hawkesbury River at Mooney Mooney or consideration of widening the existing bridge.

Response

A second Hawkesbury crossing or widening the existing bridge at Mooney Mooney is beyond the scope of the NorthConnex project

Tables 7-30 and 7-31 of the environmental impact statement provide mid-block traffic performance of the M1 Pacific Motorway north of the project tunnel portal for 2019 and 2029. This shows that the M1 Pacific Motorway would operate with spare capacity with a level of service ranging from B to C in 2019 and B to D in 2029. In this context, consideration of another bridge or widening of the existing bridge is not necessary,

In relation to a second Hawkesbury crossing, the NSW Government announced in June 2014 that it had allocated funding for preliminary investigations to inform the identification and reservation of a corridor for the future M9 Motorway (Outer Sydney Orbital). The M9 Motorway would be consistent with the Type C corridor considered in the 2004 report, and supported by the 2007 Pearlman Review as a long term option. The preliminary investigations are underway, with planning for the M9 Motorway being conducted concurrently with delivery of the NorthConnex project.

M5 East Motorway

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding the M5 East Motorway.

In summary, the submissions raised the following issues:

- There is evidence of people moving away from the M5 East Motorway due to health issues with an immediate improvement in health following relocation.
- Residents around the M5 East Motorway ventilation outlet have found visible evidence of the pollution in their homes.
- Residents reported significant odour annoyance and ill-effects such as sore eyes, throat irritation and increased asthma. The study carried out by NSW Health into these reports was inconclusive and unreliable due to multiple flaws in the study design and statistical analysis.

Response

The environmental performance of the M5 East Motorway and the robustness of studies by NSW Health regarding the M5 East Motorway are beyond the scope of the NorthConnex project. Anecdotal evidence about local populations relocating based on actual or perceived

health effects from the operation of the M5 East Motorway ventilation outlet is not supported by a robust scientific investigation based on credible, reliable data.

In the case of the NorthConnex project, the human health risk assessment presented in Section 7.4 and Appendix H of the environmental impact assessment has demonstrated that potential health risks posed by the NorthConnex project are very low and would not be discernible from background variations in health effects within the population considered. There would therefore be no basis for operation of the NorthConnex ventilation outlets to require relocation of local receivers based on health impacts.

Dust that may settle in people's homes comes from many natural and man-made sources. The major contributors to dust levels in the Sydney airshed come from wood-fired heaters (a man-made source) and from bushfires (a natural source). It is often difficult to determine the exact source(s) of dust that may settle in people's homes, and in the case of contributions from transport sources, it is not possible to differentiate from contributions from vehicles on surface roads and contributions from road tunnel ventilation outlets.

Issue description

Submissions relating to the project, but which are outside the scope of the environmental impact statement, raised issues regarding the M5 East Motorway.

In summary, the submissions raised the following issues:

- The filtration system in the M5 East Motorway tunnel must remain operational to allow a full two thirds of the harmful air pollutants to be removed from the filtered air being emitted into Sydney suburbs. This falls under the Governments compliance with duty of care.
- Consideration must be given to increasing the volume of air filtered and extending the daily length of time that the filtration system runs.
- Concerns regarding the CSIRO report revealing the M5 East Motorway filtration trial did not measure all particle sizes.

Response

The provision of filtration in the M5 East Motorway tunnel and the outcomes of the M5 East filtration trial is beyond the scope of the NorthConnex project.

Further information on the availability and efficacy of in-tunnel air treatment technologies is provided in **Section 3.1** of this report. **Section 3.2** considers the application of filtration to the NorthConnex project, and concludes that it is not feasible and reasonable.

The use of filtration systems within the tunnel ventilation outlets has been proven to be costly and inefficient. Learnings from the M5 East Motorway tunnel filtration trial have unequivocally demonstrated that greater improvements in air quality can be achieved through investment in programs targeting other emission sources that contribute higher levels of pollution to the surrounding environment. For example, improvements have been demonstrated through the smoky vehicle strategy investigated by Roads and Maritime and the Environment Protection Authority on the M5 East Motorway. Further details of the effectiveness of this strategy are provided in Section 7.3.1 of the environmental impact statement.

Ventilation facilities

Issue description

Submissions raised concerns regarding the NSW Government's non-compliance with their duty of care by failing to implement filtration in road tunnels in Sydney. The NSW and Australian Governments continue to breach the Universal Declaration of Human Rights by allowing citizens to be exposed to vehicle emissions, some being classed as carcinogenic.

Suggestion that the best possible air filtration systems be installed in all Australian tunnels or retrospectively installed into all existing tunnels.

Response

Further information on the availability and efficacy of in-tunnel air treatment technologies is provided in **Section 3.1** of this report. **Section 3.2** considers the application of filtration to the NorthConnex project, and concludes that it is not feasible and reasonable.

The use of filtration systems within the tunnel ventilation outlets has been proven to be costly and inefficient. Learnings from the M5 East Motorway tunnel filtration trial have unequivocally demonstrated that greater improvements in air quality can be achieved through investment in programs targeting other emission sources that contribute higher levels of pollution to the surrounding environment. For example, improvements have been demonstrated through the smoky vehicle strategy investigated by Roads and Maritime and the Environment Protection Authority on the M5 East Motorway. Further details of the effectiveness of this strategy are provided in Section 7.3.1 of the environmental impact statement.

Issue description

Australia should investigate filtration expertise and technology in countries where it has been successful in removing 95 per cent of harmful emissions.

Response

Roads and Maritime services have investigated filtration systems throughout the world, sending delegations to both Norway and Japan to investigate these systems and meet with the relevant road authorities. Since then, the filtration has been trialled under Australian conditions in the M5 East Motorway tunnels. Further information on the availability and efficacy of in-tunnel air treatment technologies is provided in **Section 3.1** of this report.

The use of filtration systems within the tunnel ventilation outlets has been proven to be costly and inefficient. Learnings from the M5 East Motorway tunnel filtration trial have unequivocally demonstrated that greater improvements in air quality can be achieved through investment in programs targeting other emission sources that contribute higher levels of pollution to the surrounding environment. For example, improvements have been demonstrated through the smoky vehicle strategy investigated by Roads and Maritime and the Environment Protection Authority on the M5 East Motorway. Further details of the effectiveness of this strategy are provided in Section 7.3.1 of the environmental impact statement.

Issue description

By changing bus and truck fleet from diesel to cleaner and cheaper LPG fuels, as a 20 year transition to renewable fuels, the problem of the tunnel ventilation outlets would be addressed, as well as the more general problem of particulates in and around our cities.

Response

These suggestions to improve air quality are beyond the scope of the NorthConnex project. The NSW Government is separately progressing strategies to improving air quality through Action for Air (EPA, 1998).

Action for Air– the Government's 25 year air quality management plan – and the updates to that strategy in 2002, 2006 and 2009, recognise that managing and improving air quality in New South Wales requires a multi-layered approach and an 'integrated attack on air pollution'. Action for Air recognises that all stakeholders and pollution sources need to play a role in maintaining and managing air quality.

In the spirit of Action for Air, it is appropriate to focus the broader task of air quality management and improvement over time on those areas where the greatest benefit could be feasibly and reasonably achieved through the most cost effective means. Action for Air includes a series of targets and focus areas, including the transport, commercial and industrial and domestic sectors, through which improvements in air quality could be achieved.

Issue description

Submissions raise concerns based on the substantial emerging data on health risks posed by vehicular emissions, especially diesel vehicles. Suggestions that policy makers make efforts to promote clean air, reduce population exposure and ensure legal protection is provided under Commonwealth environmental and human rights laws. As Australia has an advanced economy, cost limitations for these projects should not affect the protection of population health.

In 2012, the Asthma Foundation stated that Australia's air monitoring was 10 years behind the rest of the world despite compelling evidence of harm.

The National Environment Protection Council (NEPC), has not led to the implementation of a standard for carcinogenic Particulate Matter (PM) of 2.5µm or less ($PM_{2.5}$). Only a 'guideline' is set. The current air quality guidelines consider a level of less than 50 $\mu m/m^3$ to be safe.

The State Government should consult widely to establish community approved scientifically valid methods of modelling near field pollution behaviour including detailed longitudinal micro-climate assessment and high resolution topographic and vegetation building data.

There appears to be a contradiction between State and Australian Government policy regarding clean air.

Response

The development of population health policy, current air quality monitoring, standards for pollutants and establishment of modelling methods is beyond the scope of the NorthConnex project.

The human health risk assessment as part environmental impact statement has been carried out in accordance with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012).

Despite a guideline value being set for particulate matter, the project acknowledges that there is no safe level and, as such, has undertaken a more detailed assessment for this pollutant.

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8.3 Project

8.3.1 Construction program

Seven submissions raised issues regarding the construction program.

Issue description

Submissions relating to the construction program for the project requested clarification of the proposed hours of access to the northern interchange compound from Eastbourne Avenue.

Response

Access to the northern interchange compound from Eastbourne Avenue would mainly be for light vehicles only. Light vehicles would utilise this access 24 hours per day and seven days per week.

Heavy vehicles would use the Eastbourne Avenue access route for the site establishment and decommissioning phases of the project. These activities would be carried out during standard daytime construction hours of 7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturday.

Issue description

Submissions raised concern over the conflicting information in the environmental impact statement about the number of heavy vehicles and spoil removal and hours of operation at the Trelawney Street site.

Response

The Trelawney Street compound (C7) would operate as a tunnel support facility for up to 24 hours per day and seven days per week during tunnelling activities. Tunnel support activities conducted at the surface, including spoil handling, management, loading and traffic movements would:

- Occur at any location within the surface site during standard construction hours.
- Be restricted to occurring within the acoustic shed outside of standards construction hours.

Heavy vehicle movements to and from the tunnelling support sites, and on these sites outside the acoustic sheds, would also occur up to 24 hours per day and seven days per week. Access and egress for these heavy vehicles has been restricted to directly to and from a major arterial road (the M1 Pacific Motorway, the Hills M2 Motorway or Pennant Hills Road) in order to reduce the potential for traffic noise impacts to local residents. Further details of these access and egress arrangements are provided in **Section 9.4** of this report.

Other construction activities conducted on the site, other than tunnel support activities, would be conducted within standard construction hours unless the construction works:

- Would not exceed the applicable noise management level at the nearest sensitive receiver, as determined under the Interim Construction Noise Guideline (DECC, 2009).
- Are required by the Police or other authorities for safety reasons.
- Are required to avoid the loss of life, property and/ or prevent environmental harm.
- Are subject to a negotiated agreement with the affected receiver(s).
- Are otherwise authorised by an Environment Protection Licence issued under the *Protection of the Environment Operations Act 1997*.

All construction activities would be conducted under a Construction Noise and Vibration Management Plan for the relevant site(s).

Construction traffic generated from the Trelawney Street compound is summarised in Table 7-17 of the environmental impact statement. This includes:

- Heavy vehicles: 570 vehicles per day, with around 23 in the AM peak and 26 in the PM peak.
- Light vehicles: 100 vehicles per day, with around eight in the AM peak and eight in the PM peak.

Issue description

Will spoil removal be 24 hours per day and seven days per week?

Response

Spoil removal will occur up to 24 hours per day and seven days per week.

Based on feedback in submissions and through other consultation with the community and other stakeholders, the proposed construction traffic routes for the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9) have been altered to avoid impacts on local residential streets. Updated construction traffic and construction noise assessments for these amended haulage routes are provided in Section 7.4 of this report.

Issue description

Object to the duration and intensity of the construction period.

Response

Construction works would result in impacts to the local community. These impacts, potentially including noise and vibration; air quality (particularly dust); visual impacts; and construction traffic, are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures. Construction works would be limited in duration and any construction-related impacts on surrounding receivers would be temporary.

The environmental impact statement identifies feasible and reasonable management and mitigation measures in order to avoid or minimise these potential impacts.

8.3.2 Construction methods

Five submissions raised issues regarding the construction methods for the project.

Issue description

Submissions raised concerns that the proposed activities within the acoustic shed and the activities outside the acoustic shed at night at the Trelawney Street site are unclear.

Response

The Trelawney Street compound (C7) would operate as a tunnel support facility for up to 24 hours per day and seven days per week during tunnelling activities. Tunnel support activities conducted at the surface, including spoil handling, management, loading and traffic movements would:

- Occur at any location within the surface site during standard construction hours.
- Be restricted to occurring within the acoustic shed outside of standards construction hours.

Heavy vehicle movements to and from the tunnelling support sites, and on these sites outside the acoustic sheds, would also occur up to 24 hours per day and seven days per week. Access and egress for these heavy vehicles has been restricted to directly to and from a major arterial road (the M1 Pacific Motorway, the Hills M2 Motorway or Pennant Hills Road) in order to reduce the potential for traffic noise impacts to local residents. Further details of these access and egress arrangements are provided in **Section 9.4** of this report.

Issue description

Submissions raised concerns regarding the construction methods for the project.

In summary, the submissions raised the following issues:

- It is unclear what excavation works are expected at the southern interchange compound.
- The levels between the adjoining properties and the site during and post construction should be provided.
- Temporary fencing locations are unclear.

Response

Excavation works would be required at the southern interchange compound. The level of the construction compound would change as construction work progress. Temporary fencing or hoarding would be situated on the boundary of the compound.

The levels of the final design are provided in the Technical Working Paper: Urban Design (Volume 4 of the environmental impact statement). This document provides a number of cross sections along the facility from Pennant Hills Road through to the residential area.

Issue description

Submissions suggested that all cement needed for the project be mixed on site(s) to minimise the amount of traffic. Small sites such as at Coral Tree Drive and the Pioneer Avenue site (next to a Cement plant) would not fall into this category. Bulk supplies of sand, cement, etc… would need to be delivered to sites.

Response

At this stage it is not proposed for the project to develop its own large scale batching plant. The provision of this facility would require a large site for the storage of raw materials and the batching equipment itself. The necessary land for this function is not available in the project area without additional property acquisition. Despite this, the project may batch small volumes locally with the construction sites.

The provision of a large project batching plant would not necessarily reduce heavy vehicle numbers by a significant volume. This would require considerable deliveries of raw materials

(sand and aggregate) and the subsequent use of heavy vehicle to transport concrete to the various construction sites. The consideration of any minor reduction in heavy vehicle numbers would also need to be considered against the potential for increased noise and air quality impact associated with a batching operation. Batching operations are typically located within industrial sites due to the potential for noise and air (dust) impacts associated with these facilities.

Additionally, there are numerous batch plants in the general vicinity of the project (Thornleigh, Hornsby and Artarmon) which could be used to supply the project. Based on a balanced consideration of all relevant factors, the provision of a large batching plant is not considered justified.

Issue description

Submissions suggested that monitoring should be undertaken for dust, chemical fumes, noxious gas, noise and vibration during construction.

Response

Chapter 9 of the environmental impact statement provides a consolidated list of mitigation measures committed to for the project. This includes a range of monitoring programs to ensure the impacts are consistent with those identified in the environmental impact statement.

Issue description

There is no information on how the southbound lanes into the tunnel will be built.

Response

Figure 5-21 of the environmental impact statement provides a graphically representation of the tie-in work with the M1 Pacific Motorway. This work commences to the north of the Edgeworth David Avenue overpass.

A description of the construction works is provided in Section 5.3 of the environmental impact statement.

Issue description

The Hills M2 Motorway will need to be narrowed to two lanes to allow the integration works to be built.

Response

In order to construct the Hills M2 Motorway integration works, the existing bus lane on the Hills M2 Motorway between Pennant Hills Road and Windsor Road will need to be converted temporarily to a general traffic lane. This would maintain the existing two general traffic lanes in this section.

8.3.3 Location and layout of construction compounds

Twenty two submissions raised issues regarding the location and layout of the construction compounds.

Issue description

Submissions raised concerns with the tunnel support facilities. What are the dimensions of the shaft at the tunnel support facilities? Will they be filled once construction works are complete?

Response

The dimensions of the shaft based on the current concept design are:

- The circular shafts at the southern interchange compound and the northern interchange compound have a diameter of around 12 metres.
- The rectangular shafts at Wilson Road compound and Trelawney Street compound are around 16 metres by 12 metres.

The size dimension of the shafts are subject to detailed design. They will be large enough to facilitate the entry of equipment such as road headers and the removal of spoil.

The shaft would become the permanent point for the extraction of smoke during an emergency.

Junction Road compound

Issue description

Submissions relating to the location of construction compounds for the project opposed the conversion of Carrington Oval to a car park for construction vehicles.

Response

Carrington Park would not be directly affected during construction or operation of the project, and would be retained in its existing condition.

The Junction Road construction compound (referenced as C11 in the environmental impact statement) would be located immediately to the north of Junction Road, to the east of the M1 Pacific Motorway, and to the south of Carrington Park. The area comprises vegetated vacant land, part of which is located within the existing road reserve of the M1 Pacific Motorway. The site would be rehabilitated when construction works are complete.

Trelawney Street compound

Issue description

Submissions relating to the location of and layout of construction compounds for the project raised issues regarding the proposed parking at the Trelawney street compound.

In summary, the submissions raised the following issues:

- Objection to the proposal for parking of 100 cars along the eastern boundary of the Trelawney Street compound (C7) due to the 24 hours per day and seven days per week operation which will cause disruption to properties. These properties are only six metres from the proposed parking area.
- Preference for all car parking to be removed from Trelawney Street.
- Workers can park at the dedicated facility at Pioneer Avenue and walk to Trelawney Street or come via minibus.

The current car parking space should be used by waiting trucks to keep them off local streets.

Response

The Pioneer Avenue compound (C8) would be a dedicated car parking facility for construction workers. These workers would then be transferred to the various construction sites via bus. In the case of the Trelawney Street compound (C7), workers may also walk the short distance between the two construction sites.

While it is intended that the Pioneer Avenue compound site would operate as the principal car parking location for construction staff, additional secondary car parking capacity has been included at other sites, including at the Trelawney Street compound. This secondary car parking has been provided to accommodate occasional parking, and site staff who are required to travel between construction sites (for example, construction and environmental management staff). The secondary car parking has also been provided as a precautionary measure to mitigate against the risk of parking in surrounding residential streets.

Car parking at the Trelawney Street compound would be required by workers such as Foremen and Engineers and other management staff who are required to travel to and from office locations and between various construction sites. The car parking has been placed along the residential boundary of the site as it would result in less impacts (such as noise) when compared to other activities on the site such as laydown areas.

When utilised for out of hours works, appropriate controls would be established to protect the amenity of the adjacent residential receivers. This may include controls such as noise hoarding to reduce noise from vehicles and visual screening to reduce light spill from vehicle headlights.

Heavy vehicles accessing and egressing the site would be organised in order to limit the potential for these to wait on local roads.

Issue description

Submissions relating to the proposed compressor located outside the acoustic shed at the Trelawney Street compound (C7) raise concerns of when the compressor will be operating and the extent of noise.

Response

Compressors are required as part of the tunnelling activities at this site. Compressors would be fitted with appropriate noise attenuation in order to reduce the potential noise impacts to nearby receivers.

Northern interchange compound

Issue description

Submissions relating to the northern interchange construction compound raised issues including:

- The Eastbourne Avenue light vehicle access road appears to lead to the Roads and Maritime reserve. It is not clear what this area is intended to be used for.
- The compound should be deleted as it is non-essential.
- The compound should be relocated north to occupy the land adjacent to the M1 Pacific Motorway where is bends around towards Pennant Hills Road.

Response

The light vehicle access road from Eastbourne Avenue would provide access to the northern interchange compound. Details of the proposed use of this compound are provided in Section 5.3.12 of the environmental impact statement.

Spoil removal from tunnelling works has been planned to occur from four sites being the southern interchange compound (C5), Wilson Road compound (C6), Trelawney Street compound (C7) and northern interchange compound (C9) in order to limit the potential impacts from any one site. the northern interchange compound is required to provide a tunnelling support site close to the northern end of the project with good access directly to and from arterial road network; and to support the local construction of the on and off-ramps.

The primary driver for the location of these sites is the objective of minimising environmental and community impacts. Wherever possible, ancillary construction facilities have been co-located within the footprint of the future operational ancillary facilities to minimise the overall land acquisition requirements, as well as impacts on heritage items and ecologically sensitive areas.

Where temporary ancillary construction facilities could not be co-located within the footprint of the future operational ancillary facilities, the following were considered when selecting the location of these facilities:

- Locating the facilities within existing road reserves or other land owned by Roads and Maritime in order to minimise land acquisition requirements.
- Locating the facilities in previously disturbed areas, such as the footprint of compounds previously utilised as part of the recently completed Hills M2 Motorway Upgrade project.
- Locating spoil extraction sites immediately adjacent to the arterial road network to reduce the impacts of spoil haulage and other heavy vehicle movements.
- Avoiding known heritage items and significant ecologically sensitive areas as far as possible.

Relocating the compound slightly north is not possible due to the terrain of the land in this location and would not eliminate the potential impacts of this compound. It would be likely to shift the existing potential impacts to other receivers.

Southern interchange compound

Issue description

Submissions relating to the location of and layout of construction compounds for the project raised issues regarding the proposed parking at the southern interchange compound.

If workers will be bussed into the site from the Pioneer Avenue compound why are 50 parking spaces provided in the southern interchange compound.

Response

The Pioneer Avenue compound (C8) would be a dedicated car parking facility for construction workers. These workers would then be transferred to the various construction sites via bus.

While it is intended that the Pioneer Avenue compound site would operate as the principal car parking location for construction staff, additional secondary car parking capacity has been included at other sites, including at the southern interchange compound. This secondary car parking has been provided to accommodate occasional parking, and site staff

who are required to travel between construction sites (for example, construction and environmental management staff). The secondary car parking has also been provided as a precautionary measure to mitigate against the risk of parking in surrounding residential streets.

Car parking at the southern interchange compound would be required by workers such as Foremen and Engineers and other management staff who are required to travel to and from office locations and between various construction sites.

When utilised for out of hours works, appropriate controls would be established to protect the amenity of residential receivers. This may include controls such as noise hoarding to reduce noise from vehicles and visual screening to reduce light spill from vehicle headlights.

Pioneer Avenue compound

Issue description

Clarification is required as to whether all workers, including tradesmen, will park at Pioneer Avenue.

Response

The Pioneer Avenue compound would be used as a parking area by the majority of workers. Some workers, such as certain trades, are likely to require their vehicles to be at the worksite. Limited parking is provided on each of the sites for these workers.

8.3.4 Operational design

Twenty seven submissions raised issues regarding the operational design of the project.

Issue description

Submissions suggest that the tunnel should have an 80 kilometre per hour zone when lights are blacked out or there should be variable limits that increase to 100 kilometre per hour when the road is not busy.

Response

The project has been designed for a maximum sign posted speed limit of 80 kilometres per hour. Variable speed limit sings would be installed in order to reduce the sign posted speed limit if required in the event of an incident or breakdown within the tunnels.

Issue description

Submissions relating to the operational design of the project raised the following concerns:

- Relocation of the tunnels further west under the ridgeline of Pennant Hills Road.
- Cross-over tunnels should not be located under existing houses or minor roads as they are of insufficient depth.
- Access tunnels should be restricted to the existing footprint of Pennant Hills Road.
- Objection of placing cross-tunnels under the lowest point of Eastbourne Avenue.

Response

The main alignment tunnels generally follow the ridge line associated with of Pennant Hills Road. In order to achieve appropriate design outcome such as the radius of curves to meet the requirements for a motorway standard connection it was not possible to directly follow the alignment if Pennant Hills Road.

Pedestrian cross passages and vehicle cross-over tunnels are required to be at a similar depth as the main alignment tunnels. Making these tunnels deeper would not allow for the functionality required. For example, a deeper pedestrian cross passage would not allow for the efficient evacuation of mobility impaired persons.

For the majority of the alignment the tunnels are at significant depth under the existing ground surface. Consideration of potential impact to properties from settlement is provided in Section 7.8.3 of the environmental impact statement.

These preliminary ground movement investigations indicate that there may be potential settlement of up to a maximum of 20 millimetres in areas where the main alignment tunnels and the on and off-ramp tunnels are shallower where they are approaching the surface. The remainder of the tunnel alignment would be expected to experience settlement of less than five millimetres.

Settlement resulting from groundwater drawdown would be less than three millimetres in all cases.

Based on previous experience and research, this indicates that, in all cases, ground movement is likely to result in cosmetic damage only. For the majority of properties the anticipated impacts would be negligible, typically resulting in hairline cracking only.

It is acknowledged, however, that the risk to individual structures would be dependent on the geotechnical conditions, the depth of the tunnel, the number of storeys of the building, and the position, condition, and masonry of the structure itself. A such, the results presented are preliminary and do not take into account the specifics of each individual structure. Further assessments would be carried out during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable mitigation and management measures required to minimise potential ground movement impacts.

Issue description

Submissions requested that the project be designed to be a level gradient tunnel between the M1 Pacific Motorway and Hills M2 Motorway to minimise emissions.

Response

Building on lessons learnt from previous tunnel projects in Sydney, the tunnel has been designed to avoid steep gradients. Although the maximum gradient of the main alignment tunnels is set at four per cent, the majority of the project tunnels are around 1.5 per cent gradient. A zero gradient tunnel between the M1 Pacific Motorway and Hills M2 Motorway is not a feasible solution. There is a change in elevation between these two points and there is existing and future underground infrastructure (such as the North West Rail Link tunnels) which needs to be considered in the alignment of the tunnels.

Issue description

Submissions requested the elimination of traffic lights on entry and exits from tunnels to reduce pollution from cars and trucks stopping and starting.

Response

The main alignment tunnels provide a motorway to motorway connection to the M1 Pacific Motorway in the north and the Hills M2 Motorway in the south. These connections do not incorporate traffic lights and would provide for free flowing traffic.

The on and off-ramps at each end of the tunnels connecting the arterial road network do not contain traffic lights on the ramps themselves. They are however, located near traffic lights which would allow traffic exiting the tunnels to safely join traffic on the arterial road network.

Issue description

Submissions relating to the operation design raised issues supporting the widening of the northern side of the Hills M2 Motorway due to:

- There are fewer residences on this side.
- There is no constraint to undertaking the widening on this side.
- Parts of the widening for the Hills M2 Motorway Upgrade project were carried out on the opposite side to the new lane.

Response

It is technically feasible to undertake the required widening on the opposite side of the motorway to the new lane however this is undesirable for a number of reasons as follows:

- It would involve significantly more construction works in order to shift the median across. This would disrupt both carriageways of the motorway and would be likely to require significantly more works at night resulting in increased construction noise impacts to the local community. In some location shifting the median would also involve shifting infrastructure associated with bus stops.
- It would involve significant alterations to the operational drainage infrastructure.
- This would not avoid moving the road closer to residential properties. Rather it would simply move the road closer to other residential properties.
- This would not necessarily result in any improvements to the traffic noise environment for residents on either side of the motorway.

Issue description

Submissions relating to the operational design of the project request for the Hills M2 Motorway to have an 80 kilometre per hour speed limit.

Response

The majority of the Hills M2 Motorway has been designed for a 100 kilometre per hour speed limit. The operational noise assessment has been completed on this basis.

Issue description

Submissions raised concerns that the public is entitled to expect that:

- The design and regulations of these tunnels would reflect international best practice, especially in terms of their safety, ventilation systems, value for money and accepted precautionary principles.
- The standards and regulations would be strictly enforced.

It appears that this proposal is unique and is not using a proven operating design.

Response

The design of the road, tunnel and ventilation system is in accordance with Roads and Maritime design guidelines, Austroads guidelines, Australian Standards and guidelines from the Permanent Association of Road Congresses.

Standards would be enforced by the relevant regulatory agency including the Department of Planning and Environment, and the NSW Environment Protection Authority.

The longitudinal ventilation system and dispersion via ventilation outlets has been successfully used on a number of tunnels across the world.

Issue description

Submissions raised concerns that no information is provided of the new distance between the M1 Pacific Motorway and property lines.

Response

The distance between the boundary of the property and built structures as part of the M1 Pacific Motorway will be determined during the detailed design stage of the project. Consultation will continue with the receivers who share a boundary with the M1 Pacific Motorway to provide this information as soon as practicable.

Issue description

Submissions request that any fixed speed camera located within the tunnel be identified and not coincide with an increase in gradient as many motorists slow down to well below the speed limit at cameras causing unnecessary braking and acceleration.

This can be supplemented with a travel time system.

Response

The regulation of vehicle speeds through the tunnel would be in accordance with current legislation and practices. The exact nature and physical infrastructure as part of this system would be developed during detailed design and in consultation with the NSW Police and Roads and Maritime.

Issue description

The interchanges should be designed so that it is very clear how to avoid the tunnel.

Response

Road signage would be provided in advance of interchanges in order for motorists to choose appropriate lanes to either use the tunnels or not enter the tunnels depending on their destination.

Issue description

From the long section it appears that the road gradient increases as the tunnel emerges from underground at the northern portals. This creates a point at which vehicles would need to accelerate and generate unnecessary noise and air pollution.

The project should be designed for vehicles to use less fuel.

Response

The project has been designed to avoid steep gradients to allow vehicles to maintain constant speeds.

The design gradient of the tunnels and surface roads has been taken into consideration as part of the operational noise and air quality assessments.

The project would provide a more efficient road link between the M1 Pacific Motorway and the Hills M2 Motorway and avoid the need for vehicle to stop and start at 21 sets of traffic lights. This would result in vehicles using less fuel than the current situation.

Issue description

It would make better hydraulic sense to locate the deluge tanks to a below ground site around Pearces Corner. This would save the acquisition of one property at Bareena Avenue.

Response

Deluge tanks are proposed to be provided at each end of the tunnel. As these are the locations where the tunnel emerges from the ground, they are the two highest points in relation to the remainder of the tunnels. Hydraulically, the deluge tanks need to be above the height of the project tunnels. The relocation of these tanks to Pearces Corner is also likely to require additional property acquisition.

Issue description

There is no indication of where the southbound lanes into the tunnel commence.

Response

Figure 5-21 of the environmental impact statement provides a graphical representation of the tie-in work with the M1 Pacific Motorway. This work commences to the north of the Edgeworth David Avenue overpass.

8.4 Planning and statutory requirements

8.4.1 Approval process

Six hundred and twenty submissions raised issues regarding the approvals process.

Adequacy of approval process

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the adequacy of the planning and approvals process.

In summary, the submissions raised the following issues:

- Belief that planning / approvals process was rushed, which will lead to mistakes in planning and the local community will suffer the consequences for decades to come.
- The approval process is not transparent. The proponent should not prepare its own environmental impact statement.

Response

This environmental impact statement has been:

- Prepared in accordance with the Director-General's environmental assessment requirements issued by then Department of Planning and Infrastructure (now Department of Planning and Environment).
- Prepared in accordance with relevant guidelines developed by regulatory agencies.
- Certified by the authors as neither false nor misleading.
- Reviewed by regulatory agencies including the Department of Planning and Environment, the Environment Protection Authority, NSW Health, NSW Office of Water, Office of Environment and Heritage, and Department of Primary Industries.

The project has been in various stages of planning since completion of the SKM review of options and alternatives in 2004. Environmental investigations to inform the environmental impact statement for the NorthConnex project commenced with preliminary field investigations in later 2013. More detailed environmental impact assessments were carried out at the end of November 2013, with the final environmental impact statement completed following announcement of a preferred tenderer in March 2014. The total period from the commencement of environmental investigations until public exhibition of the environmental impact statement for the NorthConnex project has been around nine months, which is not unusual for a major infrastructure project.

Issue description

Submissions raised concerns of clear conflicts of interest as the state government in its various forms is the proponent (Roads and Maritime), assessor (Department of Planning and Environment) and consent authority (Minister for Planning).

Therefore the application must be referred to the Planning Assessment Commission for determination.

Response

As detailed in Chapter 2 of the environmental impact statement, the project is permissible without consent by virtue of clause 94 of the *State Environmental Planning Policy (Infrastructure) 2007*. The project was declared, by Ministerial Order to be State significant

infrastructure. As such, Roads and Maritime are seeking approval under Part 5.1 of the *Environment Planning and Assessment Act 1979*.

The Department of Planning and Environment will undertake an independent assessment of the NorthConnex project, consistent with the requirements of the *Environmental Planning and Assessment Act 1979*. As part of this the Department of Planning and Environment considers the content of the environmental impact statement, the submissions received and the proponent's response to those submissions. As part of this process, the Department of Planning and Environment receives specialist input and advice from other agencies, such as the Environment Protection Authority, and may engage specialists to undertake independent reviews and to provide technical advice as deemed appropriate by the Department.

Issue description

Submissions relating to the project approval process raised the following concerns:

- The locations of the tunnel portals and ventilation outlets have moved without notice when comparing the locations from the state significant infrastructure application with the environmental impacts statement.
- The original State significant infrastructure application report was not updated to reflect the preferred option, leaving the community with misleading information on the NorthConnex website. This is unsatisfactory and the report should have been updated.
- The Director-General's requirements for the project have been developed on an incorrect project description as the original State significant infrastructure application report did not reflect the preferred option.

Response

The State significant infrastructure application report does not identify in text or on any figures that the portals or the northern ventilation facility would be south of the North Shore railway line (or indeed in other location). The original State significant infrastructure application report (in section 4.4.2) states 'the location of ventilation outlets and portals are subject to further design development'.

The State significant infrastructure application report provides a project corridor (in Figure 3-2 of that report) within which the project may be located depending on the outcomes of the design and contract tender process. The location of the northern portals and the northern ventilation facility is within this project corridor.

The State significant infrastructure application report is only required to be updated if there is a material change in the project which may impact the content of the Director-General's requirements. On this basis, the report was updated to reflect the Hills M2 Motorway integration works, as these works were outside of the project corridor identified in Figure 3-1 of the original State significant infrastructure application report. The final position of the northern portals and the northern ventilation facility is within the project corridor as identified in the original State significant infrastructure application report. Further, the position north of the North Shore railway line was not precluded by the original State significant infrastructure application report, nor does it change the potential impacts and nature of proposed assessment as identified in the original State significant infrastructure application report.

As soon as a decision was made regarding the preferred tenderer, the project team made this information available to the public. This was done through a variety of mechanisms including updates to the project website, letter box drops of project fact sheets and a number of community information sessions along the project corridor.

Issue description

There is a difference between the key and non-key issues between the State significant infrastructure application report and the environmental impact statement. This difference should be explained.

Response

The State significant infrastructure application report provides consideration of the key issues based on preliminary assessment and is intended to assist in informing the Director-General's environmental assessment requirements. The key issues within the environmental impact statement are consistent with the key issues from the Director-General's environmental assessment requirements

Issue description

Sections in the State significant infrastructure application report relating the 2004 report were not clearly identified.

The report also did not identify the 2006 approach to the NSW Government by the owners of the Hills M2 Motorway to develop the yellow corridor option.

Response

References to the 2004 report are clearly identified in the sections of the State significant infrastructure application report relating to the alternatives and options development.

Previous approaches to the NSW Government by the owner of the Hills M2 Motorway to develop a yellow corridor option in lieu of the purple corridor option are not relevant to the current NorthConnex project.

Issue description

NorthConnex have publically provided amended impact and mitigation measures on their website without an adequacy assessment or approval of the Director-General. As this is an amendment to the environmental impact statement, the requirements of the Environmental Planning and Assessment Regulation should be applied. This requires the proponent to gain approval from the Director-General for an amendment. From investigations it appears that the approval from Department of Planning and Environment has not been obtained to amend the application.

Response

The project website was updated with this additional information in order to clarify some misconceptions about the project that were made publicly to ensure the community is informed correctly as part of the environmental impact statement public exhibition phase.

This update to the website does not form part of the environmental impact statement and did not provide information (in terms of impact assessment or mitigation measures) which was inconsistent with the environmental impact statement.

Information released publically by the project team in order to correct public misconceptions about the project released by others does not form part of the environmental impact assessment process.

As such, there is no requirement to seek approval from the Department of Planning and Environment to release this information.

Issue description

Submissions relating to the project approval process raised the following concerns:

- Public infrastructure which will be delivered via an unsolicited bid process should never be critical infrastructure.
- Unsolicited bid projects should never be deemed critical infrastructure projects.
- The unsolicited bid process needs to have a higher degree of transparency for issues of public importance.

Response

The unsolicited project process is not directly related to the planning approval process.

When an unsolicited proposal is received by the NSW Government, strict transparency, probity and conduct requirements must be followed as detailed in Unsolicited Proposals: Guide for Submission and Assessment (NSW Government, 2014). These requirements have been followed in relation to the unsolicited proposal for the NorthConnex project.

Project approval

Issue description

Submissions relating to planning and statutory requirements provided support for the Department of Planning and Environment's review and assessment process.

Response

Support for the Department of Planning and Environment's review and assessment process is noted.

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the approval of the project.

In summary, the submissions raised the following issues:

- The project should not be approved without the okay from the local community.
- The project should not be approved in its current form.
- Department of Planning and Environment should require the Project to meet best practice for design and emission controls, including full filtration for particles, nitrogen oxide and other key emissions
- The project should not be approved until the NSW Government's Advisory Committee on Tunnel Air Quality complete its work.
- The project should not be approved until details regarding spoil transportation and disposal are finalised.

Response

Following the preparation of this report, the Secretary of the Department of Planning and Environment will prepare and provide to the Minister for Planning, a report detailing the Secretary's assessment of the NorthConnex project. This report will include consideration of issues raised in public submissions, and Roads and Maritime's response to those issues (as detailed in this report).

The work being carried out by the Advisory Committee on Tunnel Air Quality is independent of the approval for the NorthConnex project. The Committee has completed a number of reports which are publically available. These reports are generally consistent with the NorthConnex tunnel design.

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the approval of the project.

The Department should not approve the project in its current form as it does not meet the principles of ecologically sustainable development.

Response

Section 11.1.4 of the environmental impact statement provides consideration of the project against the principles of ecologically sustainable development. A summary is provided below

The precautionary principle

- The precautionary principle has been applied throughout the design and development of the project.
- The alternatives and options analysis as part of the 2004 report considered environmental impacts, including the minimisation of surface disturbance and potential impacts to National Parks and other ecologically sensitive areas.
- The design aimed to avoid known areas or items of environmental value. Where avoidance was not possible, mitigation measures were identified to manage these risks.

Intergenerational equity

One of the key objectives of the project is to assist in a reduction in traffic congestion along Pennant Hills Road and provide shorter travel times for road users. The project would provide an alternative travel route between the M1 Pacific Motorway and the Sydney orbital road network increasing the capacity of the road network. The project is also being future proofed with the ability to be retro-fitted to three lanes in each direction if required in the future.

The project would also provide the following benefits for today's generations and future generations:

- Provide a reduction in air quality emissions along the Pennant Hills Road corridor.
- Improve noise amenity along the Pennant Hills Road corridor through the reduction in heavy vehicle use.
- Improve road safety through the provision of a motorway standard connection.
- Result in improvements to local amenity.
- Result in reduced operational greenhouse gas emissions when compared to the project not being built.

Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity is a fundamental consideration of the project. The alternatives and options analysis as part of the 2004 report considered ecological integrity, evident through the selection of an option which minimised potential

impacts to National Parks and other ecologically sensitive areas. The current project design avoids impacts to areas of high ecological value as far as practical.

Improved valuation and pricing of environmental resources

The value placed on the environment is evident in the development of design features and also in the extent of environmental investigations for the project. In addition the costs associated with the planning and design of measures to avoid / minimise adverse environmental impacts and the costs to implement them have been built into the overall project costs.

A target rating of 'excellent' has been set for the NorthConnex project under the Infrastructure Sustainability Council of Australia's Infrastructure Sustainability (IS) Framework. Feasible and reasonable measures to pursue this target rating will be identified and developed during detailed design of the project.

The provision of a toll on the project supports the concept of users of goods and services paying prices based on the full life cycle of costs of providing the goods. Whilst the upfront capital costs would be provided by a combination of private funding and a contribution from the NSW and Australian Governments, this funding would be recouped through a toll to cover the upfront construction, and ongoing operation and maintenance costs.

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the approval of the project in its current form.

In summary, the submissions raised the following issues:

- The Department of Planning and Environment should not approve the project until a detailed cycling infrastructure plan is included as part of the project.

Response

The project involves the construction of dedicated grade separated cyclist facilities across the new on and off-ramps where the main alignment tunnels connect to the M1 Pacific Motorway and the Hills M2 Motorway. This is described in Section 5.2.8 of the environmental impact statement.

Provision of dedicated cycling infrastructure along Pennant Hills Road is beyond the scope of the NorthConnex project. There are currently no plans to alter or reduce the capacity or operation of Pennant Hills Road as part of the NorthConnex project. In future, there may be separate projects that consider changes or enhancements along Pennant Hills Road, and these would be subject to appropriate assessment, consultation and approval in accordance with the *Environmental Planning and Assessment Act 1979*.

As part of the NorthConnex project, only limited localised changes to Pennant Hills Road would be required to accommodate the new northern and southern interchanges. Beyond these required changes, the project does not propose to make any other alterations to Pennant Hills Road.

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the approval of the project.

In summary, the submissions raised the following issues:

- It is requested that the Department of Planning and Environment treats the environmental impact statement with the cynicism that it deserves, and makes its own enquiries for as long as it takes to determine the facts and to enforce a more rational approach.
- The public should be wary of the conditions of approval from the Department of Planning and Environment. There is a belief that conditions on past projects are largely meaningless.
- Do the Department of Planning and Environment have the knowledge or the access to impartial experts to assess the project?

Response

The Department of Planning and Environment will undertake an independent assessment of the NorthConnex project, consistent with the requirements of the *Environmental Planning and Assessment Act 1979*. As part of this the Department of Planning and Environment considers the content of the environmental impact statement, the submissions received and the proponent's response to those submissions. As part of this process, the Department of Planning and Environment receives specialist input and advice from other agencies, such as the Environment Protection Authority, and may engage specialists to undertake independent reviews and to provide technical advice as deemed appropriate by the Department.

Following the preparation of this report, the Secretary of the Department of Planning and Environment will prepare and provide to the Minister for Planning, a report detailing the Secretary's assessment of the NorthConnex project. This report will include consideration of issues raised in public submissions, and Roads and Maritime's response to those issues (as detailed in this report).

Conditions of approval issued as part of the Minister for Planning's determination are based on the anticipated environmental risks of the project. These are an effective means of enforcing necessary environmental performance standards and resulting in improved environmental and social outcomes.

Issue description

Submissions raised concerns that without a justifiable set of traffic numbers the project should not be approved.

Response

The Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) provides a thorough assessment of potential traffic impacts from the project based on numbers from a robust strategic traffic model.

Conditions of approval

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the conditions of approval for the project.

In summary, the submissions raised the following issues:

- An alternative solution is needed if the air pollution levels associated with operation of the project are higher than predicted.
- There is no justification to close the tunnel after the project has been completed.
- Concerns the planning conditions will not be robust.

Response

The project would be required to operate within any planning conditions set by the Minister for Planning.

The air quality impact assessment presented in Section 7.3 and Appendix G of the environmental impact statement demonstrates that ambient air quality criteria would be met:

- Under forecast traffic conditions in both 2019 and 2029.
- In the unlikely event that the project reaches its theoretical design capacity during the peak hour.
- In the unlikely event that there was a very high load on the ventilation system from an extremely large number of vehicles using the tunnel, traffic management measures would be implemented to control the traffic entering the tunnels; similar to measures implemented during emergency incidents.

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the conditions of approval for the project.

In summary, the submissions raised the following issues:

- There is a lack of confidence that the commitments made as part of the environmental impact statement would be implemented.
- It is likely that the residents of Wahroonga will be impacted much more than anticipated in the environmental impact statement.

Response

The project would be required to operate consistently with the environmental impact statement, including implementation of all mitigation, management and monitoring measures committed to in that document. In addition, the project will be required to comply with the conditions of approval that may be applied to the project by the Minister for Planning.

The environmental impact statement has demonstrated that the potential impacts of the project, including the implementation of mitigation, management and monitoring measures, would comply with applicable standards and would generally be very low.

Issue description

Submissions request that there needs to be a condition of approval that the Wilson Road and Trelawney Street sites are used for their intended purpose only.

Response

The suggested condition of approval is noted. There are no plans to use these facilities for any other purpose from that described in the environmental impact statement.

Options evaluation

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the need for the Department of Planning and Environment to evaluate different options and select the one that has the best overall result for the community.

Response

The Department of Planning and Environment is required under the *Environmental Planning and Assessment Act 1979* to assess an application for State significant infrastructure based on the scope of the project detailed in the application and the accompanying environmental impact statement. The Department of Planning and Environment is required to consider whether an adequate assessment of alternatives has been conducted, but is not required to conduct its own detailed options evaluation and alternatives selection process.

The NSW Government has undertaken a robust and comprehensive alternatives and options assessment. The outcomes of this assessment are documented in the 2004 report and the 2007 review, and are summarised in Section 4 of the environmental impact statement.

Appeals process

Issue description

Submissions relating to planning and statutory requirements raised issues regarding the appeals process for the project.

The NorthConnex project has been designated as critical infrastructure under NSW planning legislation. Consequently, the community have no recourse to legal appeals after the planning approval process.

Response

The declaration of the NorthConnex as critical State significant infrastructure provides important protections from third-party challenges in respect of the validity of any approval, and certain aspects of the *Protection of the Environment Operations Act.* Section 115ZK of the *Environmental Planning and Assessment Act 1979* sets out the extent of these protections.

8.4.2 Adequacy and independence of the environmental impact statement

One hundred and thirty five submissions raised issues regarding the adequacy and independence of the environmental impact statement.

Director-General's environmental assessment requirements

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement raised issues regarding the Director-General's environmental assessment requirements.

In summary, the submissions raised the following issues:

- The Director-General's environmental assessment requirements have not been met.
- There is an incomplete description of activities in the project description chapter.
- A consideration of feasible alternatives is required.
- The Equilibria proposal has not been analysed.
- Consideration of wider transport interactions is required. Belief that the Hills M2 Motorway is not the best route to the Westlink M7 Motorway and Pennant Hills Road will not be improved.
- Assessment of operational traffic does not fix the issues on Pennant Hills Road.
- Assessment of operational traffic does not quantify the proportion of traffic considered dangerous goods which would continue to use Pennant Hills Road.

Response

The environmental impact statement has been prepared in accordance with the Director-General's environmental assessment requirements. An assessment of strategic alternatives is included in Chapter 4 of the environmental impact statement, and an assessment of operational traffic in Section 7.1 of the environmental impact statement.

A more detailed analysis of the Equilibria proposal is provided in **Section 8.2.4** of this report.

Before the NorthConnex project was proposed, an alternatives and options assessment including rail upgrades and consideration of various potential road alignments was carried out by SKM in 2004 (the 2004 report). Specifically, the 2004 report considered a number of strategic alternatives, followed by the identification of broad corridor types and a preferred corridor alignment.

Details of the alternatives and options development process are provided in Chapter 4 of the environmental impact statement with a summary below.

<u>Alternatives</u>

Strategic alternatives assessed as part of the project have included:

- Base case or 'do nothing/ do minimum'.
- Road link between the M1 Pacific Motorway and the Sydney Orbital Network.
- Rail and public transportation upgrades.

A road link between the M1 Pacific Motorway and Sydney Orbital Network was identified in the 2004 report as the preferred option that would best meet the project objectives as it would:

- Provide a high standard access controlled motorway that would integrate with the regional transport network.
- Improve the travel conditions, road safety and efficiency of Pennant Hills Road for motorists, road based public transport and cyclists.
- Support local and regional economic development.
- Provide opportunities for improved public transport in the area around Pennant Hills Road.
- Provide a motorway that is safe and reliable for road users.

Corridor options

Three broad corridor types were identified in the 2004 report that provided feasible connections between the M1 Pacific Motorway and the Sydney Orbital Network. These broad corridor types were:

- Type A corridors were more easterly alignment options which generally formed an extension of the M1 Pacific Motorway to connect to the Hills M2 Motorway.
- Type B corridors connected the Sydney Orbital between Pennant Hills Road and Dean Park to the M1 Pacific Motorway between Wahroonga and the Hawkesbury River.
- Type C corridors included more westerly options which connected the Sydney Orbital between Windsor Road and Dean Park with the M1 Pacific Motorway north of the Hawkesbury River.

Analysis conducted as part of the 2004 report determined that broad corridor type A best satisfied the planning and project objectives.

Options review

A review of the options analysis presented in the 2004 report was carried out in 2007 by the Honourable Mahla Pearlman AO (former Chief Judge of the NSW Land and Environment Court) at the request of the Australian Government. The 2007 review concluded that the purple corridor alignment option should be the preferred route and should progress to the next stage of design and development.

Tender process

A competitive design and construct tender process was carried out in order to identify an innovative, cost effective and environmentally-responsive design within the purple corridor option as identified and endorsed by the 2004 report and the 2007 Pearlman Review respectively.

The preferred tenderer was chosen after a thorough evaluation of the three tender submissions. The tender evaluation process provided a balanced consideration of engineering design requirements, project cost (including upfront capital expenditure and ongoing operational expenditure), and environmental and social impacts.

Operational traffic

Section 7.1 and Appendix E of the environmental impact statement provides an assessment of operational traffic. This assessment included traffic network performance on Pennant Hills Road with and without the project.

Vehicles carrying dangerous goods would not be permitted to use the project tunnels. These vehicles would continue to use Pennant Hills Road, which is consistent with the existing situation. There is no requirement within the Director-General's environmental assessment requirements to quantify the proportion of dangerous goods vehicles on Pennant Hills Road.

In 2011, the Audit Office of New South Wales conducted a performance audit of the Office of Environment and Heritage and WorkCover NSW concerning the discharge of the regulatory responsibilities of those agencies in relation to the transport of dangerous goods (The Audit Office of New South Wales, May 2011). The audit report states that around 10 to 15 per cent of domestic freight constitutes dangerous goods. If all heavy vehicles travelling along Pennant Hills Road are conservatively assumed to be associated with domestic freight transport, then up to around 10 to 15 per cent of those heavy vehicles could be expected to be carrying dangerous goods.

Adequacy of the environmental impact statement

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement provided support for the environmental impact statement as being comprehensive and detailed.

Response

Support for the environmental impact statement is noted.

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement raised issues regarding omissions and inconsistencies in the environmental impact statement.

In summary, the submissions raised the following issues:

- The additional fans, shaft and tunnel required at the southern ventilation facility are not provided. The details are not available for public scrutiny.
- Roads and Maritime owns four blocks of land within the Pennant Hills Golf Course which was not included in the environmental impact statement.
- For the declaration on the certification page of the environmental impact statement to be satisfied, this missing information must be provided.

Response

The location of the ventilation offtake connecting the southbound main alignment tunnel to the southern ventilation outlet is detailed in **Section 4.2** and **Figure 4-1** of this report.

The assessment carried out as part of the environmental impact statement have been based on the ventilation design of the preferred tenderer. The ventilation system includes a connection between the southbound main alignment tunnel and the southern ventilation facility.

The location of the ventilation connection between the project tunnels and the southern ventilation facility does not affect the assumptions, methodology or conclusions of the air quality impact assessment conducted for the NorthConnex project and included in the environmental impact statement.

Notwithstanding, it is recognised that this issue is of interest to some community members. As such, this information has been added to the project website (www.northconnex.com.au) and was included within the presentation to the community and stakeholders at the Air Quality Forum on 29 July 2014.

The environmental impact statement is not required to disclose all land currently owned by Road and Maritime Services in the vicinity of the project. Further, two of the lots adjacent to the Golf Course owned by Roads and Maritime form the eastbound on-ramp from Pennant Hills Road to the Hills M2 Motorway. The remaining two lots owned by Roads and Maritime form a relatively narrow strip between road infrastructure and the Pennant Hills Golf Course. This area does not provide sufficient space for the operational infrastructure associated with the ventilation facility.

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement raised issues regarding the lack of specific assessments within the environmental impact statement.

There are a number of schools in the area which do not appear to have been assessed in any detail with regards to noise and other impacts, including:

- West Pennant Hills Public School.
- Mount Saint Benedict College.
- Pennant Hills Public School.

Response

Schools are included in the assessments contained within the environmental impact statement where relevant. With the exception of Mount Saint Benedict College, the schools identified are not located in proximity to any construction activity and would not experience any direct impacts.

Mount Saint Benedict College is located relatively close to the Wilson Road compound (C6) (around 250 to 300 metres away, on the opposite side of Pennant Hills Road). Potential for noise impacts to this school have been considered as part of the construction noise assessment in Section 7.2.4 of the environmental impact statement.

School communities may experience some indirect impacts from the project. For example, traffic impact during the construction phase. These types of impacts are addressed in the relevant sections of the environmental impact statement.

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement raised issues regarding the lack of detail and perceived flaws in the environmental impact statement.

In summary, the submissions raised the following issues:

- The environmental impact statement contains so many flaws that the entire document should be independently reviewed by accredited experts outside of NSW.
- NorthConnex has not done the proper due diligence for such a large project.
- There is not enough detail in the proposed plans.
- Properties backing onto the works have not been individually identified in the environmental impact statement.
- The environmental impact statement does not contain all necessary information for the community to make informed and comprehensive submissions.
- The growing volume of evidence available regarding the health impacts from vehicle emissions shows that the assurances in the environmental impact statement of 'world best practice' are nonsense.
- Statistics stating that seven per cent of particulate matter comes from vehicles and 50 per cent comes from wood fire heaters is misleading.
- The environmental impacts statement does not assess the impacts from the change in toll levels on other Sydney motorways.
- The environmental impact statement appears to comply with various rules and regulations but provides scant comfort that the project will deliver outcomes beneficial and safe for the community.

Response

In contrast to other major infrastructure projects, the NorthConnex project has brought forward the more detailed design work which would ordinarily not occur until after environmental planning approvals had been granted. This design development, achieved through a competitive design and construct tender process before preparation of the environmental impact statement, has allowed a more detailed, definitive assessment of potential environmental impacts than would typically be provided for other major infrastructure projects.

The environmental impact assessment for the project presents a comprehensive assessment of the potential impacts of the project during construction and operation, consistent with the requirements of the *Environmental Planning and Assessment Act 1979* and the environmental assessment requirements issued by the Director-General of the Department of Planning and Environment.

Statistics regarding the percentage of existing particulate matter pollution in Sydney presented in the environmental impact statement and the overview document are accurate representations and have been sourced from the Air emissions inventory for the Greater Metropolitan Region in NSW 2008 calendar year (EPA, 2012). It is noted that $PM_{2.5}$ from motor vehicle emissions make up around 14 per cent and emissions from wood fire heater comprise around 50 per cent.

Changes in toll levels on other Sydney motorways are subject to commercial arrangements between the NSW Government and the motorway operator. The assessment potential implications of these changes are outside the scope of the NorthConnex environmental impact statement.

Issue description

Submissions raised concerns that motorway maintenance activities have been excluded from the environmental impact statement. Request that the impact and associated mitigation for maintenance activities needs to be addressed in the submissions report for the project.

Response

As identified in Section 1.1 of the environmental impact statement, the project does not involve the ongoing major motorway maintenance activities during operation. These activities would be subject to separate assessment and approval as may be required from time to time in the future. This is typical practice for infrastructure projects of this nature and scale.

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement raised the following issues:

- The environmental impact statement conceals or misrepresents significant issues of potential concern, in some cases by the very size and complexity of the document and lack of a logical layout.
- The information provided in the environmental impact statement shows potentially contradictory assumptions and conclusions. In many cases the figures do not add up and when they do they provide a confronting picture.
- As the environmental impact statement is legally required to form part of the public exhibition documentation, it would seem appropriate to ensure that it was organised and written in a way that was user friendly for the general public.

Response

The environmental impact statement provides an accurate assessment of the potential impacts associated with the NorthConnex project. All attempts have been made to provide a logical document layout by splitting the document into each relevant area of impacts and a consistent flow of describing the project from south to north throughout the document.

It is acknowledged that an environmental impact statement for a project of this nature and scale provides a significant volume of information which may be of interest to the community.

In order to assist the community understand the information of interest to them, a comprehensive community and stakeholder engagement program was carried out to support the exhibition of the environmental impact statement. This included the preparation of a project overview document, a variety of project fact sheets, community drop in sessions, a project specific air quality forum and a dedicated community information centre located in Pennant Hills. Project team members were also available to answer questions on the project free call telephone line or via email. Further details of this program are provided in **Chapter 5** of this report.

Issue description

Submissions raised concerns over geotechnical investigations currently being carried out. Suggestion that the environmental impact statement should not have been released until all the data was available for public assessment.

Response

Geotechnical investigations carried out during the development of the environmental impact statement provided sufficient detail to produce a concept design and assessment the potential impacts.

Ongoing geotechnical investigations are being carried out to gain a more detailed understanding of the geology in order to inform the detailed design of the project.

Issue description

Submissions relating to the adequacy and independence of the environmental impacts statement raised the following concerns:

- Historical information from 2004 has no bearing on the current proposal due to timeliness and stakeholder, economic and environmental change.
- Adequate consideration should be given to contemporary developments such as the North West Rail Link, the Hunter Expressway and continuing commuter traffic growth from the Central Coast and lower Hunter.

Response

The 2004 report provides the alternatives and options assessment for the project and is an important consideration as part of the environmental impact statement.

This report was reviewed in 2007, which found that the conclusions remain sound and valid.

The commencement of project such as the North West Rail Link and the Epping to Thornleigh Third Track are considered in Section 4.1.1 of the environmental impact statement. These projects alone would not satisfy future transport demand as they cater for different markets and objectives than the project.

The growth in commuter traffic from the Central Coast and the lower Hunter regions reinforces the need for the NorthConnex project.

Issue description

Submissions raised concerns that the options assessment reports have been selectively quoted to suit the purposes of the proponents.

Response

The options assessment report (the 2004 report and the 2007 Pearlman Review) have been summarised within Chapter 4 of the environmental impact statement. The environmental impact statement has accurately portrayed these reports which conclude that the preferred option is the purple option, on which the NorthConnex project is based.

Issue description

Submissions raised concerns that NorthConnex can still make changes to the environmental impact statement.

Response

Consistent with the requirements of the *Environmental Planning and Assessment Act 1979*, modification can be made to State significant infrastructure projects. Where this modifications are not consistent with the project as described in the environmental impact statement, this may require additional assessment to be undertaken and approval to be gained from the Minister for Planning.

This process may, at the discretion of the Minister for Planning, involve additional community consultation.

Independence of the environmental impact statement

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement raised issues regarding the independence of the assessment.

In summary, the submissions raised the following issues:

- The environmental impact statement is expected to be an independent document developed to identify the issues and recommend options to mitigate or eliminate them.
- The environmental impact statement appears to purely to support the project as proposed.
- The document uses intentionally misleading statistics to obscure the true impact of the project.
- The use of Epping to Thornleigh Third Track project as an argument to reduce congestion is misleading.
- The results are held out entirely in what the proponents 'would do' and a hypothesis that vehicle emissions will reduce over time.
- The environmental impact statement should be resubmitted by independent consultants with a statement of the pros and cons.
- An independent legal opinion should be sought as to the possibility of negligence in the event the project is approved and then is found to cause health problems.
- An independent body need to be involved and responsible for overseeing the process.
- The disclaimer on the document indicates that no responsibility is taken by the authors for any of the content.

Response

The environmental impact statement has been:

- Prepared in accordance with relevant guidelines developed by regulatory agencies and the Director-General's environmental assessment requirements.
- Certified by the authors as neither false nor misleading.
- Reviewed by regulatory agencies including the Department of Planning and Environment, the Environment Protection Authority, NSW Health, NSW Office of Water, Office of Environment and Heritage, and the Department of Primary Industries.

The disclaimer is required in order to protect the authors and in no way detracts from the certification made by the authors.

The environmental impact statement provides a thorough assessment of the project including identifying the potential environmental impacts; and identifying feasible and reasonable mitigation measures to avoid or minimise these impacts.

The air quality assessment conservatively assumes that there will be no improvements in fuel standards or vehicle efficiencies after 2020. It is likely that there will be some improvements in fuel standards and vehicle efficiencies after 2020, which means that the air quality impact assessment for 2029 is likely to be conservative.

The environmental impact statement does not identify Epping to Thornleigh Third Track as reducing congestion on Pennant Hills Road. Conversely, the environmental impact statement identifies that the capacity provided by Epping to Thornleigh Third Track would be taken up by freight growth by 2031 and that the Epping to Thornleigh Third Track would be unlikely to change freight movements on Pennant Hills Road.

The Department of Planning and Environment will undertake an independent assessment of the NorthConnex project, consistent with the requirements of the *Environmental Planning and Assessment Act 1979*. As part of this the Department of Planning and Environment

considers the content of the environmental impact statement, the submissions received and the proponent's response to those submissions. As part of this process, the Department of Planning and Environment receives specialist input and advice from other agencies, such as the Environment Protection Authority, and may engage specialists to undertake independent reviews and to provide technical advice as deemed appropriate by the Department.

Issue description

Submissions relating to the adequacy and independence of the environmental impacts statement requested the following information:

- Any potential, actual or perceived conflicts of interest between the Department of Planning and Environment and those entities involved in the preparation of the environmental impact statement.
- Any known conflicts of interest.
- Any publicly employed staff who have left that employment to enter into employment with one of the entities involved in the environmental impact statement preparation.
- Any publicly employed staff member who holds shares, or any other beneficial interest, in any of the entities involved in the preparation of the environmental impact statement.
- Any donation received by any NSW Parliamentarian from any of the parties involved in the environmental impact statement preparation.
- Any NSW Parliamentarian involved in the environmental impact statement process who has received donations from Transurban, Lend Lease, or any other associated subcontractors, suppliers or consultants to the project.
- Any NSW Department of Planning and Environment staff member who has sold property located within the affected project corridor in the last 24 months.
- Any political donations from big business on the industrial side of Pennant Hills Road in Thornleigh.

Response

No potential, actual or perceived conflicts of interest have been identified involving the authors of the environmental impact statement for the NorthConnex project, or the authors of this report.

Political donations and Parliamentary pecuniary interests are required to be disclosed by law, and there are public registers available which record this information.

It is beyond the scope of this report to comment on the activities of NSW Government agencies.

Requests for additional assessments

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement requested that a re-assessment of the NorthConnex project be carried out to consider the health of affected residents at both ends of the project.

Response

The environmental impact statement provides a human health risk assessment consistent with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012). This includes a human health risk assessment of the potentially

affected residents near both the southern and northern ventilation facilities and the potential improvements along Pennant Hills Road.

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement raised issues regarding the need for additional surface water assessments.

In summary, the submissions raised the following issues:

- The environmental impact statement does not provide a separate assessment or technical report for surface water impacts. The assumption is made that Darling Mills Creek is degraded and so no assessment is warranted. This is a subjective statement that conceals the fact that surface water impacts will likely degrade the health of the stream.

  The impact might be small but omitting it from consideration is not credible. Reliance is made on the 'comprehensive' water sampling program carried out by the Hills Shire Council. This program only samples Darling Mills Creek well downstream to evaluate stormwater flows from the Loyalty Road industrial area. The validity of relying on this sampling quite distanced from the project is not explained.
- Request that the environmental impact statement provides an addendum that properly and objectively evaluates surface water impacts.

Response

A surface water impact assessment is provided in Section 7.9 of the environmental impact statement and has been carried out consistent with the requirements of the Director-General's environmental assessment requirements. The environmental impact statement does not use the degraded nature of the watercourses or the anticipated small impact of the project to justify not undertaking an assessment of potential surface water impacts.

The environmental impact statement identifies that, in general, Hornsby Shire Council and The Hills Shire Council both undertake comprehensive water quality monitoring programs and the relevant results from these programs have been used as part of the assessment. The two water sampling locations along Darling Mills Creek tested as part of The Hills Shire Council water monitoring program provide an indication of the existing water quality.

Notwithstanding the fact that existing water quality is likely to be poor based on the urbanised nature of the catchment, the environmental impact statement provides an adequate assessment of the potential impacts from the project and identifies appropriate mitigation measures to reduce these impacts.

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement requested that the potential health risks be assessed by an independent body with no financial interests in the project as this is a conflict of interest.

Response

The human health risk assessment presented in Section 7.4 and Appendix H of the environmental impact statement has been carried out in accordance with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012).

The human health risk assessment has been subject to independent assessment by the Department of Planning and Environment, who has also requested comment on the environmental impact statement from other specialist Government agencies, such as the Environment Protection Authority.

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement raised issues regarding the use of assumptions within the assessment.

In summary, the submissions raised the following issues:

- The environmental impact statement increases uncertainty in the assessment by making assumptions.
- It is important that a sensitivity analysis is carried out to understand the impact of possibly incorrect assumptions and poor models.

Response

The environmental impact statement utilises assumptions where necessary. Generally, these assumptions are conservative in nature and provide a worst-case assessment. For example, the human health risk assessment assumes that receivers are constantly impacted for 24 hours a day, seven days a week and 365 days a year, over their lifetime. In reality, people would not be continuously in one place. They would move from place to place such as from their home or to their place of work.

Issue description

Submissions relating to the adequacy and independence of the environmental impact statement requested a detailed assessment on the direct and indirect impacts of the northern ventilation facility on historic homes and conservation areas before the project is approved.

Response

Section 7.10.3 and Appendix L of the environmental impact statement provide an assessment of the potential impacts to non-Aboriginal heritage items. The project tunnels and the location of surface infrastructure have been designed to avoid and minimise direct and potentially indirect impacts to local heritage as far as feasible and reasonable. Where this has not been possible, appropriate mitigation and management measures have been recommended as part of the assessment and will be incorporated subject to the requirements of any relevant conditions of approval.

Section 7.10.3 of the environmental impact statement provides an assessment of the potential impacts to the Wahroonga North heritage conservation area, which includes consideration of visual impacts.

Impacts to heritage values within the conservation area would be localised to specific areas on the edge of the conservation area and already associated with major transport network infrastructure. The northern ventilation facility would not impact on the existing streetscape or development pattern of the heritage conservation area. The overall heritage value of the heritage conservation area would not be significantly impacted by the proposed works.

Overall, it is concluded that the heritage value of the listed items would not be significantly affected by the project and associated works.

8.4.3 Statutory requirements and other approvals

Sixty nine submissions raised issues regarding the statutory requirements and other approvals.

Issue description

Submissions relating to statutory requirements and other approvals raised concerns that:

- The Environment Protection Authority will not be regulating the tunnel as it will be self-regulated.
- Operating licence may not require the motorway operator to comply with relevant parameters throughout the life of the operation.
- The operator may not have to maintain controls over the life of the operation.

Response

The project would be required to operate in accordance with the approval issued by the Minister for Planning, including all mitigation, management and monitoring measures included in that approval.

Additionally, the Environment Protection Authority maintains a role with respect to compliance with legislation such as the *Protection of the Environment Operations Act 1997* to the extent that it applies to the project.

Issue description

Submissions relating to statutory requirements and other approvals raise issues as to why the Australian Government is satisfied with standards in relation to filtration that do not appear to be comparable with those used by technologically advanced countries?

Response

The air quality standards in Australia and New South Wales are comparable and in some cases more stringent to those set by the World Health Organisation, the United States Environmental Protection Agency and various countries throughout Europe.

Further information on the availability and efficacy of in-tunnel air treatment technologies is provided in **Section 3.1** of this report. **Section 3.2** considers the application of filtration to the NorthConnex project, and concludes that it is not feasible and reasonable.

Internationally, there are a very small number of road tunnels with filtration systems chiefly in Japan and Norway and they are provided mainly to assist in maintaining in-tunnel visibility. It is also noted that the majority of road tunnels in both these countries do not have filtration systems.

In Japan filtration systems are required to address the combination of a high fraction of diesel powered cars and a very high percentage of heavy goods vehicles. In Norway filtration systems are required for the high dust concentration related to the use of spiked tyres used in icy conditions and large amounts of sand and salt dispersed in wintertime. Sydney tunnels do not have these issues and as such conventional ventilation systems without filtration have been proven to work very safely and effectively.

Issue description

Submissions relating to statutory requirements and other approvals request that more restrictions be placed on large developers concentrating toxic exhaust fumes and pumping them into densely populated areas.

Response

New South Wales and Australia currently have stringent air quality standards. In relation to the NorthConnex project, the air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Issue description

Submissions relating to statutory requirements and other approvals requested that there should be significant fines and penalties if / when agreed standards are not met for noise and air quality during construction.

Response

Noise and air quality during construction would be regulated by the Environment Protection Authority through an environment protection licence. The Environment Protection Authority has appropriate powers to issue fines and take additional regulatory actions in the event of breaches of the conditions of the licence.

Issue description

Submissions relating to statutory requirements and other approvals raised concerns that the work completed by the Advisory Committee on Tunnel Air Quality is not independent and does not include community representatives. An organisation such as the World Health Organisation should be consulted.

Response

The work of the Advisory Committee on Tunnel Air Quality is outside the scope of the NorthConnex project. The Advisory Committee have considered reports produced by international bodies such as the World Health Organisation.

Issue description

Submissions relating to statutory requirements and other approvals raised concerns that when the motorway tunnel is complete, it will result in a very high and unacceptable level of risk that will exceed established regulatory thresholds.

Response

The environmental impact statement has considered these potential impacts and demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

Issue description

The Environment Protection Authority must give consideration to all issues raised in submissions before granting an environment protection licence for the construction of the NorthConnex project.

Response

It is the role of the Department of Planning and Environment to consider the issues raised in submissions, and the proponents response to these issues in deciding whether or not to approve the project.

Under section 115ZH of the *Environmental Planning and Assessment Act 1979*, an environment protection licence cannot be refused and must be substantially consistent with the State significant infrastructure approval. The Environment Protection Authority may consider general community feedback in setting conditions of the environment protection licence.

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8.5 Consultation

8.5.1 Level and quality of consultation

One hundred and six submissions raised issues regarding the level and quality of consultation.

Issue description

Submissions relating to consultation raised issues regarding the quality of consultation to date.

In summary, the submissions raised the following issues:

- Many residents, schools and businesses have received little information to date about the project. Project flyers were not received by some community members.
- October and November 2013 sessions were poorly attended and the distribution of information was inadequate.
- Meetings with residents have simply been to inform the community what is going to happen.
- The initial 'public consultation' process was selective and intended to avoid residents nearest to the northern outlet most likely to be affected.
- Consultation for major infrastructure is a sham.
- Belief that there was no opportunity to be consulted or consider the impacts to the community.
- There has not been adequate consultation with motorists from the Hunter and Central Coast regions, included as part of earlier route selection studies. These motorists are significant stakeholders. The participants at the value management workshops as part of the 2004 report did not include road users at any level.
- Belief that information is being withheld.
- Until early September, no personal communication had been received from the NorthConnex project for residents near the northern ventilation facility.

Response

Consultation has been a key part of the project, from the options development process in the 2004 report through to the recent tender design and environmental impact assessment process. The consultation which occurred throughout the 2004 report and 2007 Pearlman Review is not uncorroborated. They are well documented in both of these reports.

Consultation carried out to date, and how feedback has been used as part of the options development and design refinement of the project, are provided in Section 6.3.3 of the environmental impact statement. A summary of this consultation is provided below.

<u>Consultation during the options and alternative development</u>

As part of the 2004 report, three Community Focus Groups were established and met during 2002 to provide comments and feedback on alternatives and options. In addition:

- Public information days were held at five locations during May 2002 to provide information to interested stakeholders and community members, and to solicit comment on alternatives and options.

- Route options displays were held at four locations during August 2003 to provide information on identified route options, and to receive comments on those options from the community and stakeholders. These locations included Hornsby, Carlingford, Dural and Gosford.

As part of this stage of the project, consultation was also separately carried out with all potentially affected local councils. The National Road Transport Association and the NRMA also made submissions which were considered as part of this process.

Feedback received from the community and stakeholders was used as part of the determination of the preferred corridor alignment.

Further opportunity was provided for interested parties to provide input into the assessment of corridor alignment options through the 2007 Pearlman Review. As part of the review, the public was invited to make submissions on the 2004 report.

Feedback received during the 2004 report and the 2007 Pearlman Review has been considered as part of the recent design development and in the preparation of the consultation strategy for the NorthConnex project.

Consultation during the tender stage

In October and November 2013, four community engagement events were held to provide up to date information about the status of the project and the design and construct tender process. At this stage the preferred tender design and the location of surface infrastructure was not known, however this consultation did include letter box drops to the community within the purple corridor (including the area around the northern ventilation outlet). In total community updates were circulated to around 14,000 households in the vicinity of the project.

Submissions and comments on the community's key issues and concerns, were summarised and provided to the three design and construct tenderers to be taken into account as part of their respective designs. In addition to these events, several briefing sessions were also held with councils, government agencies and utility providers to provide input into the tender designs.

Exhibition of the preferred tender design

Following announcement of the preferred project tender design in March 2014, a further series of four community information sessions were held to provide more detailed information about the project. At these sessions, project design information was provided and community members commented on key issues of interest and concern. Through feedback obtained during those sessions, and in subsequent feedback, key community issues have been identified. These issues have been addressed in the environmental impact statement and as part of the ongoing design development for the NorthConnex project.

During this period, stakeholders were also engaged through interest group meetings. Interest groups included an environmental and community interest group, a business and industry interest group and a traffic and transport interest group.

Changes have been made to the project design and construction methodologies in response to feedback received during this consultation period. These changes include:

- Reducing the height of the Wilson Road and Trelawney Street tunnel support facilities in order to minimise the visual impacts.

- A commitment made to investigating the feasibility of the early implementation of operational noise barriers and landscaping around operational ancillary facilities to provide mitigation during the construction period.
- A commitment to restrict the use of the Ventura Road access track.

Additional changes to the design or construction methods have been made based on feedback received during the exhibition of the environmental impact statement. These changes are documented in **Chapter 9** of this report.

The project team is continuing to consider community feedback as part of ongoing design refinements.

Consultation during the development of the environmental impact statement

Community and stakeholder engagement has been carried out in accordance with the Director-General's Requirements, the Community Engagement Policy Statement 2012 (Roads and Maritime, 2012a), the Stakeholder Engagement Framework (Transurban, 2013) and supporting policies and standards. This has included extensive letterbox drops, stakeholder notifications, media advertising and a series of advertised community information sessions along the project corridor in late 2013, March/ April 2014 and again during July / August 2014.

Communication and consultation activities have been, and will continue to be, tailored for each phase of the project. Consultation to date has included:

- Community events to introduce the project.
- Meetings with agencies, councils, Members of Parliament, emergency services representatives and services and utility providers.
- Presentations and meetings with key stakeholders including local schools, places of worship and business groups.
- Phone, email and written correspondence.
- Set up and regular updates of the project website.
- Door knocks, phone calls, one-on-one interviews and letters of acquisition notification addressed to owners of properties potentially required for full or partial surface acquisition.
- Interest group briefings.
- Community events displaying the preferred tender design.
- Public access to an interactive website displaying details of the preferred tender design.
- Establishment of a dedicated project Community Information Centre at Pennant Hills.
- Briefings to local members of Parliament.
- Distribution of community updates and 'letters to householder' regarding technical field investigations, project process and milestones as well as community involvement opportunities.

The consultation to date has been carried out in line with the project consultation objectives, which are detailed in Section 6.2.1 of the environmental impact statement.

Further details regarding the consultation carried out up to the exhibition of the environmental impact statement are provided in Section 6.3.3 of the environmental impact statement. Details of consultation during exhibition of the environmental impact statement

are provided in **Chapter 5** of this report. This included a dedicated air quality forum relating to air quality and human health risks, held on 29 July 2014. This air quality forum was held in response to the community's requests during the March / April 2014 consultation and the significant interest in this topic amongst the local community and stakeholders.

Issue description

Submissions relating to consultation raised issues regarding the lack of acknowledgement of the high level of anxiety of the community around the northern ventilation outlet.

Response

Anxiety within the community has been recognised and the NorthConnex project team has considered and implemented all reasonable measures to appropriately inform and consult with the affected community. As part of these measures, the project has set up a process for the provision of a counselling service on a case by case basis and free of charge. This is an independent service through which an individual would contact the service directly and anonymously. The caller's identity is not provided to the NorthConnex project team or any other third party.

Issue description

Submissions relating to consultation raised issues regarding the quality of consultation to date. Belief the NorthConnex project team has shown indifference to the community. From the end of 2013, consultation has moved from poor to just informing the community of the project.

Response

The NorthConnex project team has carried out a comprehensive community consultation program throughout the development and exhibition of the environmental impact statement. This has included organisation and attendance at community information sessions, one-on-one meetings with residents and property visits, preparation and distribution of project factsheets, establishment of a community accessible information centre during the environmental impact statement exhibition period, a freecall telephone number and a project email address. At all times the NorthConnex project team endeavoured to provide meaningful, transparent and comprehensive information on the project to assist community members and other stakeholders to formulate their respective submissions on the project.

Changes were made to the project design and construction methodologies as documented in the environmental impact statement in response to feedback received from community consultation. These changes include:

- Reducing the height of the Wilson Road and Trelawney Street tunnel support facilities in order to minimise the visual impacts.
- A commitment made to investigating the feasibility of the early implementation of operational noise barriers and landscaping around operational ancillary facilities to provide mitigation during the construction period.
- A commitment to restrict the use of the Ventura Road access track.

Further changes have been made based on feedback received from the community during the public exhibition period. These changes are documented in **Chapter 9** of this report.

Issue description

Submissions relating to consultation raised issues regarding the quality of consultation to date.

In summary, the submissions raised the following issues:

- Replies to emails were not timely.
- Inaccurate information has been provided to the community including:
  - Measurements from the edge of the ventilation outlet to surrounding properties.
  - A statement was made that the northern ventilation outlet would not be put in a residential area. This should be publically retracted.
  - Artist's impressions provided to the community shows the outlet only nine metres high when in fact it will be 23 metre high. Some artist's impressions also show Wahroonga as an industrial area with grey buildings. Accurate artist's impressions should be provided.
  - Sources to other tunnel monitoring provided by the NorthConnex team only included in-tunnel data or ambient data which was over four years old.
  - The information provided regarding the results of the M5 East Motorway filtration trial are misleading. Belief that the project deliberately misled the community regarding the cost effectiveness of filtration. NorthConnex should admit this to the community, amend their brochures to provide information which is not misleading and distribute update flyers to the community.
  - The desire of NorthConnex to genuinely engage with the community appears absent, with the focus of their activities to "tick" the community consultation box and to manage any opposition to their key messages. The methods and materials they have used to engage with the community are far from best practice, have not been provided in a timely manner and are in many cases misleading or incorrect.
  - Claims that existing tunnel outlets are located in residential areas.
  - Misleading information about exhaust fumes.
  - The community were not adequately informed of NorthConnex's critical State infrastructure status, or the legal ramifications of this. All future critical State significant infrastructure projects should be identified to the effected community as such, and the ramifications explained.
  - It is difficult to accept the report from Environment Canada endorsing Sydney's air quality provided in the NorthConnex brochures.
- Over-reliance on community updates to inform the community. The delivery of the community updates has been beset with issues
- Provide assurances that information to date has been transparent.

Response

The NorthConnex project team endeavoured to provide factual, up-to-date, transparent and comprehensive information on the project to assist community members and other stakeholders to form their independent views about the project.

A range of mechanisms were used to consult with the community. This included community updates, community factsheets, a free call telephone number, a project email address, door knocks to affected communities, meeting with community members and groups on request and a number of community information sessions along the project corridor. The project also held a topic specific air quality forum due to the high interest in this topic and opened a

community information centre in Pennant Hills for interested members of the community to drop in to gain information about the project.

Enquiries made to the NorthConnex project during the public exhibition period were responded to as quickly and efficiently as possible. At times there were high volumes of enquiries and some community questions were particularly detailed, complex and technical in nature, requiring more time to respond.

Information provided regarding measurements from the ventilation outlet to surrounding properties was accurate based on the concept design of the project.

The project team acknowledges the majority of the area surrounding the western side of the northern ventilation outlet is residential. The other sides within the M1 Pacific Motorway reserve.

The environmental impact statement provided accurate artist's impressions to the community. The artist's impressions showed views from the surrounding residential area which is located higher than the adjacent M1 Pacific Motorway. The northern ventilation outlet would be 23 metres above the M1 Pacific Motorway level. As part of this report, the northern and southern ventilation outlets have been increased in height by five metres. Further details of this height increase and its potential impact are provided in **Section 7.2** of this report.

Links to other tunnel websites and air quality provided by the project team were to the latest available information for both in-tunnel and ambient air quality for the Lane Cove Tunnel.

The information provided to the community regarding filtration and the outcomes of the M5 East Motorway filtration trial were accurate.

Information provided to the community in relation to the location of other tunnel ventilation outlets was accurate. This information included the distance from these outlets to residential locations.

Issue description

Submissions relating to consultation noted that the project brochure does not adequately stipulate the benefits in the long term.

Response

Project factsheets have been developed to provide key project information to the community and information on how community members can obtain further information. The key benefits of the project are provided in a number of the fact sheets. Additionally, key project benefits are identified within Section 11.2 of the environmental impact statement.

Issue description

Submissions relating to consultation raised issues regarding the lack of details on the risk of sinkholes in the project marketing material.

Response

Sinkholes may occur in unconsolidated material or in geology where voids may form such as limestone. The NorthConnex project has been designed to maximise the length of tunnel within Hawkesbury Sandstone which is high strength with infrequent and widely spaced geological defects. Sinkholes would be very unlikely to occur within this geology.

Project factsheets prepared for the project provide an overview of the key features of the project and information on specific topics, including air quality, tunnelling and safety and incident management.

In addition, the project website provides links to key project documents where the community is able to source additional information such as noise and traffic impacts, and construction hazards.

The project website also provides contact information including a project email address and 1800 telephone number. Members of the community are able to contact project team members in order to obtain additional information.

Section 7.8.3 of the environmental impact statement provides an assessment of ground movement from the tunnelling work. Tunnelling work is expected to result in ground movement of up to 20 millimetres which may result in cosmetic damage only with cracking up to five millimetres.

Before the start of tunnelling works, existing condition surveys would be carried out on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. In the unlikely event of damage caused by the construction of the NorthConnex project, this would be rectified by the contractor at no cost to the property owner.

Section 8.2.1 of the environmental impact statement provides an assessment of workplace hazards including the potential for tunnel collapse during construction. In accordance with the requirements of the Work Cover Code of Practice for Tunnels, work methods for excavation and support installation would ensure that no persons would be required to work under unsupported ground without an adequate overhead protection structure. Primary support for the project tunnels would be installed as the excavation progresses, as recommended by an appropriately qualified geotechnical or tunnel engineer. A 'Permit to Tunnel' system would also be developed and are taken into consideration and ground support conditions modified if required before the excavation advances. This system requires the methodology and approach for any proposed tunnelling works to be reviewed and approved before the proposed work stage to proceed.

The structural integrity of the tunnel would be assured during construction through the implementation of an appropriate construction methodology for the tunnelling conditions and ongoing tunnel support by way of rockbolts and / or shotcrete lining. The majority of the main alignment tunnels would be constructed at significant depth within Hawkesbury Sandstone with minimal risk of surface effects. For on and off-ramps, and where the main alignment tunnels come to the surface, tunnel components would be progressively constructed and stabilised to ensure that surface deformations do not occur.

The preferred design and construct contractor for the NorthConnex project, the Lend Lease Bouygues Joint Venture, has extensive experience in tunnelling activities. The joint venture will draw on this extensive experience to ensure that the project is constructed in a safe manner, and that geological risks during tunnelling are minimised and managed.

Issue description

Submissions relating to consultation raised concerns that the information presented at NorthConnex information events was biased.

Response

The project team has carried out a number of community information events throughout the development of the environmental impact statement and during public exhibition. During

those events, the key focus has been on provision of factual information to assist the community and other stakeholders to form their independent views about the project.

These events have aimed to provide up-to-date factual information regarding the project and provided the opportunity for members of the public to identify areas of concern and ask questions to key project team members.

Issue description

Submissions relating to consultation raised issues regarding the lack of information on the project website about noise and traffic impacts on Loch Maree Avenue.

Response

Sections 7.1.4 and 7.2.4 of the environmental impact statement assess the construction traffic and noise impacts on receivers on Loch Maree Avenue respectively.

The project website provides an overview of the key features of the project. Links to key project documents are provided where the community are able to source a factsheet about the Trelawney Street compound for additional information such as noise and traffic impacts.

Additionally, the project website provides contact information including a project email address and 1800 telephone number. Members of the community are able to contact project team members in order to obtain additional information.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the Trelawney Street compound (C7). Changes made to access arrangements at the Trelawney Street compound are detailed and assessed in **Section 9.4** of this report.

Issue description

Submissions relating to consultation raised issues regarding the lack of information around the missing link between the main tunnel alignment and the southern ventilation facility. Concerns that there may be no intention to connect either tunnel to the ventilation facility and that NorthConnex has no intention of putting anything in writing.

Response

The location of the ventilation offtake connecting the southbound main alignment tunnel to the southern ventilation outlet is detailed in **Section 4.2** and **Figure 4-1** of this report.

The assessments carried out as part of the environmental impact statement have been based on the ventilation design of the preferred tenderer. The ventilation system includes a connection between the southbound main alignment tunnel and the southern ventilation facility.

The location of the ventilation connection between the project tunnels and the southern ventilation facility does not affect the assumptions, methodology or conclusions of the air quality impact assessment conducted for the NorthConnex project and included in the environmental impact statement.

Notwithstanding, it is recognised that this issue is of interest to some community members. As such, this information has been added to the project website (www.northconnex.com.au) and was included within the presentation to the community and stakeholders at the air quality forum on 29 July 2014.

Issue description

Submissions relating to consultation raised issues regarding being misled by NorthConnex by not mentioning that specific properties would be affected by the tunnel.

Response

The project team made contact with property owners whose properties would be directly affected by the NorthConnex project at the first available opportunity. Considerable resources were dedicated by the project to ensure property owners impacted were contacted before the announcement of the preferred tender design in March 2014.

Issue description

Submissions relating to consultation raised issues regarding the initial air quality and ventilation facts sheets. Belief that these were misleading and implied that the Chief Scientist and Independent Tunnel Air Quality Committee were going to be directly involved in assessing and setting air quality standards for the NorthConnex tunnel.

Submissions request that NorthConnex publically acknowledge that the original air quality and ventilation factsheets were misleading.

Response

The Committee has no formal role in the assessment of the project. However, the Director-General's environmental assessment requirements set by the Department of Planning and Environment for NorthConnex states under Air Quality that the project:

> *'take into account any applicable advice provided by the Independent Advisory Committee on Tunnel Air Quality.'*

The information on the Advisory Committee provided in the Air Quality factsheet was largely drawn from the terms of reference of the Committee. The tunnel ventilation system factsheet similarly provides a description of the role of the committee.

There was no intent to imply any type of regulatory role of the Advisory Committee for NorthConnex in its materials. The purpose was to reinforce the NSW Government's commitment to air quality in Sydney's tunnels and raise awareness of the work of the Committee for the broader Sydney region.

In accordance with the Director-General's environmental assessment requirements, the project team presented information to the Committee regarding its approach and methodology to air quality for input into the development of the environmental impact statement.

Issue description

Submissions relating to consultation raised issues regarding consultation not being specific to the locations of the proposed tunnel portals or outlets. Submissions request that due to inadequate consultation, the process should be undertaken again with accurate information being provided to the community.

Response

Consultation regarding the project as part of the October and November 2013 consultation included the area around the proposed ventilation outlet. The NorthConnex project team made information regarding the location of the northern portals and ventilation facility publically available as soon as practical following the decision regarding the preferred tender design. This occurred as part of the March 2014 consultation on the preferred tender design.

Issue description

The method of announcement to directly impacted residents in March 2014 was via a letter box drop which is inadequate.

Response

Directly impacted property owners (ie those whose property would be subject to full or partial acquisition were door knocked immediately before the announcement of the project.

A range of other consultation strategies were available to other potentially indirectly impacted residents including a number of community information sessions around the time of the announcement, a free call telephone line and a project email address for members of the community to obtain answers to their particular questions.

Issue description

Exact dates of the March / April information sessions and the number of attendees are not provided. The attendees of the business and industry groups are not provided, or exactly which members of parliament were briefed on the project.

Response

The dates of these sessions are provided in Table 6-5 of the environmental impact statement. The number of attendees and the exact make up of attendees at these sessions is not considered to be relevant.

Issue description

Information was not clearly provided that the project was subject to the unsolicited proposal process or that it would rely on the 2004 report and the 2007 Pearlman Review.

Response

Section 1.1 of the environmental impact statement clearly identifies that the project is based on the unsolicited proposal to the NSW Government. This is not directly relevant to the environmental impact statement.

The 2004 options report and the 2007 Pearlman Review provide important components of the history of the development of the project. This is clearly identified in the environmental impact statement and is consistent with the approach taken on other major infrastructure projects.

8.5.2 Consultation during exhibition

Four hundred and thirty submissions raised issues regarding the consultation during the exhibition period.

Issue description

Submissions relating to consultation acknowledged the project team for personally meeting with residents in order to gain further understanding of the local issues with the project.

Response

This acknowledgement is noted.

Issue description

Submissions relating to consultation raised issues regarding the length of the exhibition period. Submissions request the exhibition period is extended to 90 days.

Response

Clause 194 of the *Environmental Planning and Assessment Regulation 2000* prescribes the minimum exhibition period for State significant infrastructure as 30 days. However, the Secretary (formerly the Director-General) of the Department of Planning and Environment has the discretion to set the public exhibition period for any duration provided that it exceeds this minimum. The Secretary specified a 60-day exhibition period for the NorthConnex project.

During the exhibition period, the project team organised and held a number of community drop-in sessions. Key members of the NorthConnex project team, including technical and environmental specialists were available at these sessions to assist submissions considerations, answer questions and explain the details of the project and the anticipated impacts.

Issue description

Submissions relating to consultation raised issues regarding the air quality forum.

In summary, the submissions raised the following issues:

- The period of two weeks between the air quality forum presentation and the release of the environmental impact statement was not long enough. Belief that the forum was misleading, unprofessional and inadequate.
- The notice period for the air quality forum was insufficient.
- NorthConnex's independent expert had not read the environmental impact statement and had no relevant information to the actual project.
- The level of information provided was insufficient and answers to questions asked were unacceptable. Concerns that the allowance of 40 minutes for question time was insufficient.
- The 18 day delay between the video being played at the forum and uploaded onto the NorthConnex website. This is misleading and seems a deliberate attempt by NorthConnex to draw out the process of environmental impact statement submissions.
- Submissions request that NorthConnex provide a "question and answers forum" for the community in relation to air quality to enable further questions on the project.
- All future air quality forums planned by Roads and Maritime need to understand the failures of the NorthConnex air quality forum – and provide a genuine opportunity for the community engagement.

Response

The air quality forum was arranged following a request by some community members. The air quality presentation provided factual information from the air quality and human health risk assessments carried out as part of the environmental impact statement. The forum provided an opportunity for residents to ask questions to a panel of key project personnel and technical specialists. The forum provided an appropriate balance between presentation time and question time from the attendees.

The air quality forum was not intended to provide a detailed presentation of all air quality and human health material already provided in the environmental impact statement. Instead, it provided a high level summary of the outcomes of the air quality and human health risk assessments in the environmental impact statement, in a form that would be readily accessible to the community and stakeholders.

An international expert was included as one of the presenters at the forum to provide independent information on ventilation systems and air quality issues in tunnels around the world. The expert's role was not related to the detail of the NorthConnex project. Separate air quality and human health risk specialists from the project team made presentations and were available to answer questions specific to the NorthConnex project.

The additional community and stakeholder information mechanisms outlined in Section 6 of the environmental impact statement remain in place for community members and stakeholders to access information on the project, including a project email address, telephone number and website.

Issue description

Submissions regarding consultation raised concerns regarding the NorthConnex "drop-in" centre.

In summary, the submissions raised the following issues:

- The centre was not open seven days a week and was difficult to access.
- Many people did not visit the drop in centre, and when they did, were often not treated well.
- The staff at the drop in centre did not have answers to many questions.
- The centre was a pointless exercise and simply a tool for NorthConnex project advertising.

Response

The NorthConnex project drop in sessions and community information centre were one of a number of consultation tools used during the public exhibition period. Although the community information centre was not open seven days a week, it was open on a number of weekdays and on Saturday mornings for members of the local community who were unable to attend on weekdays. The information centre is located next to Pennant Hills Railway Station and in a location with car parking facilities nearby to provide convenient access.

In addition to the community information centre, the project provided a number of other avenues for member of the community to gain necessary information about the project. For example, the project team is available through the project free call information telephone line or via the email address.

Key members of the NorthConnex project team, including technical and environmental specialists were available at the drop-in sessions to assist submissions considerations, answer questions and explain the details of the project and the anticipated impacts.

When answers to community concerns were not able to be immediately provided at the drop-in sessions or the project community information centre, these questions were taken on notice and the project team followed up with a response once the details were able to be investigated.

Issue description

Submissions regarding consultation supported the information provided at the air quality forum on the 29 July.

Response

Support for the air quality forum and the information provided is noted.

Issue description

Submissions regarding consultation requested that the report and preferred infrastructure report be exhibited to allow for community response to the revised information.

Response

This report has been made publically available on the NorthConnex website and the Department of Planning and Environment's website.

The project team will continue to consult with the community and stakeholders following the preparation of this report and, should the project be approved, during the detailed design and construction phase. The nature of this consultation is outlined in Section 6.6.1 and Appendix D of the environmental impact statement.

Issue description

Submissions regarding consultation requested that the environmental impact statement be available for download as a complete document. Concerns that the document is unnecessarily large and although the reasons for splitting the document in parts is appreciated, a combined version would seem easy to provide and would make reading considerably easier.

Response

The environmental impact statement is split into is various components so that members of the community and stakeholders can readily download sections of interest to them without having to download a large electronic file.

The environmental impact statement is also available as larger file sizes, split into its various volumes, rather than sections, on the Department of Planning and Environment's website for members of the community and stakeholders who wish to download larger components of the document. Electronic copies of the environmental impact statement (on CD) were also made available on request.

Issue description

Submissions regarding consultation raised concerns regarding a number of enquiries that were made to the project team regarding the adequacy of the surface water assessment that did not receive a meaningful or complete response.

Response

Enquiries made to the NorthConnex project during the public exhibition period were responded to as quickly and efficiently as possible. At times there were high volumes of enquiries and some community questions were particularly detailed and technical in nature. At all times the NorthConnex project team endeavoured to provide meaningful, transparent and comprehensive information on the project to assist community members and other stakeholders to formulate their respective submissions on the project.

Issue description

Submissions regarding consultation raised concerns regarding the consultation during the exhibition period.

In summary, the submissions raised the following issues:

- NorthConnex have sent letters to property owners regarding "potential eligibility for individual property noise treatment". A number of property owners were sent this in error.
- NorthConnex have a responsibility to ensure letters containing important and distressing information about specific properties, are sent to all affected properties, and not to any unaffected properties.
- Letters sent to individual properties should be personally addressed, rather than the ubiquitous "property owner". In the case of leased properties, separate letters should be sent to the property owner's current residential address as well.
- In instances where errors occur, these errors should be corrected as soon as possible. "Internal review processes" should not take five weeks before distressed community members are informed of errors.
- Letters should provide information as specific as possible. NorthConnex staff should be available to meet with affected residents and be conscious of any pre-existing work, study and social commitments, and be prepared to meet with residents in the evening, at weekends, etc where necessary. A copy of notes taken by NorthConnex team members at any meeting with residents, should be automatically provided to the resident.

Response

As part of the noise and vibration impact assessment for the environmental impact statement, sensitive receivers and properties potentially eligible for consideration of at-property acoustic treatment were identified.

A total of 129 properties have been identified in the environmental impact statement as potentially eligible, subject to detailed design and further noise impact assessment. As is normal in major infrastructure delivery, it is possible the list of properties identified may reduce or expand based on changes in detailed design and the outcomes of further noise assessment.

A number of the properties identified as potentially eligible do not actually receive an increase in noise levels as a result of the project but because they are already impacted by high noise levels. The project offers the opportunity to provide benefits to these already impacted receivers.

Although not a requirement of environmental impact statement consultation, correspondence was distributed to notify residents as part of the environmental impact statement and project approval process regarding potential construction and operational noise impacts.

Some discrepancies were identified between properties who received project correspondence and those published in the environmental impact statement as potentially eligible for consideration of at-property acoustic treatment. The discrepancies resulted from inaccuracies in the address list used to inform the correspondence. Follow up correspondence was provided in each instance and hand delivered by representatives of the project team.

The noise and vibration impact assessment findings presented in the environmental impact statement are correct based on the proposed concept design.

It is noted, however that due to further design refinements, additional properties potentially eligible for consideration of at-property acoustic treatment have been identified near Coral Tree Drive. This is further discussed in the **Section 2.10** of this report.

Issue description

Submissions regarding consultation raised concerns regarding the lack of translation of the environmental impact statement into any other languages. Submissions request that all future documentation be provided in Cantonese, Mandarin, Korean and Vietnamese.

Response

The project has offered a translation service on all correspondence sent to the local community. The translation service is available for members of the public to discuss any aspects of the project with the project team.

Issue description

Submissions regarding consultation requested site inspections of affected individual properties to understand the relationship between homes and existing motorways.

Response

The environmental impact statement has been prepared in accordance with the Director-General's environmental assessment requirements and following guidance from various government impact assessment guidelines. This has been undertaken through a combination of desktop assessments and site inspections. It is not practical or necessary to undertake an inspection of every property which may be impacted by the project as part of this process.

Issue description

Submissions regarding consultation objected to the information provided in the community update 5.

In summary, the submissions raised the following issues:

- Comparisons to "wood fired heaters in the Sydney Basin… accounting for more than 50 per cent of particulate matter" to support the project. This refers to the whole of the Greater Metropolitan Area and not to a concentrated location such as the exhaust outlet.
- "Road tunnels and ventilation outlets do not generate pollution: vehicles using both surface roads and tunnels are the cause of the emissions". What the NorthConnex project appears to be misunderstanding is that the tunnels and the outlets are concentrating emissions from vehicles using the tunnels and the surface road vehicles are not the cause of the emissions from the tunnels and the outlets.
- Community update 5 was the first correspondence received about the project and does not give enough time for form views.

Response

Community update 5 contained information that is factually correct and relevant to the issues contained in the update.

Comparisons to the other sources of pollution are provided to give the community context when considering and formulating their views on the project.

The NorthConnex project would not produce new emissions or pollution. The NorthConnex project would collect vehicle emissions that are currently released in an uncontrolled manner

at ground level, next to residential and other sensitive receivers, and effectively disperse those emissions in a controlled manner high in the atmosphere. The net effect would be a reduction in the concentration of vehicle pollution at ground level where it may affect the local community.

Emissions managed by the NorthConnex project originate from the exhaust of vehicles using the project, in the same way as vehicles currently using Pennant Hills Road are the principal source of air pollution along that road. It is accepted that the NorthConnex project is responsible for the appropriate and efficient collection, management and dispersion of in-tunnel vehicle emissions. The environmental impact statement has demonstrated that the project's ventilation system, including ventilation outlets, will achieve this outcome and will effectively disperse vehicle emissions below applicable ambient air quality criteria.

A range of community updates and other correspondence has been issued to the local community throughout the project. The distribution area for this correspondence has been consistent since the announcement of the preferred tender design. Distribution companies used GPS tracking devices to ensure the area was appropriately covered.

Issue description

Submissions raised concerns that convenors at community sessions were more interested in finishing on time and didn't allow all community questions to be asked.

Response

Forums were structured to provide an appropriate balance between presentations from the project team and time for the community to ask questions.

Community events held during the environmental impact statement public exhibition period were open drop-in events. No presentations were delivered at these events, but rather the events were structured to provide flexibility for members of the community to drop-in, view project documentation and ask questions of the project team.

The additional community and stakeholder information mechanisms outlined in Section 6 of the environmental impact statement remain in place for community members and stakeholders to access information on the project, including a project email address, telephone number and website.

Issue description

Submissions relating to consultation raised concerns of the lack of available information on specific aspects of the proposal that were available at the public meetings.

Response

The information presented in the environmental impact statement and the public forums is based on the concept design of the project.

In contrast to other major infrastructure projects, however, the NorthConnex project has brought forward the more detailed design work which would ordinarily not occur until after environmental planning approvals had been granted. Notwithstanding, there are a number of aspects of the project which are subject to detailed design. This is consistent with the approach taken on other major infrastructure projects.

Issue description

Submissions regarding consultation raised concerns regarding the relevance of the public exhibition exercise.

Belief that the statement that comments are valued and all interested parties are invited to make a submission cannot be accepted on face value.

Response

Public exhibition is an important component of the environmental impact assessment process. Submissions received are carefully examined and responded to by the project team.

In relation to NorthConnex, submissions received from the community have allowed the project team to better understand issues of concern to the community. This has resulted in a number of changes to the project including changes to haulage routes to reduce impact on local roads. These changes are described in **Section 9.4** of this report.

Following the preparation of this report, the Secretary of the Department of Planning and Environment will prepare and provide to the Minister for Planning, a report detailing the Secretary's assessment of the NorthConnex project. This report will include consideration of issues raised in public submissions, and Roads and Maritime's response to those issues (as detailed in this report).

Issue description

Submissions regarding consultation raised concerns regarding the availability and access to the environmental impacts statement during exhibition. Having copies on display only at central coast councils and nowhere in the Hunter region is not sufficient recognition of the stakeholder significance of motorists from the central coast and Hunter area.

Response

Electronic copies of the environmental impact statement are available on the Department of Planning and Environment's website (www.planning.nsw.gov.au) and on the NorthConnex website (www.northconnex.com.au).

Formal exhibition locations for the environmental impact statement have been determined by the Department of Planning and Environment.

The approach to consultation during the preparation and exhibition of the environmental impact statement was consistent with the Director-General's environmental assessment requirements with the focus on the project area, including communities, organisations and adjoining and affected landowners.

The project also recognised a heightened level of interest in areas to the north of Sydney that would likely benefit from the tunnel once in operation. To respond to this interest, the preferred tender design and the NorthConnex public exhibition were advertised in the Central Coast Express advocate and project representatives engaged regularly with local government as well as elected State and Federal Members of Parliament. The environmental impact statement documents were on display at a variety of local government facilities and in the electorate offices of Federal Members of Parliament. Representative of the NorthConnex Project team also attended shopping centre displays on the Central Coast.

Meetings and displays in the region included:

- Within the Gosford local government area copies of the environmental impact statement were available to the public at Gosford City Council and at Erina Library, located at Erina Fair Shopping Centre.

- Within the Wyong local government area copies of the environmental impacts statement were available to the public at the Wyong Shire Council building and at Tuggerah Library, located at the Westfield Tuggerah Shopping Centre.
- Copies of the environmental impact statement were displayed in the offices of the Federal Member for Dobell at Tuggerah and also the Federal Member for Robertson in West Gosford.
- During the public exhibition of the environmental impact statement the NorthConnex project team met with Wyong Shire Council on 27 August 2014.
- The NorthConnex project team met with political representatives from the Central Coast including the State member for Gosford and the Federal Members for Dobell and Robertson.
- The NorthConnex project team held two staffed displays on the Central Coast. The first at Deepwater Plaza, Woy Woy on Tuesday 19 August and the second at the Imperial Centre Gosford on Friday 22 August 2014.

Issue description

Hard copies of the environmental impact statement should be provided to members of the community.

Response

The proponent is not required to provide hard copies of the environmental impact statement to members of the community. Due to the size of the document, it was considered that providing hard copies was not a practical option.

Hard copies of the environmental impact statement were available at numerous venues throughout the project corridor and CD copies were provided to members of the public on request.

The document was also available for download from the NorthConnex website and the Department of Planning and Environment's website.

Issue description

All properties within 50 metres of the corridor should be detailed in the environmental impact statement.

Response

It is not considered relevant or appropriate to list all properties within 50 metres of the corridor. This information is available for individual property owners by contacting the project team or can be easily derived from the alignment drawings provided within the environmental impact statement.

Issue description

An elevation of the route should be released as soon as possible so that owners know where the alignment is above the Hawkesbury Sandstone.

Response

A geological long section showing the alignment and the relevant rock stratum layers is proved in Appendix C of the environmental impact statement.

8.5.3 Future consultation

Eighty four submissions raised issues regarding future consultation.

Issue description

Submissions regarding consultation requested that alternative accommodation be provided for houses above the tunnels during tunnelling works.

Response

As detailed in Section 7.2.4 of the environmental impact statement, a protocol would be developed to identify the need for and provision of respite measures for residents in accordance with the Interim Construction Noise Guidelines. Respite measures may include the restriction to the hours of construction activities resulting in impulsive or tonal noise (such as rock breaking, rock hammering, pile driving), or other appropriate measures agreed between the contractor and residential receiver such as alternative accommodation. The mitigation measures offered would be dependent on the noise level exceedance and the duration of the activity.

Further clarification of proposed noise and vibration mitigation and management measures to be applied during construction is provided in **Section 4.5** of this report.

Issue description

Submissions relating to consultation raised issues regarding the provision for continued consultation after the conclusion of the exhibition period.

In summary, the submissions raised the following issues:

- The consultation process should continue after the end of the environmental impact statement exhibition period. This should include the counselling service currently available.
- Details should be provided on the procedures and plans to ensure the transparency of information in the future.
- Issues raised during construction should be addressed and responded to in a timely and comprehensive manner.
- Moving forward NorthConnex should commit to undertaking genuine engagement with the community through a range of traditional and social media.
- Any modifications to the structure/s stated in the environmental impact statement must be made open to public viewing with the ability to lodge submissions accordingly.

Response

Consultation with the local community and stakeholders would continue during the detailed design and construction phase of the project. The Community Communications Framework provided in Appendix D of the environmental impact statement provides the outline of the future Community Liaison Implementation Plan which would be developed to detail the nature and type of consultation during the construction phase.

NorthConnex is committed to continuing the effective community consultation which has occurred throughout the development of the project to date.

Issue description

Submissions relating to consultation requested the allowance of community input once the design of the increased drainage and detention basin behind Lisle Court has been determined.

Response

Works in the vicinity of Lisle Court are required to facilitate the construction of the new on-ramp connecting the Hills M2 Motorway to the northbound main alignment tunnel, and potentially for the augmentation of an existing surface water detention basin.

Opportunities to limit the extent of works and the impact on the public reserve would be investigated during the detailed design stage. Roads and Maritime would consider minimising the acquisition to only the land required for the NorthConnex project. This would leave land not required for the NorthConnex project for community use.

As identified in Appendix D of the environmental impact statement, the Urban Design and Landscape Plan would be developed in consultation with the community and relevant local council/s.

Issue description

Submissions relating to consultation requested access to a 24 hour community hotline for complaints in the event that construction noise conditions are broken.

Response

A 24 hour community telephone line would be maintained by the project team during construction works.

Issue description

Submissions relating to consultation raised concerns that NorthConnex has not proposed community involvement in the development of appropriate monitoring programs.

Submissions request that an Air Quality Consultative Group be formed consisting of representatives from the community (including schools and health professionals) to be involved in the developing the long term monitoring program as well as assessing the results of monitoring.

Response

The Community Communications Framework provided in Appendix D to the environmental impact statement provides an initial framework for ongoing communications and consultation with the community and other stakeholders. The framework does not preclude consultation on air quality monitoring issues, and an appropriate consultation mechanism for these and other issues could be developed and included in consultation activities during detailed design and implementation of the project. The need for issue specific consultative groups would be considered during development of consultation activities following approval of the project (if it is approved).

Issue description

Submissions relating to consultation request that local councils should be consulted on Construction Traffic Management Plans prior to approval of the project.

There should be extensive community consultation during the development of the traffic management plans. Community should be provided more information regarding traffic

numbers, especially at night. The NorthConnex project traffic contact for each of the four sites would allow community involvement.

Suggestions for dissemination of information to the public in relation to traffic include:

- Using radio stations to provide advance warnings of upcoming disruptions via traffic updates.
- Overhead signage on Pennant Hills Road to alert drivers when delays are expected so they can choose other routes or alter travel times.

Response

Traffic Management Plans and Traffic Control Plans would be developed in order to detail the site specific construction vehicle arrangements as well as the safe movement of motorists, cyclists and pedestrians around the construction sites. Additional measures would be considered during the development of Traffic Management Plans such as:

- The use of temporary traffic lights at heavy vehicle egress points.
- Siting heavy vehicle egress point where there are downhill grades where feasible and reasonable.
- Stipulating certain emissions standards (such as Euro 3) from heavy vehicles used as part of the project.
- The use of trucks with greater capacity to reduce the overall number of heavy vehicle movements.

The Community Communications Framework provided in Appendix D of the environmental impact statement identifies targeted consultation activities for specific environmental issues. In relation to construction traffic, local councils are identified as a key stakeholder. A Traffic and Transport Liaison Group would be established to discuss traffic management and road safety mater associated with the construction of the project. The Traffic and Transport Liaison Group would include representative from the relevant local councils.

The local community would be advised in advance of changes to traffic arrangements. As identified in Section 6.6.1 and Appendix D of the environmental impact statement, consultation would continue with the local community. Various avenues would be available for the community to contact the project with their concerns, including via email and a free call telephone number.

Issue description

Residents in the immediate vicinity of the Coral Tree Drive switching station should be consulted about the final ‘finishes’.

Response

Consultation with the local community and stakeholders will continue during the detailed design and construction phase of the project. The Community Communications Framework provided in Appendix D of the environmental impact statement provides the outline of the future Community Liaison Implementation Plan which will be developed to detail the nature and type of consultation during the construction phase. As identified in Appendix D of the environmental impact statement, the Urban Design and Landscape Plan would be developed in consultation with the community and relevant local council/s.

8.5.4 Endorsements of other submissions

One hundred and eighteen submissions endorsed submissions made by others.

Issue description

Respondents endorsed submissions made by others.

Response

Endorsements of submissions are noted.

8.6 Construction traffic

8.6.1 Traffic numbers and routes

One hundred and eighty two submissions raised issues regarding the construction traffic numbers and routes.

General concerns

Issue description

Submissions relating to construction traffic raised issues regarding general traffic concerns.

In summary, the submissions raised the following issues:

- The volume of heavy vehicles and the impacts to Pennant Hills Road and feeder roads. Submissions request heavy vehicles be restricted to Pennant Hills Road and the Hills M2 Motorway.
- Submissions request spoil from northern sites be directed north and spoil from southern sites be directed south or west.
- The use of trucks 24 hours per day, seven days per week during construction.
- The environmental impact statement does not properly address the impact of heavy construction vehicle movements at night.
- There needs to be a clear statement detailing how traffic disruption will be controlled during the construction period.
- Whether the AM and PM peak assessment derived from three hours or one hour.

Response

The NorthConnex project has been designed to minimise the generation of construction traffic where feasible and reasonable. This has included selecting the optimum size of vehicles to transport materials, plant and equipment, in order to minimise the total number of trips required during construction of the project.

Tunnelling works are required to be carried out continuously 24 hours per day and seven days per week. As a result, heavy vehicle movements to remove spoil from the construction sites are also likely to be required up to 24 hours per day and seven days per week. This is principally because of three factors:

- The total extent of land acquisition and surface disturbance required for the project has been minimised. As a consequence, there is limited space to stockpile spoil and a need to regularly remove spoil from tunnel support sites.
- Spreading traffic movements over a 24 hour period reduces peak impacts, with lower impacts on average for most receivers.
- The highly congested traffic situation along Pennant Hills Road during and around peak hours, and high traffic volumes at other times of the day limit the ability to remove spoil for large periods during day time hours.

The environmental impact statement provides an assessment of the construction traffic impacts of the project in Section 7.1 and Appendix E, and an assessment of the construction noise impacts of the project in Section 7.2 and Appendix F. The construction traffic impact assessment focuses on vehicle movements during the peak periods, as this represents the worst-case traffic impact scenario (peak background traffic with the addition of project construction vehicles). The construction traffic noise impact assessment considers several scenarios, including traffic noise during the day time and worst case night time and early

morning traffic impact scenarios. During construction, Traffic Management Plans would be developed and implemented to manage the movement of vehicles to and from the project site and to ensure that vehicle movements are conducted in a manner that minimises impacts on local amenity, traffic flows and road safety.

Based on feedback in submissions and through other consultation with the community and other stakeholders, the proposed construction traffic routes for the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9) have been altered to avoid impacts on local residential streets. Updated construction traffic and construction noise assessments for these amended haulage routes are provided in **Section 9.4** of this report.

The AM and PM peak assessments presented in the environmental impact statement are for one hour peak periods. This assessment provides consideration of the worst affected periods of the day.

Issue description

Submissions relating to construction traffic raised issues regarding the lack of assessment for spoil transportation.

Response

The traffic impact assessment provided in Section 7.1 and Appendix E of the environmental impact statement provides a comprehensive assessment of construction traffic focused on the impacts of spoil removal.

This assessment has been carried out on the basis of all spoil being transported to a northern disposal site and all spoil being transported to a southern disposal site. As such, this assessment is conservative and worst-case. The performance of all intersections along Pennant Hills Road has been considered.

Based on feedback in submissions and through other consultation with the community and other stakeholders, the proposed construction traffic routes for the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9) have been altered to avoid impacts on local residential streets. Updated construction traffic and construction noise assessments for these amended haulage routes are provided in **Section 9.4** of this report.

Issue description

Submissions relating to construction traffic raised issues regarding the increase in traffic around the Junction Road compound 24 hours per day and seven days per week.

Response

The Junction Road compound would not ordinarily be used 24 hour per day and seven days per week, although it may be used to support other out of hours works from time to time.

Vehicle numbers to and from the compound would be relatively low with around 100 light vehicles and five heavy vehicles spread throughout day. This is not predicted to have a significant impact on the local road network.

Issue description

Submissions relating to construction traffic requested that detailed traffic management plans covering the site in Thornleigh (Pioneer Avenue and Trelawney Street compounds) are carefully formulated by traffic consultants who are familiar with the area.

Response

As identified in Section 7.1.4 of the environmental impact statement, Traffic Management Plans would be developed and implemented to manage the movement of vehicles to and from the project site and to ensure that vehicle movements are conducted in a manner that minimises impacts on local amenity, traffic flows and road safety.

Traffic Management Plans would be developed by the construction contractor by appropriately qualified and experienced personnel.

Issue description

Submissions relating to construction traffic raised issues regarding the variances of the number of trucks required for spoil removal and transportation. The environmental impact statement does not convert spoil cubic metres into truck numbers.

Response

The construction traffic numbers in the environmental impact statement are based on a conversion of spoil volumes into truck numbers required from each site. The majority of trucks would be truck and dogs with capacity greater than six cubic metres.

The peak traffic numbers during tunnelling works cannot simply be multiplied by the tunnelling timeframe to provide a total number of trucks. The peak truck movements would not occur for the entire tunnelling phase at each of the construction sites.

Issue description

Submissions relating to construction traffic raised issues regarding the decision of 2016 as the assessment year for construction when the peak tunnelling activities would occur in 2017.

Response

2016 was selected as an indicative year for assessment as it falls around the middle of the projected construction period. Any differences between 2016 and 2017 in terms of background traffic growth would be negligible and would not impact the outcomes of the assessment.

Issue description

Submissions relating to construction traffic raised issues regarding the construction traffic performance assessment.

In summary, the submissions raised the following issues:

- The minimal deterioration from the introduction of a large number of vehicles does not make sense.
- The improvement in performance of some intersections with construction traffic does not make sense.

Response

The Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) provides a thorough assessment of construction traffic impacts. Responses to the specific questions raised are as follows:

- The volume of heavy vehicles is split throughout the day and only a certain number of these would occur within the peak periods. In some cases there is deterioration in

performance in relation to average delay, however this deterioration is not enough to change the overall level of service.

- As explained in the environmental impact statement, some intersections deteriorate to a point where they act as a bottleneck. This can result in slight improvements in downstream intersections.

Southern interchange compound (C5)

Issue description

Submissions relating to construction traffic raised issues regarding the proposed heavy vehicle route to the southern interchange compound.

In summary, the submissions raised the following issues:

- The proposed heavy vehicle route to the southern interchange compound using Aiken Road, Oakes Road, Eaton Road and Karloon Road is unacceptable.
- These roads are already heavily trafficked and not suited for heavy vehicles due to road widths, steep gradients, round-a-bouts and existing car parking.
- The addition of heavily vehicles will overload these roads. Other impacts from this route would include:
    - Negative impacts to residents.
    - Negative impacts to bus routes and commuters.
    - Impacts to parking.
    - Impacts to Carmen Drive shops.
    - Impacts to school children.
- A stated aim of the project is to '*maintain existing road characteristic and environment especially residential streets...*' and 'maintain existing neighbourhood connectivity and local access for local traffic'. These objectives have been totally ignored during planning for both the construction and operational phases of the project and particularly in regard to Karloon and Eaton Roads.
- A comprehensive traffic study should be prepared which investigates the existing traffic conditions at the intersection of Karloon/ Eaton/ Pennant Hills Road and factors in the proposed construction related vehicular movements.
- The statement that the road limits which exist on the local roads do not apply is incorrect. Exemptions from load limits for roads only apply where there is no other alternative route to access the site to which the vehicle is going. To state that there is no other way of accessing the Southern Interchange Compound other than via Karloon Road and Eaton Road is incorrect and misleading.

Submissions recommend an alternative heavy vehicle route based on direct access off Pennant Hills Road. Suggestions include:

- Use of the wide median strip and later the traffic lights at Pennant Hills Road lights to form a right turn lane into Eaton Road (for construction vehicles only). This would back up the trucks on Pennant Hills Road but minimise the impact on residents and local traffic.
- Construct a right turn (for construction vehicles only) half way between Eaton Road and the Hills M2 Motorway interchange.

- Have the trucks turn right onto the Hills M2 Motorway from Pennant Hills Road, drive to the Windsor Road overbridge, double back along the Hills M2 Motorway and access the construction compound.
- Direct access from the Hills M2 Motorway off-ramp to the compound. All vehicles heading north from the construction compound should exit via this same ramp back onto the Hills M2 Motorway.
- Temporarily closing Copeland Road to all traffic at Pennant Hills Road. This traffic would be routed via Beecroft Road, Hull Road, Hannah Street or Cardinal Avenue.

It is also recommend that a communication system is implemented where a control centre can contact heavy vehicles and call them to site from north or south holding locations. The number of trucks waiting to access the construction compound must be strictly limited to prevent severe disruption to normal traffic.

If the route cannot be changed, Aiken Road and Oakes Road, and the associated round-a-bouts, should be widened or modified, to accommodate the increased traffic conditions.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Aiken Road, Oakes Road, Karloon Road and Eaton Road.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

During construction, Traffic Management Plans would be developed and implemented to manage the movement of vehicles to and from the project site and to ensure that vehicle movements are conducted in a manner that minimises impacts on local amenity, traffic flows and road safety.

Issue description

Submissions relating to construction traffic raised issues regarding the house of heavy vehicle movements.

In summary, the submissions raised the following issues:

- Concern of extend to which heavy vehicles movements will be outside of standard construction house (7 am to 6 pm).
- Are heavy vehicle movements required to remove material whenever tunnelling is occurring or can the tunnelling material be stockpiled for later removal?
- What restrictions will the movement of heavy vehicles during standard construction hours have on local traffic using Eaton, Karloon, and Pennant Hills Roads?

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Aiken Road,

Oakes Road, Karloon Road and Eaton Road. As such, there would be no restriction on the existing use of these roads by local traffic.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

The expected 1,480 heavy vehicle movements would be evenly spread throughout the day and night, although opportunities would be investigated to limit the number of heavy vehicles required at night as much as feasible and reasonable. Some stockpiling space is available within the site compounds (both within and outside the acoustic sheds), however there is unlikely to be sufficient space to allow stockpiling to occur throughout the night with no heavy vehicle movements.

Issue description

Submissions raised concerns over contradictions in the environmental impact statement regarding the southern interchange compound, spoil movements and 24 hour vehicle movements.

It is unclear if access will be required through private property. Are there any plans to use the easement through 2 Eaton Road to access the compound? If not, will this easement be removed?

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Aiken Road, Oakes Road, Karloon Road and Eaton Road.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

Access would not be required through private property or through the easement on 2 Eaton Road. The removal of the easement is beyond the scope of the NorthConnex project.

Issue description

Submissions relating to construction traffic request that vehicle access for the works to the detention basin behind Lisle and Savoy Courts should be restricted to enter via Oakes Road.

Response

Wherever possible, access and egress for these works will be from the Hills M2 Motorway, from Oakes Road or through the construction site from the southern interchange compound site. As the extent of works in relation to this detention basin are not currently know, it is not possible to categorically rule out access via Lisle Court or Savoy Court. It is acknowledged however that current access through these streets would be restricted width and nature of the existing access paths.

Issue description

Further information to be supplied on at what stages of construction any ‘anticipated’ volume may be exceeded, how often these are predicted to occur and for how long they may operate so that residents can comment on their potential impact.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Aiken Road, Oakes Road, Karloon Road and Eaton Road.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

During construction, Traffic Management Plans would be developed and implemented to manage the movement of vehicles to and from the project site and to ensure that vehicle movements are conducted in a manner that minimises impacts on local amenity, traffic flows and road safety.

Issue description

In Chapter 1, Section 1.1 of the environmental impact statement there is a mention of widening of Eaton Road. This appears to be the only mention of this proposed work within the environmental impact statement. No details regarding the extent or design of the works, the proposed location or the hours when this work is proposed to occur. Why has this matter not been expanded upon and all relevant implications, such as noise, vibration, traffic disruption, impact on adjoining properties etc, been detailed in the report?

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Aiken Road, Oakes Road, Karloon Road and Eaton Road, therefore widening of Eaton Road would no longer be required.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

During construction, Traffic Management Plans would be developed and implemented to manage the movement of vehicles to and from the project site and to ensure that vehicle movements are conducted in a manner that minimises impacts on local amenity, traffic flows and road safety.

Northern interchange compound (C9)

Issue description

Submissions raised concerns that increased traffic on Eastbourne Avenue could make entering and exiting Seaton Road impossible. Request mitigation measures to cope with excess vehicle traffic.

Response

Eastbourne Avenue would be primarily used as a light vehicle access route to the northern interchange compound. Table 5-19 of the environmental impact statement identifies that there are predicted to be 100 light vehicles per day accessing this compound. Assuming all vehicles accessed the site during the standard daytime construction hours, this would

equate to around 10 vehicles per hour which is not expected to result in significant constraints on this road.

Notwithstanding, Traffic Management Plans and Traffic Control Plans would be developed in line with the Roads and Maritime Traffic Control at Worksites Manual and Australian Standard AS1742. These plans would document the site specific construction vehicle arrangements.

Trelawney Street compound (C7)

Issue description

Submissions relating to construction traffic raised concerns regarding the haulage routes around the Trelawney Street compound (C7).

In summary, the submissions raised the following issues:

- The proposed heavy vehicle route through the Phyllis Avenue roundabout is unsuitable. Heavy vehicles leaving the site and needing to cross three lanes of traffic to turn right at Phyllis Avenue. The Phyllis Avenue intersection is a local road sized round-a-bout and is not suitable for heavy vehicles. This would be a logistical nightmare and impossible task given the size of the round-a-bout, the current traffic conditions on Pennant Hills Road, and the current traffic demand on Phyllis Avenue with Bunnings, McDonalds, McDonalds headquarters, Ibis Hotel and local bus routes.
- Increased heavy vehicle volumes.
- Heavy vehicles accessing the site 24 hours per day, seven days per week.
- Local residents will have difficulty accessing their properties on Loch Maree Avenue due to truck movements.
- Existing congestion at intersections at Loch Maree Avenue and Duffy Avenue. The Pennant Hills Road / Loch Maree Avenue / Phyllis Avenue intersection is already failing.
- Request a swept path analysis be undertaken for the proposed left turn left into Loch Maree Avenue. Request consideration to altering the kerb to allow for trucks to turn into Loch Maree Avenue without encroaching into other lanes.
- Assumptions that one truck per minute will enter and leave the Trelawney Street construction compound (C7) is unfeasible.
- Request that construction vehicles be prohibited for parking on or using Nelson Street, Trelawney Street and Loch Maree Avenue to access the site.
- Loch Maree Avenue, Trelawney Street and Nelson Street are all residential streets and heavy vehicles above five tonnes should be prohibited.
- There will be impacts on church parking on Loch Maree Avenue on Sunday mornings.
- The original plan for cars and trucks to enter and exit the site via Pennant Hills Road would have much less impact on the local community.
- If there is a delay in trucks entering from Loch Maree Avenue, residents would be stuck on Pennant Hills Road unable to turn into the street.
- Questions raised on the location of access points for light vehicles to access the construction site in Loch Maree Avenue.

Submissions offer suggestions including:

- All heavy vehicle traffic from Trelawney Street should be directed to a southern spoil disposal site.

- All trucks should access the site via Pennant Hills Road.
- No trucks should turn around or wait along Phyllis Avenue.
- No tuck parking or waiting should be permitted in Loch Maree Avenue or Trelawney Street.
- Further information should be supplied regarding night time movements.
- Entry and exit to Pennant Hills Road should be controlled by traffic lights with the kerbside, southbound lane designated for trucks only. The lights should be synced with the Duffy Avenue and Phyllis Avenue lights and should allow the trucks to turn both North and South.
- The bulk of spoil from this compound should be removed outside of the AM/ PM and weekend peaks.
- All trucks approaching the Trelawney Street site should come from the north.
- All trucks leaving the Trelawney Street site should travel south.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the Trelawney Street compound (C7). Changes made to access arrangements at the Trelawney Street compound are detailed and assessed in **Section 9.4** of this report.

Issue description

Submissions relating to construction traffic raised concerns regarding the proposed heavy vehicle route from the northern interchange compound with the proposed turn around point at Phyllis Avenue. The Pennant Hills Road/ Loch Maree Avenue/ Phyllis Avenue intersection cannot handle these additional heavy vehicle movements.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the northern interchange compound (C9) and the Trelawney Street compound (C7). This has included changes to potential impacts on Phyllis Avenue and the Pennant Hills Road/ Loch Maree Avenue/ Phyllis Avenue intersection.

Changes made to access arrangements at the northern interchange and Trelawney Street compounds are detailed and assessed in **Section 9.4** of this report.

Wilson Road compound (C6)

Issue description

Submissions relating to construction traffic raised issues regarding the current traffic plan.

In summary, the submissions raised the following issues:

- The current traffic plan is not a satisfactory solution, however it may be the best given the location of Wilson Street compound.
- If after spoil locations are finalised trucks have to travel south, a temporary set of coordinated traffic lights could be a safety measure at Wilson Street compound exit for trucks crossing three lanes of a busy highway.

- Suggest that spoil removal from the Wilson Road compound be transported to the north.
- The site should provide separate access and egress points.

Response

The construction traffic and traffic noise assessment carried out as part of the environmental impact statement considered two scenarios where all spoil would be transported to a spoil disposal site to the north and all spoil would be transported to a spoil disposal site in the south. It is reasonably feasible that multiple spoil disposal sites would be utilised in each of these direction and, as such, this represents a worst-case conservative assessment. At this stage of the project, flexibility is required in identifying spoil disposal location to allow options such as beneficial re-use to be explored.

Further work would be carried out during the detailed design stage through consultation between the construction contractor, Roads and Maritime and Transport Management Centre, to refine construction haul routes with the aim of reducing construction traffic impacts along Pennant Hills Road and minimising impacts to the local community.

Issue description

Submissions relating to construction traffic raised concerns that the location of the Wilson Road construction compound and operational surface facility will restrict access to the rear of adjacent properties and restrict the ability to develop or extend development on those properties.

Response

The project would not impact the existing access arrangements to properties around the Wilson Road tunnel support facility. Access to surrounding receivers to build extensions would not be impacted by the project. The facility is being constructed within current property boundaries which will remain unchanged.

Pioneer Avenue compound (C8)

Issue description

Submissions relating to construction traffic raised issues regarding the existing congested condition of Pioneer Avenue and Duffy Avenue.

In summary, the submissions suggest the following alternatives:

- No access or egress from Pioneer Avenue into the NorthConnex Compound.
- Use of additional (temporary) coordinated traffic lights Pioneer/Duffy intersection.
- The addition of a slip lane from Duffy Avenue turning north into Pennant Hills Road.
- Improved coordination between existing Duffy Avenue and Phyllis/Loch Maree Avenue traffic lights.

Response

The Pioneer Avenue compound (C8) is being provided as a dedicated construction worker facility in order to reduce local impacts around construction compounds such as worker parking. Whilst there may be some deterioration of intersection performance around the Pioneer Avenue facility, these impacts would be offset by the significant benefits around construction compounds for the project as a whole. To mitigate some of the traffic impacts around the Pioneer Avenue compound, the Lymoore Avenue access would be upgraded as part of the establishment works to ensure that it is suitable for its intended use.

Options to reduce the potential traffic impacts from this site would be considered during the development of Traffic Management Plans, which may involve staggered shift change times, or shift change times outside of existing traffic peaks.

Bareena Avenue compound (C10)

Issue description

The narrowness of the road will inhibit vehicle movements along Woonona Avenue North. Suggest that the route needs to be via Churchill Avenue or Ingalara Avenue to Fern Avenue. During peak times it would make sense to deploy traffic controllers.

Response

Access requirements to the Bareena Avenue compound are detailed in Table 7-15 of the environmental impact statement. Not all construction works can feasibly be carried out from the motorway and some heavy vehicles will need to access the compound via the local road network. The route used is proposed to be Myra Street, Ingram Road, Edgeworth David Avenue, Woonona Avenue North and Bareena Avenue. This route minimises the use of local roads as much as reasonable and feasible.

8.6.2 Network performance

Seventy three submissions raised issues regarding the network performance during construction.

General concerns

Issue description

Submissions requested that Roads and Maritime should insist that only brand new trucks or trucks less than one year old be used on this project and no trucks older than three years be allowed on the project. This would have to be strictly monitored by Roads and Maritime.

Response

The construction contractor would ensure that all heavy vehicles used as part of construction are maintained in good working order to limit the potential for breakdowns on Pennant Hills Road.

Issue description

Communication should occur between the NorthConnex project, the Epping to Chatswood Third Track and the North West Rail Link project teams to manage cumulative traffic impacts.

Response

Consideration of potential cumulative traffic impacts is provided in Table 7-22 of the environmental impact statement. Overall, due to the anticipated staging and relative location of each project the potential for significant cumulative impacts is negligible.

Consultation would occur between the relevant projects in relation to construction staging and haul routes in order to minimise the potential for cumulative impacts.

Southern interchange compound (C5)

Issue description

Submissions relating to construction traffic raised issues regarding the existing congested condition of the Pennant Hills Road / Eaton Road intersection.

In summary, the submissions raised the following issues:

- Concerns that additional trucks would create chaos.
- Request that no roadwork or construction traffic should be allowed on Eaton Road before 9 am (Monday - Friday).
- Concern that there is also no area proposed for trucks to queue as they wait to enter the southern interchange compound.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Eaton Road.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

Issue description

Submissions raised concern that heavy vehicles will congest local streets on the proposed temporary suburban route near the southern interchange compound (C5).

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5).

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

Wilson Road compound (C6)

Issue description

Submissions raised concerns regarding the Wilson Road Compound.

Construction traffic movements

In summary, the submissions raised the following issues:

- Construction truck movements to and from the Wilson Road compound will cause further traffic congestion to all road users.
- Beecroft Road is not designed for truck turning and is operating at capacity. The right turn bay to Beecroft Road from Pennant Hills Road is already operating at capacity during peak hour, and has no additional capacity for truck queuing.
- No separate entry and exit truck access between Wilson Road compound and Pennant Hills Road will cause unacceptable queuing on Pennant Hills Road.

- Northbound traffic entering the site via Beecroft Road cannot occur during either the AM or PM peak. The Beecroft Road/ Pennant Hills Road intersection is already at/beyond capacity.
- Traffic Assessment fails to take into account weekend traffic peaks on Pennant Hills Road.

Mitigation measures

The submitted traffic impact assessment presented in the environmental impact statement provides no mitigating strategies with respect to construction traffic, and defers traffic impacts and management to a future detailed Traffic Management Plan.

Submissions suggest recommendations including:

- No southbound return on Pennant Hills Road via Beecroft Road between 6 am – 10 pm weekdays, and 9 am – 12 pm Saturday/ Sunday and 3 pm – 6 pm Saturday/ Sunday to prevent trucks exiting the site crossing three lanes on Pennant Hills Road to get to the right turn bay.
- Any southbound return or access to Beecroft Road for trucks must be performed with traffic controllers. This is to ensure safe truck movement at/near the intersection.
- The design of the proposed vehicular access of the Wilson Road compound (C6) must allow trucks to freely enter and exit at the same time with no conflicting manoeuvres. Otherwise, separate vehicular accesses should be provided for entering and exiting vehicles. This is to avoid unacceptable queuing on Pennant Hills Road.
- Restricting the size of vehicles to the site to ensure all vehicles can enter and exit Wilson Road compound (C6) from the far left lane only and continue northbound on exit to avoid unacceptable queuing on Pennant Hills Road.
- Any vehicles that cannot enter/exit the site to/from the far left lane must be restricted to enter and exit between 10 pm – 6 am (the next day) weekdays only, and must enter and exit the site with traffic controllers. This is to ensure safe truck movement at the site.

No northbound access to the site should be allowed from Beecroft Road between 6 am – 9 am, 3pm – 7pm weekdays 9 am – 12 pm Saturday/ Sunday and 3 pm-6 pm Saturday/ Sunday to avoid detrimental impacts to the operation of the Pennant Hills Road/ Beecroft Road intersection.

Response

Section 7.1.4 of the environmental impact statement identifies and assesses the potential impacts of construction traffic, including the potential impact at the Wilson Road compound.

Although the site entry and exit point are located in the same position directly to and from Pennant Hills Road, the access and egress through physical and procedural management measures would be arranged so as to reduce the potential for queuing back onto Pennant Hills Road.

Traffic Management Plans would be developed for each construction site in order to detail the site specific construction vehicle access arrangements. Feasible and reasonable mitigation would be considered during this process in order to minimise impacts to the local road network. This would include consideration of restrictions of traffic movements during peak periods where appropriate.

The traffic impact assessment acknowledges that Pennant Hills Road does not exhibit the same drop in peak periods during the weekend. The assessment carried out provides a

conservative assessment of the potential impacts from construction traffic. The assessment of the AM peak period would be relevant to the likely impact during the weekday AM peak period and during weekend peak conditions.

Section 7.1.5 of the environmental impact statement identifies a range of management measures to be implemented during the construction phase in order to reduce potential impacts. Further consideration of traffic management measures would be carried out during the development of Traffic Management and Traffic Control Plans should the project be approved.

Further work would be carried out during the detailed design stage through consultation between the construction contractor, Roads and Maritime and Transport Management Centre, to refine construction haul routes with the aim of reducing construction traffic impacts along Pennant Hills Road and minimising impacts to the local community.

Trelawney Street compound (C7)

Issue description

Submissions relating to construction traffic raised issues regarding the network performance.

In summary, the submissions raised the following issues:

- Concerned the exit lanes from Loch Maree Avenue onto Pennant Hills Road will be reduced from two lanes to only one. This would result in extensive delays and queuing for residents. Access to and from Loch Maree Avenue is likely to be disrupted for local residents.
- The proposed light and heavy vehicle movements cannot be incorporated into the current traffic flow on Pennant Hills Road without negatively contributing to already unacceptable congestion.
- Concern about the ability of the Pennant Hills Road / Loch Maree Avenue / Phyllis Avenue intersection to cope with construction traffic from the project. The Pennant Hills Road / Loch Maree Avenue intersection is already at failure point.
- Concern that the proposed left turn into Loch Maree Avenue from Pennant Hills Road would require the trucks to turn from the outside lane because of existing congestion. When leaving the site the trucks would have to cross three lanes of congested traffic in order to turn into Phyllis Avenue.
- Concerns of major negative impacts on local neighbourhood roads (around Trelawney Street compound) and street traffic congestion.

Submissions suggest alternatives including:

- Provision of alternative temporary traffic light intersection with a left turn on red and right-turning green arrow to alleviate congestion. This could be done at Nelson Street which would be a suitable alternative for residents.
- Light vehicles to access the site directly on and off Pennant Hills Road.
- No access on and off Loch Maree Avenue or Trelawney Street.
- Change the traffic light phasing at Loch Maree Avenue to give longer time for trucks to turn out.
- Traffic lights on the north side of Loch Maree Avenue to be moved back to allow room for trucks to turn.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the Trelawney Street compound (C7).

Changes made to access arrangements at the Trelawney Street compound are detailed and assessed in **Section 9.4** of this report. The revised construction traffic assessment indicates that the new proposed haul route arrangements would result in improvements to the Pennant Hills Road / Loch Maree intersection compared to those identified in the environmental impact statement.

Trucks may be required to turn from the middle lane of Pennant Hills Road when turning left into Loch Maree Avenue. This is commonly carried out by heavy vehicles across the road network.

Issue description

Submissions raised concerns that increased pedestrian movements due to construction workers at the Trelawney Street compound (C7) crossing to the McDonald's on the other side of Pennant Hills Road will result in increased congestion and travel delays along Pennant Hills Road.

Response

A roaming canteen would be provided at the project construction sites, which would limit the need for pedestrian movements across Pennant Hills Road.

Construction workers would be required to lawfully cross Pennant Hills Road at marked pedestrian crossings at traffic lights, as is the case with all members of the public. There is no proposal to alter the timing of traffic lights and all pedestrians would be required to cross Pennant Hills Road within the same crossing times currently provided along that road.

Pioneer Avenue compound (C8)

Issue description

Submissions relating to construction traffic raised issues regarding the Pioneer Avenue car parking site. Submissions acknowledged the provision was beneficial, however the light vehicles and buses accessing the Pioneer Avenue site would still have an impact on local traffic. Intersections in the vicinity are already at failure point. The proposed main entrance at Lymoore Street is a one way lane and exits onto a school zone.

Submissions suggest a direct link on and off Pennant Hills Road for vehicle access to the Pioneer Avenue site be established.

Response

The Pioneer Avenue compound is being provided as a dedicated construction worker facility in order to reduce local impacts around construction compounds such as worker parking. Whilst there may be some deterioration of intersection performance around the Pioneer Avenue facility, these impacts would be offset by the significant benefits around construction compounds for the project as a whole. To mitigate some of the traffic impacts around the Pioneer Avenue compound, the Lymoore Avenue access would be upgraded as part of the establishment works to ensure it is suitable for its intended use.

Options to reduce the potential traffic impacts from this site will be considered during the development of Traffic Management Plans, which may involve staggered shift change times, or shift change times outside of existing traffic peaks.

A direct link from Pennant Hills Road to the Pioneer Avenue site is not practical due to the presence of the Northern Railway Line.

8.6.3 Public transport and emergency services

Fifty nine submissions raised issues regarding public transport and emergency services during construction.

Issue description

Submissions relating to construction traffic raised concerns regarding public transport and emergency services.

In summary, the submissions raised the following issues:

- The proposed heavy vehicle route at the southern interchange compound (C5) is unacceptable and will negatively impact on Aiken Road bus routes and bus commuters.
- Emergency vehicles would incur difficulties in navigating Aiken Road due to the number of trucks proposed – there are two nursing homes/ retirement villages off Hill Road (access via Aiken Road).

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Aiken Road and Eaton Road.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

Issue description

Submissions relating to construction traffic raised issues regarding the public transport and emergency services.

In summary, the submissions raised the following issues:

- Concern of impacts to the police, fire brigade, hospitals and bus services along Pennant Hills Road.
- Concern over the impact of increased congestion on the response times of these services.
- Request that construction heavy vehicles be excluded or reduced along Pennant Hills Road.
- Request the M1 Pacific Motorway and the Hills M2 Motorway should be used to transport spoil.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5), Trelawney Street compound (C7) and the northern interchange compound (C9). Changes made to these access arrangements are detailed and assessed in **Section 9.4** of this report.

Spoil removal sites have been spread along the tunnel alignment in order to reduce the potential impacts at any one location. Removing spoil from the two ends of the project is likely to result in significantly increased impacts in those two locations due to the increased trucks movements required. This would also be likely to increase the construction duration as space to store spoil is limited. The locations for spoil disposal have yet to be finalised.

Access and egress routes for spoil trucks would continue to be examined in consultation with Roads and Maritime and the Traffic Management Centre during the development of Traffic Management Plan and Traffic Control Plans to ensure that potential impacts on the surrounding road network and the local community are minimised where feasible and reasonable.

As part of the development of the Traffic Management Plans, NorthConnex would also consult with the relevant emergency service providers to ensure appropriate measures are in place to allow appropriate response times. This may include measures such as the use of construction zones by emergency services to bypass traffic.

8.6.4 Impacts to pedestrians and cyclists

Fifty eight submissions raised issues regarding the impacts to pedestrians and cyclists during construction.

Issue description

Submissions relating to construction traffic raised issues regarding potential impacts to pedestrians and cyclists from the project.

In summary, the submissions raised the following issues:

- Request detailed travel routes and traffic management to ensure alternative cycle routes are viable and are upgraded to a suitable standard for cycling during construction.
- Request the employment of suitable independent consultants experienced in cycling infrastructure design.
- Object to the requirement of cyclists having to dismount and walk through diversions.
- Request provisions for frequent maintenance of alternate cycling routes including vegetation overgrowth cut-back and path cleaning (especially after adverse weather events).
- Request the establishment of detour and diversion facilities for cyclists to be compliant with the detailed traffic management plans before the commencement of construction.
- Request a suitable independent contractor experienced with cycling infrastructure design be appointed to manage the development of and oversight of cycling provisions.
- Request the incorporation of any recommendations of the Independent Cycling Infrastructure Consultant into the detour and diversion facilities, and into the design of the final project infrastructure.

Submissions request that conditions of approval applied to the project include:

- Independent contractor assessment of impacts and mitigation strategies for cycling and pedestrian access and safety associated with those ancillary works around the project corridor.
- Consideration of opportunities to integrate interim construction provisions for cycling and pedestrian elements into the surrounding street networks.

Detailed consultation should be carried out with cycling organisations to establish reasonable provisions and traffic management plans to cover the construction period.

Response

Alternative cycle routes would be designed by suitably qualified designers engaged by the NorthConnex project and would be constructed by the relevant NorthConnex construction contractor.

The nature of the design and construction of these facilities would be dependent on factors such as:

- The duration that the temporary route will be in use.
- The existing nature of the area and what can practically be designed and constructed.

Wherever feasible and reasonable, the design and construction of the alternative cycling facilities will be compliant with the relevant cycleway design guidelines.

Consultation would continue with the relevant cycling groups, such as Bike North, in relation to the design and construction of alternative cycling infrastructure.

Wilson Road compound (C6)

Issue description

Submissions relating to construction traffic raised issues regarding the Wilson Road compound.

In summary, the submissions raised the following issues:

- The proposal to maintain pedestrian access to Wilson Road from Pennant Hills Road, metres away from heavy vehicle movements is dangerous and reckless.
- Recommendation that the proposed pedestrian access from Pennant Hills Road into Wilson Road be discarded to prevent dangerous pedestrian movements near heavy vehicle movements.

Response

The project is committed to providing a safe environment for surrounding pedestrians to navigate around the construction sites. As identified in Section 7.1.5 of the environmental impact statement, detailed Traffic Management Plans and Traffic Control Plans would be prepared for each construction site, in line with the Roads and Maritime Traffic Control at Worksites Manual and Australian Standard AS1742. These plans would document the site specific construction traffic measures. Depending on the nature of the site and anticipated number of pedestrians this may include measures such as closure of the footpath to pedestrians and provision of suitable and signposted alternatives, or controlled crossing of construction access points using construction personnel to safely direct pedestrians past the access point.

Trelawney Street compound (C7)

Issue description

Submissions relating to construction traffic raised issues regarding Trelawney Street compound (C7).

In summary, the submissions raised the following issues:

- Concerns of impacts on pedestrians crossing Pennant Hills Road at the intersections of Loch Maree Avenue and Duffy Avenue and for school students alighting buses on the corner of Pennant Hills Road and Loch Maree Avenue.
- Request signage to remind truck drivers that pedestrians also use the intersection.
- Request the relocation of the bus stop away from the Loch Maree Avenue entry to the Trelawney Street compound.

Response

The volume of traffic generated by construction is expected to be relatively low when compared to the existing traffic volumes on Pennant Hills Road, the Pacific Highway, the Hills M2 Motorway and the M1 Pacific Motorway. For example, along Pennant Hills Road the project would generate around 2,675 heavy vehicles per day and 1,240 light vehicles per day. This compares to the current volumes on Pennant Hills Road (for the section north of the Hills M2 Motorway) of around 79,000 vehicles in total of which around 11,000 are heavy vehicles.

As the volume of traffic generated by construction is expected to be relatively low compared to existing traffic, the effects of this short-term increase on the existing road network is not expected to significantly affect road safety in the project area.

It is acknowledged that the access and egress point to and from construction compounds and worksites would introduce an interface between construction traffic, pedestrians and potentially cyclists. Site specific traffic management plans and traffic controls plans would be developed in order to effectively manage this interface. This may include measure such as temporary diversions for pedestrians and cyclists, and traffic controllers at access / egress points.

Additional information regarding road safety during construction is provided in Section 7.1.4 of the environmental impact statement.

Issue description

Submissions raised concerns that residents currently use the footpath along Pennant Hills Road between Trelawney Street and Loch Maree Avenue. An alternative safe path should be provided if this is lost during construction.

Response

It is acknowledged that the access and egress point to and from construction compounds and worksites would introduce an interface between construction traffic and pedestrians. Site specific Traffic Management Plans and Traffic Controls Plans would be developed in order to effectively manage this interface. This may include measures such as temporary diversions for pedestrians, and traffic controllers at access / egress points.

Additional information regarding pedestrian safety during construction is provided in Section 7.1.4 of the environmental impact statement.

Southern interchange compound (C5)

Issue description

Submissions relating to construction traffic raised issues regarding the Southern interchange compound (C5).

In summary, the submissions raised the following issues:

- The proposed heavy vehicle route near the southern interchange compound (C5) is unacceptable and will negatively impact residents and school children on foot. Crossing Eaton Road, Karloon Road and Oakes Road will become very unsafe.
- Request for a pedestrian crossing with lights or a zebra crossing on Oakes Road.
- Increased traffic in Savoy and Lisle Courts will put pedestrians including young children at risk.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5).

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

Savoy Court and Lisle Court are not anticipated to be utilised for construction vehicle access or egress. If use of these streets is required to access or egress works around the existing Hills M2 Motorway detention basin it would be limited in terms of number of vehicles and timeframe. In this case, appropriate controls would be implemented to manage the potential safety risk to the local community.

Northern interchange compound (C9)

Issue description

Submissions requested that the footpath from Hewitt Avenue to Pennant Hills Road be retained during construction as the alternative route is inconvenient.

Response

The pedestrian path between Hewitt Avenue and Pennant Hills Road may need to be closed during the construction period to ensure the safety of the public.

Opportunities to keep this path open, or to limit closures to short periods will be investigated during detailed design and construction planning. In the event the path is required to be closed, a suitable alternative will be provided.

8.6.5 Traffic safety

Fifty six submissions raised issues regarding traffic safety during construction.

Southern interchange compound (C5)

Issue description

Submissions relating to construction traffic raised issues regarding traffic safety at the Southern interchange compound (C5).

In summary, the submissions raised the following issues:

- Concerns that heavy vehicles using Karloon Road, Aiken Road, Oakes Road and Eaton Road will present a safety hazard.
- Concerns that heavy vehicles using Karloon Road, Aiken Road, Oakes Road and Eaton Road will restrict property access and result in dangerous conditions.
- Request consideration of an alternative route for the safety of residents.
- Concerns of safety for users (mostly children) of Savoy Court with increased heavy vehicle access.
- Heavy vehicle using local roads (Aitken, Oakes, Eaton and Karloon Roads) would increase the risk of traffic accident.
- If there has been no safety audit how can the proposed traffic arrangements be declared the most appropriate? Safety for all road users should be a primary consideration.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Karloon Road, Aiken Road, Oakes Road and Eaton Road.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

Savoy Court and Lisle Court are not anticipated to be utilised for construction vehicle access or egress. If use of these streets is required to access or egress works around the existing Hills M2 Motorway detention basin it would be limited in terms of number of vehicles and timeframe. In this case, appropriate controls would be implemented to manage the potential safety risk to the local community.

Trelawney Street compound (C7)

Issue description

Submissions relating to construction traffic raised issues regarding traffic safety at the Trelawney Street compound (C7).

In summary, the submissions raised the following issues:

- Increase in traffic volumes on Loch Maree Avenue will increase the risk of traffic accidents.

- Concerns regarding trucks using a quiet street where children play and safety concerns with trucks using Pennant Hills Road / Loch Maree Avenue / Phyllis Avenue intersection.
- Heavy vehicles cross the Pennant Hills Road / Loch Maree Avenue / Phyllis Avenue intersection after the Pennant Hills Road lights have turned red, placing the safety of local residents at an unacceptable risk.
- Suggest that site access and egress should be via Pennant Hills Road only.
- The intersection at the bottom of Trelawney Street and Loch Maree Avenue is dangerous with no control signs. With congestion on Loch Maree Avenue, trucks will divert to the left and travel up Nelson Street to access Pennant Hills Road.
- Pennant Hills Road is curved near the point where the trucks will enter it and oncoming traffic will not see the trucks in time. What is the planned speed limit on Pennant Hills Road during construction?
- Traffic lights should be installed at Nelson Street / Pennant Hills Road to enable residents from within this catchment area to exit safely.
- A pedestrian crossing near the bus stop would be a valuable safety addition.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the Trelawney Street compound (C7).

Changes made to access arrangements at the Trelawney Street compound are detailed and assessed in **Section 9.4** of this report.

It is acknowledged that the access and egress point to and from construction compounds and worksites would introduce an interface between construction traffic, pedestrians and potentially cyclists. Site specific traffic management plans and traffic controls plans would be developed in order to effectively manage this interface. This may include measure such as temporary diversions for pedestrians and cyclists, traffic controllers at access / egress points and reduced speed limits in the vicinity of construction sites.

The installation of another set of traffic lights along this section of Pennant Hills Road would be likely to increase existing traffic congestion issues. Based on the revised assessment of construction traffic provided in **Section 9.4** of this report, provision of an alternative access for local residents around the Trelawney Street compound is not warranted.

Additional information regarding road safety during construction is provided in Section 7.1.4 of the environmental impact statement.

General safety concerns

Issue description

Concerns raised regarding traffic safety during construction including:

- Safety around schools in Wahroonga.
- Car accidents when leaving properties on Eastbourne Avenue. Pedestrian access and crossing the road could also be extremely dangerous.
- The proposed main entrance for the Pioneer Avenue compound (C8) at Lymoore Street exits onto a school zone. If shift change is around school hours this would be unsafe for children.

- Around Hewitt Avenue.
- Around the Junction Road compound.
- Truck movements along Pennant Hills Road.

Consultation needs to be carried out with schools and local councils to ensure safety of school children.

Response

The project team has consulted with the schools and the local councils in the vicinity of the project in order to understand their individual concerns and requirements. The project team would continue to work closely with schools in the vicinity to develop construction methods and mitigation measures which do not decrease the safety of school students.

The Community Communications Framework provided in Appendix D of the environmental impact statement identifies targeted consultation activities for specific environmental issues. In relation to construction traffic, local councils are identified as a key stakeholder. A Traffic and Transport Liaison Group would be established to discuss traffic management and road safety mater associated with the construction of the project. The Traffic and Transport Liaison Group would include representative from the relevant local councils.

The volume of traffic generated by construction of the project is expected to be relatively low when compared to the existing traffic volumes on the Pacific Highway and the M1 Pacific Motorway and the effects of this short-term increase on the existing road network is not expected to significantly impact road safety.

It is acknowledged that the access and egress point to and from construction compounds and worksites would introduce an interface between construction traffic, pedestrians and potentially cyclists. Site specific traffic management plans and traffic controls plans would be developed in order to effectively manage this interface. This may include measure such as temporary diversions for pedestrians and cyclists, and traffic controllers at access / egress points. In the case of Pioneer Avenue, this would also include the consideration of shift change over times in relation to school drop off and pick up times.

Additional information regarding road safety during construction is provided in Section 7.1.4 of the environmental impact statement.

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8.7 Operational traffic

8.7.1 Traffic forecasts and modelling

Ninety one submissions raised issues regarding the operation traffic forecasts and modelling.

Issue description

The existing traffic conditions are not convincingly established. Issues include:

- The exact traffic count stations are not identified.
- The mid-block counts in Table 3-7 of the Technical Working Paper: Traffic and Transport are not shown in the same detail as the rest of the assessment.
- The 14.4 per cent daily heavy vehicles in Table 3-7 of the Technical Working Paper: Traffic and Transport is not explained when the AM and PM peak heavy vehicles are lower. The source of this data has not been provided.
- There is a variance between the two way flows on the Hills M2 Motorway, the volume exiting the motorway at Pennant Hills Road and the two way flow on Pennant Hills Road.
- In some cases there appears to be only a small increase in traffic or even a decrease in traffic volumes when compared to the 2004 report. An explanation of this is required.
- The source of the information in Table 4-9 of the Technical Working Paper: Traffic and Transport should be provided as well as the source of the daily traffic counts for these mid-blocks.
- The source of the information in Table 4-10 of the Technical Working Paper: Traffic and Transport should be provided. An explanation for the change in intersection numbers from Table 3-8 should be provided.

Response

The Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) provides a thorough description of the existing traffic conditions. Responses to the specific questions raised are as follows:

- The location of existing traffic counts are shown on Figure 5-2 of the Technical Working Paper: Traffic and Transport.
- Table 3-7 of the Technical Working Paper: Traffic and Transport provides an indication of traffic numbers and heavy vehicle percentages along key sections of the network around the project. The information is provided with sufficient detail for the reader to gain an appreciation of the current situation on the surrounding road network.
- The higher percentage (14.4 per cent) of heavy vehicles as a daily figure compared to the lower percentage in the AM and PM peaks indicates that there is a higher percentage of heavy vehicles outside of the peak traffic periods. This is likely to be driven by a desire of heavy vehicle drivers to avoid the most congested periods on Pennant Hills Road. The relatively high percentage of heavy vehicles on Pennant Hills Road indicates its importance for freight movement. This data has been obtained from traffic counts conducted in late 2013 as part of the preparation of the environmental impact statement.
- The two way flow numbers on the Hills M2 Motorway, Pennant Hills Road and the volume exiting onto Pennant Hills Road cannot simply be balanced. The two way flows are static count locations and do not take into account vehicles which perform turning movements at the intersection or the direction in which they travel.

- Changes in traffic patterns since the 2004 report may be caused by a number of factors. The relatively small increase or even a decrease in some sections may be due to capacity constraints on the network and the behaviour of motorists to seek alternatives to heavily congested routes.
- The data in Table 4-9 of the Technical Working Paper: Traffic and Transport has been obtained from traffic counts conducted in late 2013 as part of the preparation of the environmental impact statement. A traffic impact assessment is concerned with the peak periods and the potential impacts to the network during those peak periods. As such, daily traffic counts (rather than peak hour traffic counts) for these mid-blocks are not a necessary inclusion. Daily traffic counts are provided for a number of mid-blocks in Table 3-7 of the Technical Working Paper: Traffic and Transport.
- The data in Table 4-10 of the Technical Working Paper: Traffic and Transport has been obtained from traffic counts conducted in late 2013 as part of the preparation of the environmental impact statement. Table 4-10 provides data for relevant intersections along Pennant Hills Road to establish a base case for intersection performance. Table 3-8 is intended to provide the reader with an understanding of the daily vehicle numbers across the network.

Issue description

Questions raised regarding the future conditions without the project. Issues include:

- More intersections should be shown in Table 6-1 of the Technical Working Paper: Traffic and Transport. The growth rates for traffic volumes presented in the table have not been explained and there are two variances with data presented in Table 3-8.
- There are variances between Table 6-2 and Figure 8-1 in the Technical Working paper: Traffic and Transport in relation to the 'without project' numbers between Comenarra Parkway and the Pacific Highway. The 2013 traffic numbers should be shown.
- The value of the data presented in Table 6-3, Table 6-4 and Table 6-5 of the Technical Working Paper: Traffic and Transport is limited if a base has not been well established.
- Table 6-18 and Table 6-19 of the Technical Working Paper: Traffic and Transport provide information on the surrounding road network. This level of detail should also be provided for key mid-blocks on Pennant Hills Road.

Response

The Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) provides a thorough description of the future traffic conditions without the project. Responses to the specific questions raised are as follows:

- Table 6-1 of the Technical Working Paper: Traffic and Transport is intended to show the daily vehicle numbers across the network to provide the reader with an understanding of the natural growth in the traffic from 2013 to 2019 and to 2029. It is not necessary to show every intersection in order for the reader to gain a general appreciation of background traffic growth.
- The growth rates in traffic data presented in Table 6-1 are a result of the key factors on which the strategic traffic modelling has been based, including issues such as population growth, development and augmentation of the major road network (as some examples The inputs to the strategic traffic modelling are provided in Chapter 5 of the Technical Working Paper: Traffic and Transport.
- The variances between data presented in Table 3-8 and Table 6-1 relate to two intersections: a 10 heavy vehicle per day variance at the M1 Pacific Motorway/ Pennant Hills Road interchange and a 10 heavy vehicle per day at the Pennant Hills Road/ Pacific Highway interchange. These variances relate to different rounding

approaches taken in the two tables and do not materially affected the traffic impact assessment or its outcomes.

- The modelled traffic volumes presented in Table 6-2 of the Technical Working Paper: Traffic and Transport are the correct values and were used for the purpose of the traffic impact assessment. This only affects data presented in Figure 8-1 for Pennant Hills Road, Comenarra Parkway to Pacific Highway.
- Table 6-2 presents forecast future traffic conditions in 2019 and 2029 without the project. Traffic data from 2013 is not relevant to the comparison presented in Table 6-2.
- The mid-blocks and intersections in Table 6-3, Table 6-4 and Table 6-5 of the Technical Working Paper: Traffic and Transport can be related directly back to the mid-blocks and intersections in Table 4-9 and Table 4-10 which provide the 2013 performance.
- The same level of detail for mid-blocks along Pennant Hills Road is provided through comparison of Table 4-9 to Tables 6-3 and Tables 6-4.

Issue description

Questions raised regarding the operational traffic impact assessment. Issues include:

- Explanation of how Table 8-3 in the Technical Working Paper relates to Table 8-1 and Table 8-2 is required. In particular, explanation is required for how these traffic numbers have been converted to daily traffic numbers.
- There are variances between Table 8-4 and Figure 8-1 of the Technical Working Paper: Traffic and Transport in relation to the 'with project' numbers between the Comenarra Parkway and the Pacific Highway.
- An explanation is required for how Table 8-5 of the Technical Working Paper: Traffic and Transport showing the daily origin destination at the southern interchange relates to Table 8-4 showing the AM and PM peak in tunnel vehicle numbers. An explanation is required for why is there no light and heavy split in Table 8-5.
- The value of the data presented in Table 8-6, Table 8-7 and Table 8-9 of the Technical Working Paper: Traffic and Transport is limited if a base has not been well established.
- An explanation for the differences in vehicle numbers on the surrounding road network is required.
- The heavy vehicle split should be shown for the surrounding road network in Section 8.5 of the Technical Working Paper: Traffic and Transport. Traffic data from 2013 should also be shown.
- Details of the anticipated land use changes and road upgrades included in the strategic traffic model should be provided.
- An explanation for the increase of 10,500 vehicles on the M1 Pacific Motorway north of the project at opening should be provided.
- The change in vehicle numbers along the Pacific Highway to Comenarra Parkway section is the simplest indicator of tunnel traffic, however the reduction in this section does not match the numbers in the tunnel.
- Given the tunnel traffic is the same for all four sections of Pennant Hills Road, the percentage reduction in vehicle numbers along Pennant Hills Road should be the same.
- If the primary purpose of the tunnel is to provide a seamless connection from the Hills M2 Motorway to the M1 Pacific Motorway, an explanation is required for why most the vehicles to and from south travel along Pennant Hills Road.

- At the northern interchange without the project, the traffic to the north on the M1 Pacific Motorway and the Pacific Highway should equal the traffic to the south on the Pacific Highway and Pennant Hills Road. And in the 'with project' case there is also a variance when adding the tunnel traffic (using the origin destination numbers from the southern interchange). This leads to a variance in traffic numbers around Pearces Corner.
- An explanation for why some intersections improve with the project and others get worse is required. An assessment of secondary roads should also be provided.

Response

The Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) provides a thorough assessment of operational traffic impacts with the project. Responses to the specific questions raised are as follows:

- Table 8-3 of the Technical Working Paper: Traffic and Transport provides future traffic numbers within the project tunnels. Table 8-1 and Table 8-2 provide traffic numbers in 2019 and 2029 along Pennant Hills Road with and without the project. There is no simple relationship between the data presented in these tables.
- The traffic impact assessment is concerned with the AM and PM peak periods only. It is not necessary to convert peak hour traffic numbers to daily traffic volumes for the purposes of a traffic impact assessment.
- The modelled traffic volumes presented in Table 8-4 of the Technical Working Paper: Traffic and Transport are the correct values and were used for the purpose of the traffic impact assessment. This only affects data presented in Figure 8-1 for Pennant Hills Road, Comenarra Parkway to Pacific Highway.
- There is no simple relationship between the daily origin destination numbers in Table 8-5 of the Technical Working Paper: Traffic and Transport and the AM and PM mid-block in-tunnel numbers in Table 8-4. The intent of Table 8-5 is to show the major traffic movements at the southern interchange and the reasons why a motorway-to-motorway east facing connection is not justified. It is not necessary to show the split between light and heavy vehicles for the purpose of this demonstration.
- The mid-blocks and intersections in Table 8-6, Table 8-7 and Table 8-9 of the Technical Working Paper: Traffic and Transport can be related directly back to the mid-blocks and intersections in Table 4-9 and Table 4-10 which provide the 2013 traffic performance. Further, this can be related back to the 'without project' performance in the same years shown in Table 6-3, Table 6-4 and Table 6-5.
- New infrastructure of the scale of the NorthConnex project can lead to a redistribution of traffic throughout the local network. This can be due to factors such as traffic seeking to get to the project tunnels.
- Section 8.5 of the Technical Working Paper is intended to present the potential changes to the broader road network as a result of the project. A detailed comparison of vehicle types is not required for this purpose. It is relevant to compare the same year with and without the project only for these roads.
- Details of inputs into the strategic traffic model are provided in Section 5.2.2. of the Technical Working Paper: Traffic and Transport.
- An increase in vehicles on the M1 Pacific Motorway north of the project at opening is likely due to vehicles using the project and subsequently the M1 Pacific Motorway who may have previously sought an alternative route. The traffic assessment shows that this section of the motorway would continue to operate at a good level of service with these additional vehicles.
- The derivation of vehicle numbers in the project tunnels is not as simple as a comparison to the expected future reductions in vehicle numbers along Pennant Hills Road. Future vehicle numbers on Pennant Hills Road would be affected by other

factors such as increased congestion, and tunnel traffic would be affected other factors such as the inducement of traffic into a motorway standard free flowing network.

- As identified above, future traffic flows in the project tunnels are not as simple as a direct reduction in vehicle numbers on Pennant Hills Road. There are numerous opportunities to enter and exit Pennant Hills Road along its length. A future with the tunnel in place may attract motorists to use certain sections of Pennant Hills Road for a certain desirable movement which would result in different percentage changes in vehicle numbers at different points along Pennant Hills Road.
- It is expected that the majority of heavy vehicles would connect to and from the Hills M2 Motorway. The vehicle numbers to and from Pennant Hills Road south include all vehicles and total vehicle numbers may be skewed by a higher number of light vehicles (rather than a significant contribution from heavy vehicles). It is noted that there are highly developed areas to the south of the project and motorists from these areas may find it attractive to use Pennant Hills Road south, particularly once the project is operational. Pennant Hills Road would also continue to be used by heavy vehicles servicing local commercial and industrial developments.
- Traffic volumes to the north on the M1 Pacific Motorway and the Pacific Highway are not necessarily the same as traffic volumes to the south on Pennant Hills Road and the Pacific Highway. These traffic numbers cannot necessarily be directly compared. These numbers do not reflect turning movements between these roads or vehicles which may leave the arterial roads and join the local road network in this area.
- The origin destination numbers at the southern interchange cannot be used as tunnel traffic numbers at the northern interchange. A large number of these vehicles would be continuing past Pearces Corner within the tunnels and continuing travel along the M1 Pacific Motorway. They would therefore not appear in traffic numbers at the northern interchange.
- The presence of new infrastructure usually leads to a redistribution of traffic across the surrounding road network. This can result in improvements at some intersections and minor deteriorations at others. It is not necessary to model secondary roads. The forecast improvements along Pennant Hills Road would be expected to flow onto the local road network.

Issue description

Concerns regarding traffic modelling raised suggestions that the M1 Pacific Motorway and the Pacific Highway should have been included in the traffic impact assessment in more detail.

Response

The Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) provides consideration of these two roads and potential changes to performance. It is noted that improvements along the Pacific Highway are outside the scope of the NorthConnex project.

Issue description

Submissions relating to operational traffic raised concerns that the environmental impact statement makes no attempt to evaluate impacts of increased traffic on suburban streets as a result of people finding the best means and shortcuts to access the tunnel or from increased access to local roads from the tunnel (such as Russell Avenue and around the southern interchange).

Response

The environmental impact statement provides an assessment of operational traffic in accordance with the Director-General's environmental assessment requirements.

The strategic traffic model used to determine the forecast traffic movements on which the environmental impact statement has been based takes into account a suite of factors, including motorist behaviour and response to tolling arrangements.

The traffic impact assessment in Section 7.1 and Appendix E of the environmental impact statement shows that the majority of intersections along Pennant Hills Road would remain at a similar level of service or show an improvement in the level of service under the 'with project' scenario in both 2019 and 2029. A small number of intersections show a marginal deterioration in intersection performance. These are mainly associated with the interchanges where new traffic movements are necessary to facilitate connections to and from the project.

Based on the expected reduction in vehicles using Pennant Hills Road, there are anticipated to be flow-on benefits to the surrounding suburban road network.

Issue description

Submissions raised concerns regarding to the traffic projections for the project, including:

- Traffic projections for tunnels are usually very optimistic. The number of cars and trucks that actually use newly constructed tunnels turn out to be much lower than forecast.
- Concerns that the project will inevitably be gridlocked soon after completion.
- The traffic projections are not realistic.
- Various tables on AADT, AM/PM peak traffic and AWDT are provided without giving the conversion factors.
- Traffic forecasts should be amended to include calculations for three different scenarios: low, reference and high.
- The traffic forecasts in the environmental impact statement show a high rate of increase until 2019 then very little increase from 2019 to 2029 without explanation.
- There are no traffic forecasts for traffic from the portals.

Given this recent history, it is reasonable to question the accuracy of the current estimates in relation to traffic volumes. Traffic forecasts by consultants are regularly incorrect.

It appears that the basis for estimating future traffic flows is based on the developer's model rather than being obtained from or estimated by independent sources. Future traffic flow information should be provided by an independent party.

Response

The environmental impact statement presents modelled operational traffic flows in the year of opening (2019) and ten years after opening (2029). The forecast performance of the main alignment tunnels is provided in Table 7-26 of the environmental impact statement. This table shows that the main alignment tunnels would operate with a level of service ranging from A to C. This indicates that the main alignment tunnels would operate as free flowing traffic with spare capacity.

The traffic volumes used for the operational traffic assessment are based on a strategic traffic model. This strategic traffic model used for the project has been carried out by the motorway operator and has been developed, progressively updated and enhanced. The forecasting approach comprises:

- A strategic highway network model of the Sydney metropolitan area including Sydney's motorway network and all major state roads within the network.
- Anticipated future land use as a basis for estimating future travel demand for cars and trucks.
- Anticipated changes and updates to the road network up until 2031.
- Representation of future vehicle travel demand to model varying travel patterns and behaviours.
- Explicit modelling of all tolls, existing and future, on the network.
- Accommodation of different motorist behaviours including willingness to pay a toll to save travel time.

Numbers for AWDT, AADT, and AM/PM peak periods are identified through traffic counts or through traffic modelling. There is not a set relationship between these numbers such that simple conversion factors can be provided.

Further details regarding the assumptions including predicted land use and population changes are provided in the traffic and transport technical working paper in Appendix E of the environmental impact statement.

Issue description

Submissions raised concerns relating to the traffic forecasts and modelling for the project.

In summary, the submissions raised the following issues:

- Concern of the dangerous goods allowance within the tunnel. Concern that this would prevent heavy vehicles from using the tunnel resulting in the majority continuing to use Pennant Hills Road.
- The environmental impact statement does not present information regarding the proportion of heavy vehicles that would be exempt from using the tunnel. Information on the proportion of heavy vehicles that would be exempt from using the tunnel and how this proportion was estimated or monitored needs to be provided.

Response

For safety reasons, vehicles carrying dangerous goods would not be permitted to use the tunnels.

In 2011, the Audit Office of New South Wales conducted a performance audit of the Office of Environment and Heritage and WorkCover NSW concerning the discharge of the regulatory responsibilities of those agencies in relation to the transport of dangerous goods (The Audit Office of New South Wales, May 2011). The audit report states that around 10 to 15 per cent of domestic freight constitutes dangerous goods. If all heavy vehicles travelling along Pennant Hills Road are conservatively assumed to be associated with domestic freight transport, then up to around 10 to 15 per cent of those heavy vehicles could be expected to be carrying dangerous goods. The remainder of heavy vehicles, around 85 to 90 percent, could be directed to use the NorthConnex project tunnels unless those vehicles were for local deliveries.

As such, the majority of trucks would be allowed to use the tunnels. Additionally, the NSW Government will be introducing regulatory measures to force heavy vehicles (other than dangerous good vehicles of those with a genuine destination along Pennant Hills Road) to use the NorthConnex project rather than surface roads. These measures may include introducing, or changing the operation of existing, traffic control facilities, advisory and / or regulatory signage, route designations, notices, application of permits, or other traffic measures. Any regulatory measures that have the effect of regulating heavy vehicles would need to be consistent with the objectives of the National Heavy Vehicle Law, where applicable.

Regulatory measures under consideration also include a potential penalty for non-compliance, for certain classes of heavy vehicles using the surrounding road network. Enforcement measures might include structures, upon which equipment associated with enforcement may need to be mounted (such as cameras or other equipment).

Issue description

Concerns regarding the volume of traffic which will turn left at Pacific Highway onto Pennant Hills Road to enter the tunnels to travel south. This will impact accessing the townhouses from Pacific Highway in this area.

Response

Motorists who currently wish to travel south from the Pacific Highway towards the Hills M2 Motorway currently need to perform this same turning movement from Pacific Highway to Pennant Hills Road. The provision of the project is not expected to result in a significant increase in motorists travelling south by this route. As such, there is not anticipated to be any impact to access to these townhouses.

Issue description

Concerns that the traffic forecasts for the project are unacceptable. Forecasts only account for the years up until 2029, even though the concession period goes up to 2048.

Response

The traffic assessment presented in Section 7.1 and Appendix E of the environmental impact statement has been carried out in accordance with the Director-General's environmental assessment requirements.

Traffic impacts are typically assessed for the year of opening (to show the potential impacts from the opening of new infrastructure) and ten years after opening (to show the predicted impacts once the traffic network has accommodated the new infrastructure).

Issue description

Submissions relating to traffic forecasting and modelling raised issues with inconsistent information in the environmental impact statement.

Statements that Pennant Hills Road carries 80,000 vehicles per day, but then also says traffic growth on Pennant Hills Road near Beecroft Road was stagnant for the period 2010 to 2013 at around 62,000 vehicles per day due to capacity limits.

Response

The volume of 80,000 vehicles per day does not necessarily mean 80,000 vehicles per day through each intersection or that each intersection has a capacity of 80,000 vehicles per day. The same table which identifies that growth on Pennant Hills Road near Beecroft Road

was stagnant at around 62,000 vehicles per day also identified that the volume of traffic on Pennant Hills Road near Castle Hill Road is around 82,000 vehicles per day.

Issue description

According to Table 8-4 of the Technical Working Paper: Traffic and Transport AWDT between the Hills M2 Motorway and North Rocks Road would be 27,900+33,800 (no saving from the "without project" AWDT of 27,850+32,000). But then there would be an additional 17,791 vehicles on the Pennant Hills Road south of the Hills M2 Motorway from the tunnels, increasing traffic by 29 per cent, already in 2019.

It is doubtful whether the level of service E (already downgraded from D) between Hills M2 Motorway and North Rocks Road has been properly calculated, given that Pennant Hills Road south of the North Rocks Road intersection continues with two lanes only up to Carlingford Court. If this section is clogged up, traffic will back up north into the tunnel. This detail alone will make the tunnel unusable during the AM peak. Additional traffic from developments in Carlingford and Epping will further add to the problem.

Similar origin destination data for the northern exit have not been provided.

Response

The 17,791 vehicles exiting the southbound tunnel and continuing south along Pennant Hills Road are already included in the numbers in Table 8-4 of the Technical Working Paper: Traffic and Transport. As such, there would not be a 29 per cent increase in traffic on this section of road.

Origin destination data was the provided for the southern interchange in order to identify the main desire lines for traffic movements. This data explains why a direct motorway-to-motorway connection from NorthConnex to the Hills M2 Motorway east is not justified.

Issue description

The NorthConnex project claims that it would remove 5,000 trucks from Pennant Hills Road per day. The peak period heavy vehicle numbers in the environmental impact statement indicate there would be 1,350 vehicles in the tunnels during the peak period. If this equates to 1,500 heavy vehicles across the entire day, further explanation of the destination of the remaining 3,500 heavy vehicles removed from Pennant Hills Road is required.

The environmental impact statement suggests that Epping to Thornleigh Third Track would take up this freight movement.

Response

The 1,350 heavy vehicles referred to in the environmental impact statement relates to the AM and PM peak hours. Traffic forecasts indicate that around 4,200 heavy vehicles would use the project tunnels in each direction per day in 2019, and around 4,900 heavy vehicles would use the project tunnels in each direction per day in 2029.

In relation to Epping to Thornleigh Third Track project, Section 5.2.2.3 of the Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) provides a discussion of this project. This identifies that any future capacity increase from the Epping to Thornleigh Third Track would be taken up by projected freight growth by around 2031. As such, the Epping to Thornleigh Third Track project is unlikely to impact heavy vehicle movements on Pennant Hills Road.

Issue description

Submissions relating to traffic forecasting and modelling raised concerns that the traffic impact assessment is inadequate and misleading. Issues raised include:

- Traffic modelling used for the operational stage of the project only considers data from and the impact on Pennant Hills Road. It does not address the issue of the two entries to the southern interchange compound proposed for Eaton Road.
- No assessment of the impact of these vehicles on the local road system has been undertaken.
- Traffic associated with the site is anticipated to include, but not limited to, staff, maintenance, delivery, emergency and garbage collection vehicles.

Request that a comprehensive traffic study which investigates the existing traffic conditions at the intersection of Karloon Road/ Eaton Road/ Pennant Hills Road be prepared that factor in the proposed construction related vehicular movements. This traffic study should be completed and released to residents for comment prior to consent being granted.

Response

The volume of traffic access and egressing the motorway operations complex during the operation stage is expected to be relatively minor. The addition of these vehicle would not be result in deterioration of intersection performance.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Aiken Road, Oakes Road, Karloon Road and Eaton Road.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

During construction, Traffic Management Plans would be developed and implemented to manage the movement of vehicles to and from the project site and to ensure that vehicle movements are conducted in a manner that minimises impacts on local amenity, traffic flows and road safety.

Issue description

Submissions relating to traffic forecasting and modelling raised concerns that the estimated travel time savings have been overestimated and that it is not possible to travel nine kilometres in five to six minutes with a speed limit of 80 kilometres per hour.

Requests for more realistic travel times to be provided for the community to consider.

Response

The project tunnels are not exactly nine kilometres in length. Even assuming the tunnels are exactly nine kilometres in length, the travel time (at 80 kilometres per hour) would be 6.75 minutes. This represents a significant travel time savings over the alternative of using Pennant Hills Road.

The forecast performance of the main alignment tunnels is provided in Table 7-26 of the environmental impact statement. This table shows that the main alignment tunnels would operate with a level of service ranging from A to C indicating that the tunnels would operate as free flowing conditions at all times. Under these conditions there is no reason why a motorist would not be able to pass through the tunnels at 80 kilometres per hour.

8.7.2 Network performance

Eighty seven submissions raised issues regarding the operational network performance.

General concerns

Issue description

Submissions raised concerns that the NorthConnex project simply increases road capacity in a congested network and therefore induces traffic and acts to increase congestion.

Response

The predicted network performance for the NorthConnex tunnels and Pennant Hills Road is provided in Section 7.1 and Appendix E of the environmental impact statement.

This shows that the majority of intersections along Pennant Hills Road would remain at a similar level of service or show an improvement in the level of service under the 'with project' scenario in both 2019 and 2029. A small number of intersections show a marginal deterioration in intersection performance. These are mainly associated with the interchanges where new traffic movements are necessary to facilitate connections to and from the project.

The forecast performance of the main alignment tunnels is provided in Table 7-26 of the environmental impact statement. This table shows that the main alignment tunnels would operate with a level of service ranging from A to C. This confirms that the southbound off-ramp would not impact on the operation of the main alignment tunnels and the main alignment tunnels would operate under free flowing traffic conditions with spare capacity.

Issue description

Submissions raised concerns that the NorthConnex project will impact wider Sydney by delivering in excess of 5,000 vehicles per day into the Macquarie Park and North Ryde Business Parks.

Response

NorthConnex is designed to primarily cater for through movements and freight movement from the M1 Pacific Motorway to the Hills M2 Motorway west of Pennant Hills Road. Although it may increase the efficiency of a journey to Macquarie Park and North Ryde, it is not expected to result in additional vehicles travelling to these destinations.

Issue description

Submissions raised concerns that the NorthConnex project would result in heavy vehicle bypassing the current lay-by area at the southern end of the M1 Pacific Motorway. Suggest that these heavy vehicles would go via the Pacific Highway to use the lay-by area at Berowra. Other provisions should be provided as part of the project.

Response

NorthConnex and Roads and Maritime have undertaken consultation with peak trucking associations to understand the needs of the heavy vehicle operators. It is noted that alternative lay-by area for heavy vehicle drivers are available along the M1 Pacific Motorway including around the Hawkesbury River crossing and at the twin service stations.

The travel time savings delivered by the NorthConnex project may result the need for a lay-by in this location redundant.

Pennant Hills Road

Issue description

The existing Cumberland Highway (Pennant Hills Road) needs to be retained for use by local traffic.

Response

NorthConnex does not propose to reduce the capacity or operation of Pennant Hills Road. In future, there may be separate projects that consider changes or enhancements along Pennant Hills Road, and these would be subject to appropriate assessment, consultation and approval in accordance with the *Environmental Planning and Assessment Act 1979*.

As part of the NorthConnex project, only limited localised changes to Pennant Hills Road (in terms of functionality) would be required to accommodate the new northern and southern interchanges. Beyond these required changes, the project does not propose to make any other alterations to Pennant Hills Road.

Issue description

Submissions raised concerns relating to the operational network performance for the project.

In summary, the submissions raised the following issues:

- The tunnel will not help residents who live mid-way along the tunnel alignment.
- Traffic problems are likely to increase once the tunnel opens.
- Belief that the project will not fix local road congestion in the long term and within 10 years the project will make no difference to Pennant Hills Road.
- Travel times on Pennant Hills Road will increase by 50 per cent southbound in the AM peak and 25 per cent northbound in the PM peak for the first 10 years of operation. Travel time savings of up to 15 minutes means savings could be down to seven minutes or less during congestion.
- The environmental impact statement concludes that the AM and PM traffic peaks along Pennant Hills Road are unlikely to be resolved by the NorthConnex project. Poor intersection performance along Pennant Hills Road would continue to be experienced in the future, particularly at Copeland road and Comenarra Parkway.
- Concerns about increased congestion within the road network including suburban streets from people using shortcuts to access the tunnel, especially Oakes Road as the only road from the West Pennant Hills Valley to get to the tunnel.
- The proposed northern interchange is very disruptive to traffic around Pearces Corner causing unnecessary stop-start traffic. The on and off-ramps should be directly to and from Pennant Hills Road. The changes at the northern interchange may mean more people will use the route via College Crescent, Milson Parade, Sefton Road and The Esplanade as an alternative to Pennant Hills Road.
- Opening more roads would entice more cars onto the road. The capacity freed up by the removal of trucks off Pennant Hills Road will quickly be taken up by cars.

Response

At opening, the NorthConnex project would provide capacity for an additional two lanes of traffic in each direction between the Hills M2 Motorway and the M1 Pacific Motorway in addition to the existing three lanes in each direction on Pennant Hills Road. The capacity of Pennant Hills Road will not be altered as part of the NorthConnex project.

The traffic impact assessment in Section 7.1 and Appendix E of the environmental impact statement shows that the majority of intersections along Pennant Hills Road would remain at

a similar level of service or show an improvement in the level of service under the 'with project' scenario in both 2019 and 2029. A small number of intersections show a marginal deterioration in intersection performance. These are mainly associated with the interchanges where new traffic movements are necessary to facilitate connections to and from the project. This assessment includes consideration of growth in traffic numbers over this period.

The project would also:

- Deliver significant travel time savings during peak hour. Table 7-36 of the environmental impact statement provides predictions of future travel times on Pennant Hills Road with and without the project. This identifies that travel time savings in 2029 would be around nine minutes southbound in the AM peak and 21 minutes northbound in the PM peak.
- Reduce truck movements along Pennant Hills Road.
- Bypass 21 sets of traffic lights east and westbound along Pennant Hills Road, providing more reliable and safer travel conditions.
- Improve air quality, reduce traffic noise and traffic congestion along Pennant Hills Road.
- Create opportunities for improving public transport.

Residents located mid-way along the project alignment would benefit from the project through improvements to local amenity and road safety along Pennant Hills Road. These residents would also benefit from reductions in traffic volumes along Pennant Hills Road, particularly heavy vehicles, which without the NorthConnex project are expected to significantly exceed the capacity of Pennant Hills Road.

Section 7.1 of the environmental impact statement and the Technical Working Paper: Traffic and Transport demonstrate that in 2029 most intersections along Pennant Hills Road would operate beyond their design capacity (level of service F and average delays in excess of 100 seconds) if the NorthConnex project is not constructed. With the implementation of the NorthConnex project, mid-block traffic volumes along Pennant Hills Road and volume to capacity (V/C) ratios are expected to improve in most cases (for both 2019 and 2029 scenarios). Improvements, particularly reductions in anticipated delays, are also anticipated at several intersections along Pennant Hills Road in 2019 and 2029.

The northern interchange provides a road network solution with minimal changes required to the existing traffic arrangement at Pearces Corner. The location of the on and off-ramps has been determined based on a balanced consideration of traffic performance and with an aim of minimising property acquisition requirements.

Issue description

Access to the Trelawney Street tunnel support facility should be from Trelawney Street and Loch Maree Avenue to not affect traffic on Pennant Hills Road.

Response

Access requirements for the Trelawney Street tunnel support facility during the operational phase would be for periodic maintenance activities only. These access requirements are anticipated to be relatively minor and are not expected to impact traffic performance on Pennant Hills Road.

Relocating the access point to Trelawney Street and / or Loch Maree Avenue would be likely to result in unnecessary impacts to the local community, including traffic, traffic noise and

general amenity impacts. These impacts would be avoided with direct access from Pennant Hills Road.

Issue description

What are the plans for the already congested Pacific Highway/ Pennant Hills Road intersection?

Response

Table 7-28 of the environmental impact statement identifies that this intersection would improve in performance in 2019 with the provision of the project. However the intersection would deteriorate to a level of service F in 2029 with or without the project, indicating that this intersection will be operating over capacity.

Roads and Maritime monitors and manages the operational performance of the arterial road network. The Pinch Point program targets peak hour traffic hotspots and investigates ways to relieve traffic congestion. Pennant Hills Road is one of the corridors that Roads and Maritime is investigating for potential improvements in future years.

Interchanges

Issue description

Submissions raised concerns relating to the operational network performance for the project.

In summary, the submissions raised the following issues:

- Traffic management arrangements at the entrances to the tunnels should be documented.
- How will cars travelling southbound on Pennant Hills Road and turning left onto the M1 Pacific Motorway be able to cut across two lane of traffic to enter the southbound tunnel portal?

Response

The operational traffic arrangements at the two interchanges are described and shown graphically in Section 5.2.4 of the environmental impact statement.

Detailed design of the interchanges would ensure these traffic movements can be appropriately and safely carried out. This would include consideration of traffic light phasing, merge and weave distances and any necessary signage to allow early lane selection by motorists.

Issue description

Submissions raised concerns that that heavy vehicles will continue to use the local road route to access the motorway operations complex when the tunnel is operational for maintenance and re-surfacing work. This will continue to block local traffic, and emit pollutants and noise.

Response

Access to the motorway operations complex during operation of the tunnel would be from Pennant Hills Road directly to Eaton Road. The route through Aiken Road, Oakes Road and Karloon Road would not be used during operation.

Issue description

Submissions raised concerns regarding increased traffic around the Pennant Hills Road/ Pacific Highway intersection. The new right hand turn lane from the M1 Pacific Motorway to Pennant Hills Road will introduce more traffic and congestion to this stretch of road.

Response

The environmental impact statement presents modelled operational traffic flows in the year of opening (2019) and ten years after opening (2029) along Pennant Hills Road. Table 7-28 shows the comparison of intersection performance with and without the project. This shows that the Pennant Hills Road/ Pacific Highway intersection would operate at a similar level of performance in 2019 and 2029 regardless of the project and the introduction of the new right turn lane from the M1 Pacific Motorway.

Issue description

Submissions raised concerns regarding increased traffic congestion in Wahroonga resulting from the tunnel.

Response

Section 7.1 of the environmental impact statement and the Technical Working Paper: Traffic and Transport demonstrate that in 2029 most intersections along Pennant Hills Road would operate beyond their design capacity (level of service F and average delays in excess of 100 seconds) if the NorthConnex project is not constructed. With the implementation of the NorthConnex project, mid-block traffic volumes along Pennant Hills Road and volume to capacity (V/C) ratios are expected to improve in most cases (for both 2019 and 2029 scenarios). Improvements, particularly reductions in anticipated delays, are also anticipated at several intersections along Pennant Hills Road in 2019 and 2029.

These improvements to traffic conditions along Pennant Hills Road are anticipated to flow on to the local road network in the vicinity.

Issue description

Submissions raised concerns that the environmental impact statement does not provide details of plans for the existing right turn from the northbound carriageway of Pennant Hills Road to Aaron Place. It is assumed that this will be removed which would lead to impacts to these residents and increased pollution form the extra travel for these residents to access Aaron Place.

Response

There are no plans to remove the existing right-hand turn movement from Pennant Hills Road northbound to Aaron Place.

Issue description

Submissions raised concerns around extension of a traffic lane on the M1 Pacific Motorway and the road moving closer to homes on Hewitt Avenue and the repositioning of the well-used cul-de-sac to in front of a property. More vehicles using the cul-de-sac will make it harder to access properties

Suggestion that the M1 Pacific Motorway should not be extended and there should be one lane in each direction only and the cul-de-sac should not be repositioned.

Response

The widening of the M1 Pacific Motorway is required in order to facilitate the new on and off-ramp from the NorthConnex tunnel to emerge in the median of the M1 Pacific Motorway.

One lane in each direction on the M1 Pacific Motorway is not sufficient to cater for the expected traffic volumes.

This requires the re-positioning of the cul-de-sac on Hewitt Avenue. This minor re-positioning is not expected to result in any changes to the traffic flow on these surrounding local roads or more vehicles using the cul-de-sac.

Issue description

Submissions raised concerns that the current design is seriously deficient because it directs all such traffic through the traffic lights on Pennant Hills Road above the Hills M2 Motorway. This intersection is already a bottleneck for traffic. Good road design creates uninterrupted flows of traffic, and this is what the eastern Hills M2 Motorway / NorthConnex intersection should have.

Response

The NorthConnex project has been designed to allow for potential future construction of ramps onto and off the Hills M2 Motorway east of Pennant Hills Road, if required as identified in Section 4.3.2 of the environmental impact statement.

A review of an east facing connection between the purple corridor and the Hills M2 Motorway was conducted as part of the Stage 2 unsolicited proposal design development process. Analysis of the traffic implications associated with east facing ramps indicated that:

- East facing ramps connecting to the Hills M2 Motorway would only provide minor travel time benefits for motorists, compared with requiring this traffic to emerge from the main alignment tunnels and use the one existing traffic light to access the Hills M2 Motorway east of Pennant Hills Road.
- The minor nature of incremental travel time benefits would not be sufficient to attract additional users and provide any further material congestion relief to the Pacific Highway and Pennant Hills Road.

In addition, significant engineering and environmental constraints were identified (including the presence of Pennant Hills Golf Course and Devlins Creek) that would need to be overcome at significant cost in order to provide east facing ramps. On balance, these constraints and the limited traffic benefits of east facing ramps justify exclusion of this design option from the scope of the project at this time. However, the project would be designed and constructed to allow for addition of east facing ramps if required in the future.

The traffic assessment (Table 7-23 of the environmental impact statement) also provides origin and destination information for NorthConnex tunnel users at the southern interchange. This identifies that on an average workday by 2029 it is anticipated that traffic to and from the Hills M2 Motorway east of Pennant Hills Road is anticipated to be around 4,000 vehicles, representing only ten per cent of total tunnel traffic.

The operational traffic performance of the Hills M2 Motorway / Pennant Hills Road intersection with and without the project is shown in Table 7-28 of the environmental impact statement. This shows that the intersection would generally improve in performance with the provision of the project.

The design of the project does not preclude implantation of tunnel connections to and from the Hills M2 Motorway east of Pennant Hills Road in the future.

Hills M2 Motorway

Issue description

Submissions raised concerns that the westbound lane proposed as part of the Hills M2 Motorway integration works will channel more heavy truck movements to Windsor Road which is already a major traffic bottleneck during peak times. This will lead to increased traffic congestion for local traffic and public transport and could impact the construction of a potential light rail system along Windsor Road.

Response

The additional westbound lane on the Hills M2 Motorway is required in order for the southbound traffic from the NorthConnex tunnel to safely merge with the westbound Hills M2 Motorway traffic. The provision of this lane is not anticipated to change the origin or destination of traffic travelling on the Hills M2 Motorway. The volumes of heavy vehicles travelling westbound along the Hills M2 Motorway in the AM and PM peak periods with and without the project are predicted to be:

- In the 2019 AM peak 270 heavy vehicles with the project and 260 heavy vehicles without the project.
- In the 2019 PM peak 480 vehicles with the project and 450 vehicles without the project.
- In the 2029 AM peak 340 vehicles with the project and 350 vehicles without the project.
- In the 2029 PM peak 500 vehicles with the project and 490 vehicles without the project.

This is a minor change in the anticipated volume of heavy vehicles using this section the Hills M2 Motorway.

As such, there is not predicted to be an increase in congestion on Windsor Road as a result of the NorthConnex project, nor any impacts to the viability of a potential light rail corridor being progressed along Windsor Road.

Issue description

Submissions raised concerns that the environmental impact statement shows that the Hills M2 Motorway westbound is already at capacity in the PM peak. Therefore, traffic will bank up in the tunnel, causing delays and frustration.

Response

The environmental impact statement in Table 7-8 identifies that the Hills M2 Motorway westbound, to the west of Pennant Hills Road is currently operating at capacity. The NorthConnex project includes the provision of a new westbound lane along the Hills M2 Motorway between Pennant Hills Road and Windsor Road. This new lane would increase the capacity of the motorway and improve the traffic performance of the Hills M2 Motorway westbound. The NorthConnex Project, including the Hills M2 Motorway integration works, has been designed to avoid traffic queuing into the project tunnels under normal operating conditions. Operational management measures would be developed and implemented to address potential congested traffic conditions, including in the event of breakdowns and incidents.

Table 7-26 of the environmental impact statement provides the predicted traffic performance of the project tunnels in 2019 and 2029. This table shows that the tunnels would operate as a free flowing traffic environment under forecast traffic volumes.

Main alignment tunnels

Issue description

Submissions raised concerns relating to the operational network performance for the project.

In summary, the submissions raised the following issues:

- It is not clear whether the length and capacity of the Pennant Hills Road southbound ramp is sufficient to ensure proper operation of the ramp so that the main tunnel traffic is not impacted.
- Measures need to be put in place to allow for alterations in lane flow during peak times.

Response

The environmental impact statement presents modelled operational traffic flows in the year of opening (2019) and ten years after opening (2029). The forecast performance of the main alignment tunnels is provided in Table 7-26 of the environmental impact statement. This table shows that the main alignment tunnels would operate with a level of service ranging from A to C. This indicates that the southbound off-ramp would not impact on the operation of the main alignment tunnels and the main alignment tunnels would operate as free flowing traffic with spare capacity.

The NorthConnex Project has been designed to avoid traffic queuing into the project tunnels or onto surface roads under normal operating conditions. Operational management measures would be developed and implemented to address potential congested traffic conditions, including in the event of breakdowns and incidents.

M1 Pacific Motorway

Issue description

Submissions raised concerns that when NorthConnex is open, the M1 Pacific Motorway will be virtually at capacity. The M1 Pacific Motorway will need to be widened to eight lanes by 2021.

Response

Tables 7-30 and 7-31 of the environmental impact statement provide mid-block traffic performance of the M1 Pacific Motorway north of the project tunnel portal for 2019 and 2029. This shows that the M1 Pacific Motorway would operate with spare capacity with a level of service ranging from B to C in 2019 and B to D in 2029.

Issue description

Submissions raised concerns that one northbound lane on the M1 Pacific Motorway around the Pacific Highway overbridge does not provide sufficient capacity for northbound traffic. This would result in traffic congestion back into Pennant Hills Road. An extra northbound lane should be provided at this location to maintain satisfactory levels of service.

Response

Traffic northbound on the M1 Pacific Motorway north from Pennant Hills Road is predicted to be around 970 vehicles per hour in the AM peak and 1,760 vehicles per hour in the PM peak by 2029. The capacity of the M1 Pacific Motorway at this location is 2,200 vehicles per hour per lane. As such, a single lane in this location is sufficient for the predicted volume of traffic into the foreseeable future.

The anticipated performance of the M1 Pacific Motorway presented in the environmental impact statement during the peak period, both with and without the project (Tables 7-29, 7-30 and 7-31 of the environmental impact statement) demonstrates that the operation of the NorthConnex project would not result in a deterioration in the operation of the M1 Pacific Motorway.

Issue description

Submissions raised concerns relating to the operational network performance for the project.

In summary, the submissions raised the following issues:

- Reducing the M1 Pacific Motorway from the current three lanes in each direction to two lanes in each direction around the portals will create a traffic pinch point and will funnel traffic into the tunnels.
- Tunnels built in parallel to existing roads should add to rather than reduce existing capacity.
- Alternative design should be investigated for the northern portals so that taxpayers can use the roads they paid to build rather than being funnelled onto a private motorway.

Response

The NorthConnex project provides increased capacity throughout the corridor. Currently, the M1 Pacific Motorway provides three lanes in each direction around the portals. Once NorthConnex is constructed, there will be a total of four lanes in each direction. As NorthConnex would remove the through traffic from this section of the corridor, two lanes for the surface M1 Pacific Motorway would be sufficient for the projected volume of traffic.

Signage approaching the tunnel portals would be provided to all motorists to select the correct lane early and choose whether to use the NorthConnex tunnels or not. The design provides sufficient choice for the motorist and does not 'funnel' motorists into the tunnels.

8.7.3 Pedestrians and cyclists

Eleven submissions raised issues regarding pedestrians and cyclists during operation.

Issue description

Improvements could be made to the pedestrian and cyclist facilities around the northern interchange as part of the project. Suggestions include:

- A pedestrian crossing should be added to the southern side of the intersection at Pearces Corner. This would reduce the number of intersections crossed by a pedestrian to get from Russell Avenue to the Wahroonga Railway Station.
- Consideration should be given to providing a pedestrian crossing on the southern side of the M1 Pacific Motorway / Pennant Hills Road intersection.
- The footpath between Russell Avenue and the Pacific Highway is used often by cyclists in both directions. Consideration should be given to widening the footpath to two metres.

Response

Alterations to pedestrian and cyclist facilities at these intersections (and other intersections along Pennant Hills Road) are outside the scope of the NorthConnex project. The project would maintain the existing functionality of these intersections in terms of available pedestrian movements and cyclist infrastructure.

Improvements to surface transport infrastructure, including pedestrian and cyclist facilities, could be considered by the relevant infrastructure agency or local council as a separate project in the future.

Issue description

Submissions suggest that there is an opportunity to install a pram ramp at the intersection of Loch Maree Avenue and Pennant Hills Road.

Response

Following construction works, the area adjacent to the Trelawney Street tunnel support facility along Pennant Hills Road would be landscaped and a pedestrian footpath reinstated. The opportunity to enhance pedestrian facilities through the provisions of features like pram ramps can be considered as part of the detailed urban and landscape design.

Issue description

Submissions raised concerns relating to cyclists for the project.

In summary, the submissions raised the following issues:

- Cyclists have not been considered in the design of this project.
- There is no consideration of the safety or health of cyclists by allowing them to use motorways.
- The proposed grade separation for cycling infrastructure on the M1 Pacific Motorway and the Hills M2 Motorway is a good solution.
- Improved cycling infrastructure should be provided as part of the Hills M2 Motorway integration works.

Response

Cycling interest groups such as Bike North have been consulted by the NorthConnex project team. Section 7.2 of the environmental impact statement provides an assessment of the potential impacts of the NorthConnex project on cyclists and cycling infrastructure during construction and operation.

Construction of the Hills M2 integration works and the M1 Pacific Motorway tie-in works will require temporary exclusion of cyclists from parts of those motorways for safety reasons. Alternative cyclist access and passage arrangements would be provided at these locations, with current cyclist infrastructure reinstated once construction is complete.

During construction, cyclists may also be indirectly affected by the project, particularly through increases in heavy vehicle movements generated by the construction process. The Traffic Management Plan(s) proposed to be developed for the project would include specific measures aimed at minimising the risks posed to cyclists and other road users from these heavy vehicles.

During operation, cyclists would be excluded from the project tunnels due to safety reasons. No changes to cyclist access or infrastructure are proposed along Pennant Hills Road. However, improvements in amenity and road safety along Pennant Hills Road as a result of the project are expected to benefit cyclists and other road users. The use of the Hills M2 Motorway and the M1 Pacific Motorway is a choice by individual cyclists.

The project also involves the construction of dedicated grade separated cyclist facilities across the new on and off-ramps where the main alignment tunnels connect to the M1

Pacific Motorway and the Hills M2 Motorway. This is described in Section 5.2.8 of the environmental impact statement.

Post construction, cyclists would be able to use the shoulders of the M1 Pacific Motorway and the shoulders of the Hills M2 Motorway, consistent with the existing situation.

Issue description

Submissions suggest that the footpath from Hewitt Avenue to Pennant Hills Road should be maintained.

Response

There are no plans to permanently remove the footpath from Hewitt Avenue to Pennant Hills Road. This footpath may, however, need to be closed during the construction period to ensure the safety of the public.

Opportunities to keep this path open, or to limit closures to short periods will be investigated during detailed design and construction planning. In the event the path is required to be closed, a suitable alternative will be provided.

Issue description

The pathway between Savoy and Lisle Courts should be retained for pedestrian access.

Response

Works in the vicinity of Lisle Court are required to facilitate the construction of the new on-ramp connecting the Hills M2 Motorway to the northbound main alignment tunnel, and potentially for the augmentation of an existing surface water detention basin.

Opportunities to limit the extent of works and the impact on the public reserve would be investigated during the detailed design stage. Roads and Maritime would consider minimising the acquisition to only the land required for the NorthConnex project. This would leave land not required for the NorthConnex project for community use. Relevant pedestrian access paths would be retained.

Issue description

Submissions raised concerns about the safety of pedestrians in Wahroonga as the tunnel will lead to more traffic in the area, particularly around schools and churches.

Response

The project has been designed to meet relevant Austroads and Roads and Maritime design guidelines. The design, construction and commissioning would be subject to road safety audits before opening.

No changes are proposed to the operation and functionality of pedestrian facilities around the northern interchange or in other parts of Wahroonga. As such, there is not anticipated to be any increased risk to the safety of pedestrians from the operation of the project

8.7.4 Traffic safety

Fourteen submissions raised issues regarding traffic safety during operation.

Issue description

Submissions raised concerns that the tunnel entrance and exit should have sun filtering to ensure safety for drivers.

Response

The project has been designed to provide a lighting transition for motorists between conditions within the project tunnels and natural, external lighting. This lighting design is in accordance with the requirements for tunnel exits from AS / NZS 1158.5: 2007 Lighting for road and public spaces – tunnels and underpasses. This would gradually acclimatise motorists to changes in lighting, and to avoid the potential for a sudden step change in lighting levels as motorists exit the tunnel portals. This is similar to the practice and lighting design used on other road tunnels through Sydney and the throughout the world.

The NorthConnex main alignment tunnel portals lie along the axes of the existing Hills M2 Motorway and the M1 Pacific Motorway. Potential sun glare and distraction to motorists using the NorthConnex project would therefore be similar to impacts already experienced by motorists using the Hills M2 Motorway and the M1 Pacific Motorway.

Key periods of potential sun-related impacts include early morning in the case of the northern portals (northbound motorists exiting onto the M1 Pacific Motorway) and late afternoon in the case of the southern portals (for westbound motorists exiting onto the Hills M2 Motorway). For the main alignment tunnels' northern portals, some mitigation would be provided by the northern orientation of the portals, local topography and screening provided by existing vegetation.

The on and off ramp portals on Pennant Hills Road for the southern interchange have a southern orientation. Motorists using the off-ramp would not experience sun glare. Motorists using the on-ramp (north facing vision) would have similar impacts to those already experienced when travelling along this section of Pennant Hills Road.

The on and off-ramp portals for the northern interchange have a western orientation. Motorists using the off-ramp (west facing vision) would experience sun glare from the setting sun – similar to motorists reaching the end of the M1 Pacific Motorway at present. Motorists using the on-ramp (east facing vision) would experience sun glare from the rising sun – similar to motorists entering the start of the M1 Pacific Motorway at present.

The design and lighting approach for the project would continue to be developed during detailed design. As part of this, consideration would be given to minimising risks to motorists, including risks that may arise as a result of lighting transitions around tunnel portals.

Issue description

Submissions suggested that the tunnel be built wide enough to provide for lane widths of at least 4.5 metres when the three lanes are brought into use (at least in any areas of significant bends) to ensure driver safety.

Response

The main alignment tunnels would be built wide enough to accommodate three lanes in each direction if required in the future. At opening, the tunnels would be marked for two lanes, each 3.5 metres wide, with a 2.5 metre wide shoulder on the left hand side and a one metre shoulder on the right hand side.

If required, this would allow three lanes in each direction in the future, with each lane being 3.5 metres wide.

Austroads is the association of Australasian road transport and traffic agencies. One of the functions of Austroads is to publish guides to promote a nationally consistent approach to the design, maintenance and operation of road networks.

In the event that the tunnel was to be converted to three lanes, the current project design incorporates two breakdown bays in each tunnel and pedestrian cross passages between each tunnel for emergency evacuation located every 120 metres.

Issue description

Submissions suggest that moving the northern portals further north would produce an exit at a point where extra width might be available for merging traffic.

Response

The northern interchange has been designed to meet the required Austroads and Roads and Maritime design standards to ensure a safe merging environment. This includes consideration of factors such as design speed, lane widths, length of merge and sight distances.

Austroads is the association of Australasian road transport and traffic agencies. One of the functions of Austroads is to publish Guides to promote a nationally consistent approach to the design, maintenance and operation of road networks.

Issue description

Submissions raised concerns that northbound vehicles regularly go through the red light at Pearces corner, narrowly missing pedestrians crossing Pennant Hills Road. The primary reason is the location of the traffic signal on the left which is difficult to see and obviously missed. This safety issue should be rectified with the new works, especially with the additional lane proposed.

Response

The Pearces Corner intersection would be upgraded as part of the NorthConnex project. The intersection design and positioning of traffic signals at this intersection would be in accordance with the Austroads and Roads and Maritime design standards to ensure a safe traffic environment. This would include consideration of factors such as visibility of traffic signals and roadside signage. Formal road safety audits would be conducted during design, construction and before opening. The audits would be carried out by registered safety auditors and in accordance with the Austroads Road Safety Audit procedures.

Austroads is the association of Australasian road transport and traffic agencies. One of the functions of Austroads is to publish Guides to promote a nationally consistent approach to the design, maintenance and operation of road networks.

Issue description

Submissions raised concerns that the new right turn lane from the M1 Pacific Motorway to Pennant Hills Road will lead to increased accidents and the risk of vehicles crashing into the homes (numbers 18 to 22) opposite on Pennant Hills Road.

Response

The new intersection arrangements have been designed to meet the required Austroads and Roads and Maritime design standards to ensure a safe intersection. This includes consideration of factors such as design speed, lane widths, and radius of the turning movement. The design, construction and commissioning would be subject to road safety audits before opening.

Austroads is the association of Australasian road transport and traffic agencies. One of the functions of Austroads is to publish Guides to promote a nationally consistent approach to the design, maintenance and operation of road networks.

Issue description

Submissions raised concerns regarding vehicle accidents on the M1 Pacific Motorway in the vicinity of Hewitt Avenue or a car crashing through the house.

Response

The M1 Pacific Motorway tie-in works have been designed to meet the required Austroads and Roads and Maritime design standards to ensure a safe road environment. This includes consideration of factors such as design speed, lane widths, and provision of safety barriers. The design, construction and commissioning would be subject to road safety audits before opening.

Austroads is the association of Australasian road transport and traffic agencies. One of the functions of Austroads is to publish Guides to promote a nationally consistent approach to the design, maintenance and operation of road networks.

Issue description

Submissions raised concerns that the sensory deprivation of travelling in a tunnel would be dangerous and lead to more accidents.

Response

An assessment of the potential traffic safety within the tunnels is provided in Section 7.1.4 of the environmental impact statement.

A motorway standard road would result in a reduction in traffic accidents compared to Pennant Hills Road. Traffic using the tunnel would be four times less likely to be involved in an injury crash, and five times less likely to be involved in a crash of any type,

One of the key principles of the in-tunnel urban design has been to provide interest to the journey to limit the potential for fatigue. This has been achieved through the design of the wall panels and the introduction of two in-tunnel ‘events’.

Issue description

Submissions raised concerns that there may be fewer crashes projected for NorthConnex but they will be higher severity crashes. Accurate crash projections are important to be provided to the community rather than suggesting that NorthConnex will be a cure for motor vehicle accidents along the corridor.

Response

The environmental impact statement does not suggest that the NorthConnex project will be a cure for motor vehicle accidents along the corridor. The environmental impact statement provides an accurate representation of the potential crash rate based on statistics from other

roads and motorways across Sydney. This information is provided in Table 7-38 of the environmental impact statement.

Based on this data, motorists using NorthConnex as an alternative to Pennant Hills Road would be four times less likely to be involved in an injury crash and five times less likely to be involved in a crash of any type. Motorists would also be less likely to be involved in a fatal crash.

8.7.5 Incident response

Fifteen submissions raised issues regarding incident response during operation.

Issue description

Submissions request that the emergency management arrangements for traffic at the entrances to the tunnels need to be documented.

Response

The design of the project includes operational emergency systems such as emergency shoulders, breakdown bays, fire suppression and firefighting systems, egress for pedestrians and access for emergency services. Specifically at the tunnel entry portals systems to minimise the likelihood of an incident and to manage the flow of traffic during an incident or congestion include:

- Height detection systems before the tunnel portals.
- Operational management measures such as lane restrictions to reduce the volume of traffic entering the tunnel.
- Tunnel barrier gates to prevent access in the event of tunnel closure. In this event, vehicle would be directed to use Pennant Hills Road.

The development of all these features has involved detailed discussions with Fire and Rescue New South Wales. Subject to planning approval, the design would include a comprehensive review and acceptance of the fire and life safety provisions by all the emergency services including Fire and Rescue New South Wales.

Issue description

Submissions suggest that vehicle inspection bays should be installed and operated before tunnel entry points to direct vehicles carrying banned goods that will cause major fire incidents from entering the tunnel, Mont Blanc 1999 incident example.

Response

Vehicles carrying dangerous goods would not be permitted to use the tunnels. These trucks would continue to use Pennant Hills Road, which is consistent with the existing situation. This would enforced similar to other tunnels in Sydney through the use of cameras to identify non-compliant vehicles.

Issue description

Submissions note that emergency services are more easily delivered on a surface road.

Response

As identified in Section 7.1.4 of the environmental impact statement, the provision of the project would result in benefits to emergency service response times both through use of the tunnel and through the reduction in traffic on Pennant Hills Road.

Issue description

Submissions raised concerns that a third lane in use in the future will impede access in a crowded nine kilometre tunnel during likely emergencies.

Response

At project opening, the NorthConnex tunnels would provide two traffic lanes in each direction and a breakdown lane. The tunnels are being built wide enough to be able to retro-fit to three lanes in each direction in the future if required. Under this scenario, there would not be a continuous breakdown lane, however there would be two breakdown bays in each direction. The project would also incorporate CCTV in order to provide a rapid response to an incident or breakdown within the tunnels. This is consistent with other tunnels throughout Sydney. In addition, two emergency vehicle crossover facilities would be provided at around the third points of the tunnels to provide flexibility for emergency services vehicle access.

As detailed in section 8.2.1 of the environmental impact statement, the project has been designed to provide for efficient, free flowing traffic with physical capacity to accommodate predicted traffic volume. The preferred design has incorporated all feasible and reasonable design measures including in relation to geometry, pavement, lighting and signage, consistent with current Australian Standards, road design guidelines and industry best practice. In doing so, the design of the project has been developed to inherently minimise the likelihood of incidents

In addition, the project has been designed in accordance with the following standards:

- Australian Standard AS4825 – Tunnel fire safety.
- National Fire Protection Association (NFPA) 502 - Standard for Road Tunnels, Bridges and Other Limited Access Highways.
- Permanent International Association of Road Congresses (PIARC) including:
    - Systems and equipment for fire and smoke control in road tunnels, 2007.
    - Road tunnels: Vehicle emissions and air demand for ventilation, 2012.
    - Fire and Smoke Control in Road Tunnels, 1999.
    - Operational Strategies for Emergency Ventilation, 2008.

Issue description

The environmental impact statement should have provided a quantitative risk assessment of vehicle accidents.

Response

Section 7.1 and Appendix E of the environmental impact statement provide consideration of traffic road safety. This section identifies that the project would provide a significantly lower frequency of crashes compared to Pennant Hills Road. Traffic using the tunnels would be four times less likely to be involved in an injury crash and about five times less likely to be involved in a crash of any type.

Additionally, the transfer of traffic from Pennant Hills Road to the tunnels would be expected to reduce the frequency of crashes on Pennant Hills Road compared to future conditions without the project.

8.8 Construction noise and vibration

8.8.1 Airborne noise

Seventy one submissions raised issues regarding airborne noise during construction.

General noise concerns

Issue description

Submissions raised concerns regarding noise management, issues include:

- Duration of construction noise and exceedances of noise management levels. This includes potential noise from workers screaming, laughing and shouting.
- Concern regarding noise impacts from the tunnel portals during construction.
- The environmental impact statement refers to consideration of temporary noise hoardings, however it is believed that nothing will be done unless NorthConnex is forced to.
- Request that an independent noise assessment is carried out.
- Request that adequate noise control measures are put in place.
- Students studying for exams including HSC exams.
- Construction Noise and Vibration Management Plan will need to provide details and protocols for minimising and managing noise and vibrations impacts.

Response

The project will implement the mitigation measures identified in the environmental impact statement.

The environmental impact statement provides an assessment of construction noise in Section 7.2.4 and Appendix F. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Nosie Guidelines (DECCW, 2009). As required by that guideline, where applicable noise management levels are expected to be exceeded, consideration has been given to feasible and reasonable noise mitigation measures. Further information on construction noise mitigation and management measures is provided in **Section 4.5** of this report.

In developing construction methodologies and a construction program for the project, the aim has been to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This has required a balance between the speed of construction activities and the ability to reasonably and feasibly maintain impacts within acceptable limits. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during the detailed design process.

In most cases, construction sites for the project would be subject to different construction activities during different times in the construction program. This means that peak construction impacts would not be experienced for the entire expected four-year duration of construction works. Section 5.3.12 of the environmental impact statement provides further details of the specific activities and expected duration of construction works at each construction ancillary facility.

A Construction Noise and Vibration Management Plan would be developed and implemented during the construction phase of the project, including details of site specific noise mitigation and management measures. The plan would include environmental

awareness training for relevant construction employees, including construction noise minimisation and management.

The Department of Planning and Environment will undertake an independent assessment of the NorthConnex project, consistent with the requirements of the *Environmental Planning and Assessment Act 1979*. As part of this the Department of Planning and Environment considers the content of the environmental impact statement, the submissions received and the proponent's response to those submissions. As part of this process, the Department of Planning and Environment receives specialist input and advice from other agencies, such as the Environment Protection Authority, and may engage specialists to undertake independent reviews and to provide technical advice as deemed appropriate by the Department.

Issue description

Questions the methodology used for assessing noise impacts. The environmental impact statement has not adequately taken into account the exact number of vehicles above the 65-70 dB(A) threshold in its noise assessment. Noise impacts should be assessed not just by reference to the relative noise increase, but the frequency and time of day that both the noise level and frequency is increased due to heavy and light vehicle construction traffic.

Response

An assessment of noise impacts, including construction and operational traffic noise impacts, is presented in Section 7.2 and Appendix F of the environmental impact statement. The assessment has been conducted in accordance with relevant guidelines, including the Interim Construction Noise Guidelines (DECCW, 2009), the NSW Road Noise Policy (EPA, 2000) and the Environmental Noise Management Manual (RTA, 2001).

A traffic noise level of 65-70 dB(A) is not a relevant noise assessment threshold under existing NSW road traffic assessment policy, and is therefore not applicable to the NorthConnex project.

Operational road traffic noise assessment thresholds are summarised in Table 7-55 and Table 7-56 of the environmental impact statement. For residential receivers, these thresholds are 60 dB(A) ($L_{Aeq(15\text{-}hour)}$) (day time) and 55 dB(A) ($L_{Aeq(9\text{-}hour)}$) (night time). These assessment thresholds are equivalent noise levels measured over a 15-hour and nine-hour period, respectively. During these periods, actual traffic volumes and the mix of vehicles is likely to vary. It is therefore not relevant to specify a single and exact number of vehicles across the period that would cause or contribute to an exceedance of these assessment thresholds.

Further, because road noise assessment thresholds are based on 15-hour and nine-hour averages, it is not relevant to consider the number of exceedances of these thresholds in each assessment period, nor the frequency of such exceedances.

In the case of construction traffic noise, there are currently no assessment thresholds or criteria. A relative increase of 2 dB(A) has therefore been nominated in the construction traffic noise assessment as the level at which an increase in construction traffic noise may be noticed, and above which consideration should be given to feasible and reasonable mitigation and management measures.

Issue description

A noise impact assessment for sensitive receivers that are in locations where existing noise barriers are removed and not immediately replaced with a similar performing structure needs to be carried out.

Temporary noise barriers should only be used where it is not possible to immediately erect permanent noise barriers. Temporary noise barriers should be at least of the same height and performance of existing barriers. Under no circumstance should construction work be allowed to occur until appropriate noise barriers are in place.

Response

The construction noise assessment has assumed that existing noise barriers would be removed during the construction phase.

Wherever feasible and reasonable, temporary noise barriers would be implemented along the motorways before the demolition of the existing noise barriers. These barriers would be designed to reduce traffic noise levels as much as feasible and reasonable, however, it is unlikely these temporary barriers would be as effective as the existing noise barriers.

Issue description

Request for double glazing to mitigate the impact of the construction noise.

Response

Properties eligible for consideration of at-property treatment are identified in Table 78 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement). Properties eligible for consideration of at-property treatment would be confirmed during the detailed design phase.

Further information on construction noise mitigation and management is provided in **Section 2.11** of this report. Generally, at-property acoustic treatments are not considered feasible or reasonable during construction given the limited duration of construction works.

Trelawney Street compound (C7)

Issue description

Noise during construction at the Trelawney Street compound (C7). Noise will echo down the valley and affect nearby residents, local school and the Sydney Adventist Hospital. In summary, the submissions raised the following issues:

- Are there any provisions in place to alleviate this issue? Request assurances that adequate mitigation measures will be in place to ensure that local residents are not unduly affected. Appropriate acoustic material should be used to ensure that noise does not exceed the national standards.
- A suitable acoustic barrier should be constructed across the eastern side of the site covering the truck entry and exit path.
- Due to the exceedances of the noise management levels and potential for sleep disturbance, a construction noise and vibration management plan should be required to address this issue prior to approval.
- Continuous monitoring should be carried out of noise during construction.
- This could be avoided with the use of an alternative tunnelling compound away from residential areas.

Response

The environmental impact statement provides an assessment of construction noise in Section 7.2.4 and Appendix F. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Nosie Guidelines (DECCW, 2009).

Where the assessment indicates that relevant noise management levels are predicted to be exceeded, consideration is required to be given to feasible and reasonable mitigation and management measures. In the case of the Trelawney Street compound, the environmental impact statement provides mitigation measures including the provision of an acoustic shed to limit noise from night-time works, restricting the access and egress point of heavy vehicles during the night time period, and the use of temporary noise hoardings (where feasible and reasonable) where ancillary construction facilities are in proximity to sensitive receivers.

Noise monitoring procedures would be developed and documented in Construction Noise and Vibration Management Plans. As identified by mitigation measure NV17 in Table 7-85 of the environmental impact statement, this would involve monitoring at the commencement of construction activities and then periodically throughout the construction program. Once noise levels have been established through monitoring of a particular activity in a particular location, there is no benefit to undertaking continuous monitoring.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), further investigation has been carried out to determine the extent of these potential exceedances and to further develop specific construction noise mitigation and management measures. These are detailed in **Section 4.5** of this report.

Opportunities for additional feasible and reasonable mitigation measures to protect local amenity and reduce construction noise impacts would be considered during the detailed design process as part of the development of Construction Noise and Vibration Management Plans.

The location of construction facilities were chosen to be co-located within the footprint of future operational ancillary infrastructure in order to limit overall land acquisition as well as potential impacts to heritage items and ecological sensitive areas.

Issue description

A compressor will be located outside the acoustic shed at the Trelawney Street compound (C7). The extent of noise from the compressor is unclear. It is requested that the compressor be relocated into the acoustic shed.

Response

Compressors are required as part of the tunnelling activities at this site. Compressors would be fitted with appropriate noise attenuation in order to reduce the potential noise impacts to nearby receivers.

Southern interchange

Issue description

Concerns regarding noise during construction at the southern interchange, including from the relocation of noise barriers and construction of the northbound on-ramp.

It is unclear what the noise impacts during construction will be around the southern interchange or what mitigation measures will be implemented.

Request to mitigate noise during the construction phase.

Response

The environmental impact statement provides an assessment of construction noise in Section 7.2.4 and Appendix F. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Nosie Guidelines (DECCW, 2009).

Where the assessment indicates that relevant noise management levels are predicted to be exceeded, consideration is required to be given to feasible and reasonable mitigation and management measures. In the case of the southern interchange, the environmental impact statement provides mitigation measures including the provision of an acoustic shed to limit noise from night-time works and restricting the access and egress point of heavy vehicles during the night time period.

Based on feedback received from the community and stakeholders through submissions and other engagement mechanisms (refer to **Chapter 5** of this report), further information on proposed construction noise levels, and mitigation and management measures is provided in **Section 4.5** of this report.

Opportunities for additional feasible and reasonable mitigation measures to protect local amenity and reduce construction noise impacts would be considered during the detailed design process as part of the development of Construction Noise and Vibration Management Plans.

Hills M2 Motorway

Issue description

Concern regarding excessive construction noise from the Hills M2 Motorway integration works.

Response

The environmental impact statement provides an assessment of construction noise in Section 7.2.4 and Appendix F. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Noise Guidelines (DECCW, 2009).

Where the assessment indicates that relevant noise management levels are predicted to be exceeded, consideration is required to be given to feasible and reasonable mitigation and management measures. In the case of the Hills M2 Motorway integration works, the environmental impact statement provides mitigation measures including scheduling to limit works outside of daytime construction hours as much as feasible and reasonable. Further information on proposed construction noise mitigation and management measures is provided in **Section 4.5** of this report.

Opportunities for additional feasible and reasonable mitigation measures to protect local amenity and reduce construction noise impacts would be considered during the detailed design process as part of the development of Construction Noise and Vibration Management Plans.

Issue description

Request for alternative accommodation for the duration of construction.

Response

As detailed in Section 7.2.4 of the environmental impact statement, a protocol would be developed to identify the need for and provision of respite measures for residential receivers in accordance with the Interim Construction Noise Guidelines. Respite measures may

include the restriction to the hours of construction activities resulting in impulsive or tonal noise (such as rock breaking, rock hammering, pile driving), or other appropriate measures agreed between the contractor and residential receiver such as alternative accommodation. The mitigation measures offered would be dependent on the noise level exceedance and the duration of the activity.

Further clarification of proposed noise mitigation and management measures to be applied during construction is provided in **Section 4.5** of this report.

8.8.2 Ground-borne noise

Ten submissions raised issues regarding ground borne noise during construction.

Issue description

Construction ground-borne noise maps do not seem to include the entire tunnel length, nor the impact on all sensitive receivers above the tunnel.

Response

Ground-borne noise maps provided in Appendix G of the Noise and Vibration Technical Working Paper indicate the areas above the tunnel where the relevant criteria are predicted to be exceeded. Other locations, for which maps have not been provided in the environmental impact statement, would comply with the relevant ground-borne noise criteria during the construction works.

Issue description

Concerns regarding noise from tunnelling works.

Response

The environmental impact statement provides an assessment of construction noise in Section 7.2.4 and Appendix F, including potential ground-borne noise from tunnelling activities. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Nosie Guidelines (DECCW, 2009).

This assessment indicates that there would be exceedances of the ground-borne noise criteria during the evening and night-time periods. These impacts would be limited in duration and would only affect receivers while tunnelling activities were being conducted beneath and / or in proximity to the receivers. Tunnelling would typically progress around a maximum of seven metres per day, thus it is likely that ground-borne noise would be discernible for up to five days at each affected receiver with exceedances occurring for up to two days. Tunnelling advance rates would reduce to two to five metres a day around the portals, which may increase the duration of exposure for receivers in these areas. As tunnelling moves towards and away from each receiver the noise levels experienced would be lower.

Further information on proposed construction noise mitigation and management measures is provided in **Section 4.5** of this report.

Opportunities for additional feasible and reasonable mitigation measures to reduce these noise impacts would be considered during the detailed design process as part of the development of Construction Noise and Vibration Management Plans.

Issue description

Submissions raised concerns that while the noise assessment includes an assessment of the noise from the operation of the road headers, this is not the only source of noise from tunnelling activities.

Based on experience from other tunnelling projects, rock bolting and use of rock hammers in the tunnel may generate ground-borne noise. The environmental impact statement also proposes the use of surface miners and these are not assessed or even mentioned in the noise vibration assessment.

Response

Surface miners would produce similar levels of noise as road headers. The assessment of ground-borne noise in the environmental impact statement is relevant for both road headers and surface miners.

Rock hammering and rock bolting would be carried out at discrete locations within the tunnels. Consideration of the potential ground-borne noise impacts from these activities would be carried out during the detailed design stage of the project. This consideration would include consideration of equipment size in order to minimise impacts.

8.8.3 Vibration from surface works

Four submissions raised issues regarding vibration form surface works during construction.

Issue description

Vibration from surface works near the Wilson Road compound (C6) and the northern interchange compound (C9).

Response

Potential for vibration impacts from surface works is assessed in Section 7.2.4 of the environmental impact statement. Safe working distances from certain plant and equipment are in Table 7-78.

Based on expected plant and equipment to be used at the Wilson Road compound and the northern interchange compound (refer to Table 5-21 in the environmental impact statement), the key vibration generating equipment on the site is expected to be a vibrating roller and a hydraulic hammer to excavate the shaft. This equipment has the potential to exceed the human response vibration criterion within up to 100 metres (vibratory roller) and 73 metres (large hydraulic hammer); and the structural cosmetic damage vibration criterion within up to 15 metres (vibratory roller) and 22 metre (large hydraulic hammer). Depending on detailed design and further development of construction activities on the site, there is potential for elevated vibration impacts on surrounding receivers under circumstances. Potential structural impacts are unlikely.

The safe working distances summarised in Table 7-78 would be considered during detailed design of the project and construction planning, with the aim of avoiding encroachment by relevant plant and equipment where feasible and reasonable to do so. If vibration intensive works are planned within the safe working distances identified, alternative equipment would be identified and vibration monitoring would be implemented. Further mitigation of vibration would not be required provided that the safe working distances are adhered to.

There is potential that vibration intensive equipment may be required within safe working distances in some cases and this may be unavoidable due to the work required and the prevalent geological site conditions. These conditions may not be fully understood until work has commenced, resulting in a potential change in operating equipment. Equipment size

would be selected taking into account the safe working distances and the distance between the area of construction and the nearest sensitive receiver. If the use of vibration intensive plant and equipment cannot be avoided within the safe working distance for cosmetic damage the following procedure would occur as a minimum:

- Notification of the works to the affected receivers.
- Works would not proceed until attended vibration measurements are undertaken.
- If ongoing works are required a permanent vibration monitoring system would be installed, to warn operators (via flashing light, audible alarm, short message service (SMS) etc) when vibration levels are approaching the cosmetic damage objective.

Additionally, existing condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works.

8.8.4 Vibration from tunnelling works

Ten submissions raised issues regarding vibration from tunnelling works.

Issue description

Submissions raised concerns relating to the vibration from tunnelling for the project.

In summary, the submissions raised the following issues:

- Vibration sensitive receivers for the construction phase have not been identified.
- Residential properties directly above the tunnel would be impacted.

Response

An assessment of vibration from tunnelling works is provided in Section 7.2.4 of the environmental impact statement. This assessment identified that 64 receivers are predicted to exceed the preferred criteria for human comfort during the night-time period. No receivers would exceed the maximum criteria for human comfort or the structural damage criteria during tunnelling activities.

Maps provided in Appendix I of the noise and vibration technical working paper provide information on where these vibration exceedances would occur. In general, vibration is more likely to be felt by receivers in the shallower sections of the tunnels, close to the tunnel portals.

No vibration sensitive ‘critical areas’, such as hospital operating theatres or precision laboratories have been identified in areas potentially affected by vibration from construction or operation of the project. The potential for such receivers to be affected by the project would be considered further during detailed design of the project, and where relevant, receiver-specific mitigation and management measures would be identified. Mitigation and management measures would be developed in consultation with the affected receiver.

Issue description

Construction vibration maps do not seem to include the entire tunnel length, nor the impact on all sensitive receivers above the tunnel. For example, the area between Boundary Road and Duffy Avenue is densely populated and there appears to be no map for this area.

Response

Vibration maps provided in Appendix I of the Noise and Vibration Technical Working Paper indicate the areas above the tunnel where the relevant human comfort criteria are predicted to be exceeded. Other locations, for which maps have not been provided in the environmental impact statement, would comply with the relevant preferred values for human comfort during the construction works. In the case of the area between Boundary Road and Duffy Avenue, applicable human comfort vibration criteria are not expected to be exceeded.

Issue description

The construction vibration impact assessment is cursory and does not adequately identify and assess all impacts and especially cumulative impacts. Targeted assessment of potential impacts during tunnelling, blasting and surface construction works should be carried out. Structural damage, human comfort, vibration dose levels, and any potential impacts to sensitive locations other than residential receivers (heritage structures for example) should be undertaken. Cumulative impacts should also be considered where there are multiple road headers impacting sensitive receivers and where sensitive receivers are also affected by surface works and tunnelling vibration impacts. Also as noted in following section there may be other tunnelling activities such as rock bolting and rock hammering that may be generated vibration. Consideration should be made to event intensity, duration, distance to foundations and existing geotechnical conditions. Suitable control measures and management practices can then be recommended.

Response

The construction vibration assessment has been carried out in accordance with the Director-General's environmental assessment requirements and relevant guidance documents.

The assessment found that the preferred levels for human comfort may be exceeded at a number of receivers at night-time. However, the maximum level for human comfort would not be exceeded. Vibration levels would not exceed the structural damage criteria. This includes heritage items.

Further consideration of potential for vibration impacts, including potential for cumulative impacts from concurrent surface works and tunnelling works, would be carried out during the detailed design stage. This would include consideration of construction work scheduling to avoid cumulative impacts where necessary.

Issue description

While the vibration assessment includes an assessment of the noise from the operation of the road headers, this is not the only source of vibration from tunnelling activities.

Based on experience from other tunnelling projects, rock bolting and use of rock hammers in the tunnel the project could generate ground-borne noise impacts. The environmental impact statement also proposes the use of surface miners and these are not assessed or even mentioned in the vibration assessment.

Response

Surface miners would produce similar levels of noise as road headers. The assessment of vibration in the environmental impact statement is relevant for both road headers and surface miners.

Rock hammering and rock bolting would be carried out at discrete locations within the tunnels. Consideration of the potential vibration impacts from these activities would be carried out during the detailed design stage of the project. This consideration would include consideration of equipment size in order to minimise impacts.

8.8.5 Traffic noise

Ninety submissions raised issues regarding traffic noise during construction.

General traffic noise concerns

Issue description

Noise impacts from construction vehicles including heavy trucks in residential streets and buses transporting workers to construction sites.

The environmental impact statement does not properly address the impact of heavy construction vehicle movements, particularly at night.

Response

The environmental impact statement provides an assessment of construction traffic noise in Section 7.2.4 and Appendix F. This assessment has been undertaken in accordance with the relevant guidelines including the Interim Construction Nosie Guidelines (DECCW, 2009). The noise impacts of traffic movements at night, particularly late at night and in the early morning, have been assessed and are summarised in Table 49, Table 50, Table 51 and Table 52 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement).

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9). As a result, heavy vehicle use of residential streets has been reduced further, with reductions in potential amenity impacts for local receivers.

Changes made to access arrangements at the southern interchange compound, the Trelawney Street compound and the northern interchange compound are detailed and assessed in **Section 9.4** of this report.

Heavy vehicle access to and from the Wilson Road compound (C6) has been restricted to directly on and off Pennant Hills Road which would limit the potential traffic noise impacts to residential receivers as much as feasible and reasonable.

The use of other local roads by heavy vehicles has been limited to the amount required in order to undertake works in the vicinity. These are not expected to result in significant traffic noise impacts.

Issue description

The location for the disposal of spoil has not been defined in the environmental impact statement – and consequently the impacts of construction traffic noise from spoil transport on sensitive receivers along Pennant Hills Road and near the spoil disposal locations has not been assessed

Response

The environmental impact statement identifies a number of sites which have the capacity to receive the spoil from the project. The environmental impact statement is not required to nominate the exact spoil disposal site or undertake an assessment of the potential impact at that site. Any spoil disposal site used will be required to have the necessary approvals in

place to receive the spoil. This would include approval to receive the volume of trucks from the project.

The project has undertaken an assessment of traffic noise from transport of spoil around each of the spoil management compounds, along Pennant Hills Road and along the Hills M2 Motorway and the M1 Pacific Motorway.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9). As a result, heavy vehicle use of residential streets has been reduced further, with reductions in potential amenity impacts for local receivers.

Changes made to access arrangements at the southern interchange compound, the Trelawney Street compound and the northern interchange compound are detailed and assessed in **Section 9.4** of this report.

Southern interchange compound (C5)

Issue description

Noise impacts from construction vehicles including heavy trucks in residential streets around the southern interchange compound (C5), including impacts on the quality of sleep.

Data used to determine additional levels of noise associated with the Southern Interchange Compound and associated sleep disturbance calculations have only used data pertaining to traffic on Pennant Hills Road. They did not include projections associated with the additional construction traffic along Eaton Road nor the noise from construction works on the Hills M2 Motorway.

Response

The environmental impact statement provides an assessment of construction traffic noise in Section 7.2.4 and Appendix F. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Nosie Guidelines (DECCW, 2009). As assessment of potential sleep disturbance has been included in the environmental impact statement. This assessment included heavy vehicle movements along all proposed routes including local roads.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9). As a result, heavy vehicle use of residential streets has been reduced further, with reductions in potential amenity impacts for local receivers.

Changes made to access arrangements at the southern interchange compound, the Trelawney Street compound and the northern interchange compound are detailed and assessed in **Section 9.4** of this report.

Issue description

Noise impacts from construction at Gum Grove Place.

Response

The environmental impact statement provides an assessment of construction traffic noise in Section 7.2.4 and Appendix F. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Nosie Guidelines (DECCW, 2009). This assessment indicates that there may be exceedances of noise management levels for receivers around the southern interchange compound (including at Gum Grove Place) at various times during the construction phase.

Where the assessment indicates that relevant noise management levels are predicted to be exceeded, consideration is required to be given to feasible and reasonable mitigation and management measures. Mitigation and management measures that would be applied are detailed in the environmental impact statement.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), further investigation has been undertaken to determine the extent of these potential exceedances and to further develop specific construction noise mitigation and management measures. These are detailed in **Section 4.5** of this report.

Opportunities for additional feasible and reasonable mitigation measures to protect local amenity and reduce construction noise impacts would be considered during the detailed design process as part of the development of Construction Noise and Vibration Management Plans.

Issue description

Noise impacts from construction traffic will be intolerable at Coral Tree Drive.

Response

Noise from construction traffic on Coral Tree Drive would mainly be as a result of construction traffic using the Hills M2 Motorway. Section 4.3 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement) provides an assessment of construction road traffic noise. The assessment of traffic noise presented in the environmental impact statement considered two scenarios, being all spoil being transported to a disposal location to the south and all spoil being transport to a disposal location to the north.

Under the worst-case scenario, there is expected to be an increase in road traffic noise of 5 dB(A) which would occur during the AM off-peak period (between 1 am and 3 am). This assessment is a worst-case scenario which assumes, in this case, all spoil is being transported to a southerly disposal site. In reality it is reasonably possible that multiple spoil disposal sites would be used in each direction which would reduce this predicted increase in road traffic noise.

Construction traffic noise may also be generated by heavy vehicles required to construct the Coral Tree Drive switching station. As identified in Table 7-15 of the environmental impact statement, this is anticipated to be around 15 heavy vehicles per day over a 15 month period. The addition of 15 heavy vehicles per day would not result in a significant increase in road noise.

Trelawney Street compound (C7)

Issue description

Increase in noise levels on Loch Maree Avenue from construction vehicles accessing Trelawney Street compound. The environmental impact statement indicates that this noise level would be an increase of between 11.8 dB(A) and 15.9 dB(A). This is much more than other compounds.

Requests assurances that mitigation measures will be introduced to reduce this to a level that is considered safe and unlikely to cause undue disruption to local residents.

Noise should be limited to be the same as what is currently experienced from Pennant Hills Road traffic.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the Trelawney Street compound (C7). As a result, heavy vehicle use of residential streets around the Trelawney Street compound has been avoided with reductions in potential traffic noise impacts as a result.

Changes made to access arrangements at the Trelawney Street compound are detailed and assessed in **Section 9.4** of this report.

8.8.6 Noise from out of hours works

Thirty submissions raised issues regarding noise from out of hours works during construction.

Issue description

Submissions raised concerns relating to noise from the out of hours work for the project.

In summary, the submissions raised the following issues:

- Out of hours works at the Trelawney Street compound (C7) has the potential to significantly impact on local residents. The environmental impact statement indicates that the noise management levels will be exceeded.
- Hours of operation should be restricted to standard construction hours specified in the Interim Construction Noise Guidelines (DECCW, 2009).
- Good acoustic barriers need to be erected before work begins.
- Suggestions that provision of alternative accommodation may be required.

Response

The project would be constructed in accordance the Interim Construction Noise Guidelines (DECC, 2009).

The construction noise impact assessment presented in Section 7.2 and Appendix F of the environmental impact statement predicts exceedances of noise management levels during works at the Trelawney Street compound (C7). Further details of these exceedances, and proposed mitigation and management measures, are provided in **Section 4.5** of this report. Noise management levels are predicted to be exceeded:

- At 79 receivers during site establishment (around nine months). This would be during standard construction hours.
- At 24 receivers during tunnel support activities (around 18 to 21 months) during standard construction hours, and at 37 receivers outside of standard construction hours.
- At 30 receivers during building construction works (around 18 months). This would be during standard construction hours.

The majority of works outside of standard construction hours would occur within an acoustic shed.

Tunnelling works are required to be carried out continuously 24 hours per day and seven days per week. As a result, tunnel support activities at the Trelawney Street compound are also likely to be required up to 24 hours per day and seven days per week. This is principally because of three factors:

- The total extent of land acquisition and surface disturbance required for the project has been minimised. As a consequence, there is limited space to stockpile spoil and a need to regularly remove spoil from tunnel support sites.
- Spreading traffic movements over a 24 hour period reduces peak impacts, with lower impacts on average for most receivers.
- The highly congested traffic situation along Pennant Hills Road during and around peak hours, and high traffic volumes at other times of the day limit the ability to remove spoil for large periods during day time hours.

Issue description

Construction hours should be restricted. Suggestions include restricting works to the standard construction hours or to the following hours:

- Monday to Friday, between 7.30am and 5pm.
- Monday to Friday 7am to 5pm and Saturday 8am to 1pm.

Response

Some of the construction activities required for the NorthConnex project cannot be conducted within standard construction hours, as specified in the Interim Construction Noise Guidelines (DECCW, 2009) which are:

- 7 am to 6 pm Monday to Friday.
- 8 am to 1 pm Saturday.
- No works on Sundays or public holidays.

Tunnelling works are required to be carried out continuously 24 hours per day and seven days per week. As a result, tunnel support activities at the southern interchange compound (C5), the Wilson Road compound (C6), the Trelawney Street compound (C7) and the northern interchange compound (C9) are also likely to be required up to 24 hours per day and seven days per week. This is principally because of three factors:

- The total extent of land acquisition and surface disturbance required for the project has been minimised. As a consequence, there is limited space to stockpile spoil and a need to regularly remove spoil from tunnel support sites.
- Spreading traffic movements over a 24 hour period reduces peak impacts, with lower impacts on average for most receivers.
- The highly congested traffic situation along Pennant Hills Road during and around peak hours, and high traffic volumes at other times of the day limit the ability to remove spoil for large periods during day time hours.

Construction works within operational motorways, such as bridgeworks on the Hills M2 Motorway, must also be conducted outside standard construction hours for safety and operational reasons.

Issue description

Submissions raised concerns that there is no out of hours assessment for the M1 Pacific Motorway tie-in works. Request a guarantee that all construction works for the M1 Pacific Motorway tie-in works and the northern portals will be undertaken within standard construction hours.

Response

The environmental impact statement includes a construction noise impact assessment for works which, based on current development of the project design and construction methodology, are known with almost complete certainty to be required outside of standard construction hours (as defined in the Interim Construction Noise Guideline). Such construction activities include parts of the Hills M2 Motorway integration works and tunnelling support activities.

In all other cases - including the M1 Pacific Motorway tie-in works - current development of the project design and construction methodology suggests that works outside standard construction may not be required. However, if works outside of standard construction hours are identified as being necessary in the future, an appropriate level of impact assessment would be conducted consistent with the requirements of the Interim Construction Noise Guideline. These works would be required to be consistent with the environmental impact statement which may require approval for the works through an environment protection licence.

This approach to the assessment and management of construction works outside standard construction hours is consistent with applicable impact assessment guidelines and policy, and with the practice applied to other major infrastructure projects in New South Wales.

Issue description

Concerns regarding out of hours works and sleep disturbance impacts, including to students studying for exams from construction at:

- Southern interchange compound (C5).
- Wilson Road compound (C6).
- Northern interchange compound (C9)
- Northern ventilation facility.

Response

The southern interchange compound (C5), the Wilson Road compound (C6) and the northern interchange compound (C9) would be tunnelling support facilities during construction, and will support tunnelling on a 24 hour per day, seven day per week basis. Tunnelling support activities are required outside of standard construction hours based on continuous tunnelling. The project includes feasible and reasonable mitigation measures in order to reduce the potential noise impact to nearby receivers including the provision of an acoustic shed.

Construction activities on the site, other than tunnelling support activities, would be conducted within standard construction hours unless the construction works:

- Would not exceed the applicable noise management level at the nearest sensitive receiver, as determined under the Interim Construction Noise Guideline (DECC, 2009).
- Are required by the Police or other authorities for safety reasons.
- Are required to avoid the loss of life, property and/ or prevent environmental harm.
- Are subject to a negotiated agreement with the affected receiver(s).
- Are otherwise authorised by an environment protection licence issued under the *Protection of the Environment Operations Act 1997*.

The sleep disturbance assessment presented in Table 7-77 of the environmental impact statement indicates that up to 23 receivers may exceed the sleep disturbance screening criterion around the southern interchange compound and up to 120 receivers may exceed the sleep disturbance screening criterion around the Wilson Road compound. Only one of these receivers (around the Wilson Road compound) would exceed the sleep disturbance awakening reaction criterion. Further details of construction noise impacts, and mitigation and management measures, are provided in **Section 4.5** of this report.

The northern ventilation facility would not ordinarily be used 24 hours per day and seven days per week during construction, although out of hours work at this facility may be required from time to time. This would be undertaken in accordance with the process outlined in Section 5.3.15 of the environmental impact statement.

Issue description

The current proposal did not elaborate on means or methodology employed in making sure the noise level (from construction machinery and heavy vehicle movements) will be properly monitored and kept in check along the Hills M2 Motorway integration works during construction.

It is hard to see how any mitigation measures could be implemented to would reduce noise to a satisfactory level.

Response

Table 7-85 of the environmental impact statement provides mitigation and management measures relevant to construction noise during construction. Further information on construction noise mitigation and management measures is provided in **Section 4.5** of this report.

8.8.7 Traffic noise from out of hours works

Nineteen submissions raised issues regarding traffic noise from out of hours work during construction.

Issue description

Noise from trucks removing debris at all times of the day and night for over two and a half years.

Response

The environmental impact statement provides an assessment of construction traffic noise in Section 7.2.4 and Appendix F. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Nosie Guidelines (DECCW, 2009). The noise impacts of traffic movements at night, particularly late at night and in the early morning, have been assessed and are summarised in Table 49, Table 50, Table 51 and Table 52 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement).

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9). As a result, heavy vehicle use of residential streets has been reduced further, with reductions in potential amenity impacts for local receivers.

Changes made to access arrangements at the southern interchange compound, the Trelawney Street compound and the northern interchange compound are detailed and assessed in **Section 9.4** of this report.

These revised haulage routes have resulted in a significant reduction in construction traffic noise levels on local roads from night-time spoil haulage.

Issue description

To minimise noise, the access road off Eastbourne Avenue to the northern interchange compound and the access road off Coonanbarra Road to the Junction Road compound should not be used between 8 pm and 7 am.

Response

Access to the northern interchange compound from Eastbourne Avenue would mainly be for light vehicles only. Light vehicles would utilise this access 24 hours per day and seven days per week.

Heavy vehicles would use the Eastbourne Avenue access route for the site establishment and decommissioning phases of the project. These activities would be carried out during standard daytime construction hours of 7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturday.

The Junction Road compound is not expected to ordinarily be in use 24 hours per day and seven days per week, however the compound may need to be used outside of standard construction hours from time to time to support other out of hours works in the vicinity.

8.8.8 Cumulative noise impacts

Six submissions raised issues regarding the cumulative noise impacts during construction.

Issue description

Residents have been subject to three years of construction noise along the Hills M2 Motorway and will now face more impacts.

Response

The environmental impact statement acknowledges that receivers along the Hills M2 Motorway have recently been affected by construction noise from the Hills M2 Motorway Upgrade project (refer to Section 7.2.4 of the environmental impact statement). Some sensitive receivers that were previously affected by noise from the Hills M2 Motorway Upgrade project would be further affected by noise and vibration generated by construction activities associated with the southern interchange and the Hills M2 Motorway integration works.

The Hills M2 Motorway Upgrade project works between the Pennant Hills Road and Windsor Road interchanges was substantially completed and opened to traffic in April 2013. Site establishment works associated with this project are expected to start in the first quarter of 2015, with the Hills M2 Motorway integration works anticipated to start in late 2015. This has provided some respite for sensitive receivers that may have been previously impacted by the Hills M2 Motorway Upgrade project and would potentially be impacted by construction activities associated with the project.

A Construction Noise and Vibration Management Plan would be prepared by the contractor. This would identify feasible and reasonable measures to manage predicted noise levels at sensitive receivers. Consultation with the affected community would also occur before and during construction. If the NorthConnex project is approved, the conditions applied to the project by the Minister for Planning may specify the required content of the Construction Noise and Vibration Management Plan, consultation requirements, and whether the plan requires review and approval by relevant regulatory authorities.

Issue description

Many residents will be exposed to both construction site noise and construction traffic noise however the cumulative impact of this is not assessed.

Response

A cumulative noise impacts assessment is provided in Section 7.2 and Appendix F of the environmental impact statement. This identifies that, at most, the cumulative noise levels could be 3 dB(A) higher than the noise levels presented in the assessment.

The construction noise assessment carried out is conservative by assuming that all plant and equipment would be operating simultaneously and at the closest location to sensitive receivers. The conservatism in this modelling is likely to outweigh the potential for a 3 dB(A) increase in noise which may arise from cumulative impacts.

Issue description

The environmental impact statement does not identify how cumulative impacts with the North West Rail Link and the Epping to Thornleigh Third Track projects would be managed.

Response

Consideration of potential cumulative traffic impacts is provided in Section 7.2.4 of the environmental impact statement. Overall, due to the anticipated staging and relative location of each project the potential for significant cumulative impacts is negligible.

Consultation would occur between the relevant projects in relation to construction staging and haul routes in order to minimise the potential for cumulative impacts.

8.8.9 Property damage and existing condition surveys

Seven submissions raised issues regarding property damage and existing condition surveys.

Issue description

Concerns regarding risk of structural damage to properties, including near the Trelawney Street compound, the northern interchange, the Hills M2 Motorway integration works and along the tunnel alignment.

Recommend that each residential home on Nelson Street, Trelawney Street and Loch Maree Avenue have the option and access to a detailed survey report on the residential property in relation to the impact from the construction of the tunnel.

Response

Before the commencement of tunnelling works, existing condition surveys would be carried out on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. Copies of these reports will be provided to the property owner. In the unlikely event of damage caused by the construction of the NorthConnex project, this would be rectified by the contractor at no cost to the property owner. Based on the assessment of potential impacts and the depth of the tunnel in this location, there is no justification for extending this 50 metre zone.

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8.9 Operational noise and vibration

8.9.1 Traffic noise

Thirty two submissions raised issues regarding traffic noise during operation.

General traffic noise concerns

Issue description

Concerns regarding noise at houses above the project's tunnel during operation.

Response

Noise impacts above and around the project tunnels may be generated through two principal mechanisms:

- Airborne noise emitted from the tunnel portals, including noise generated by vehicles exiting the tunnels and noise generated by the operation of jet fans.
- Vibration from within the project tunnels, which in some cases may be transmitted via the ground and may affect surface receivers as ground-borne noise.

Section 7.2 and Appendix F of the environmental impact assessment provide a detailed assessment of relevant noise emissions from the project during construction and operation of the project. This assessment includes potential airborne noise impacts associated with forecast traffic movements and 'breakout noise' generated by the operation of the tunnel jet fans.

Vehicles using the project tunnels during operation would not generate vibration transmitted through the tunnel and overlying rock at levels likely to lead to ground-borne impacts at the surface. This is because:

- Vehicles would generate relatively low intensity vibration, particularly relative to other project scenarios such as the use of road headers during construction tunnelling.
- The vehicle vibration sources are not in direct contact with the transmitting rock above the tunnel, with significant vibration attenuation provided by the tunnel structure and the air column within the tunnel.
- The tunnel would be located at significant depth in most locations. By comparison, the more vibration intensive use of road headers for construction tunnelling only result in elevated ground-borne noise levels around tunnel portals and shallower sections of the project tunnels (reflecting the effect of deep tunnel locations and attenuation through significant rock depths).

On this basis, the project is not expected to result in significant operational vibration and ground-borne noise issues during operation. These issues have therefore not been subject to a quantitative assessment in the environmental impact statement.

Issue description

Increased noise from project operation will affect a large number of residential properties.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide an operational noise assessment, including an assessment of potential traffic noise along the Hills M2 Motorway. This assessment considers the potential increase in operational traffic noise and feasible and reasonable mitigation measures where receivers are above the criteria

identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

Appendix J to the Technical Working Paper: Noise and Vibration (Appendix F to the environmental impact statement) presents a series of tables which summarise the operational traffic noise modelling results for receivers around the project. The tables include predicted noise levels with and without the project in 2019 and 2029, and under different noise barrier scenarios.

The tables indicate that even without the NorthConnex project, most of the receivers listed in the tables would be classified as 'acute' receivers under the Environmental Noise Management Manual. This highlights that most of these receivers already experience elevated levels of traffic noise due to their proximity to major roads and motorways. While it is acknowledged that the NorthConnex project will contribute to increases in road traffic noise for some of these receivers, most of the listed receivers are eligible for consideration of at-property acoustic treatments as a consequence of existing elevated traffic noise levels. The NorthConnex project presents an opportunity to not only address increases in traffic noise levels generated by the project, but to improve acoustic amenity for many receivers within the project area already experiencing elevated traffic noise levels.

Issue description

Further information is sought on the expected reductions in road traffic noise along Pennant Hills Road as a result of the project.

Response

One of the objectives of the project is to contribute towards a reduction in the number of heavy vehicles using Pennant Hills Road and as a result improve local air quality and noise amenity along that corridor.

Table 7-13 and 7-24 of the environmental impact statement provides a comparison of AM and PM traffic volumes on different sections of Pennant Hills Road with and without the project in 2019 and 2029. Table 8-4 of the Traffic and Transport Technical Working Paper (Appendix E of the environmental impact statement) provides the average weekday traffic volumes along various sections of Pennant Hills Road with and without the project in 2019 and 2029.

These tables identify that there would be an overall reduction in traffic on Pennant Hills Road, particularly heavy vehicles. This reduction would also result in an overall reduction in traffic noise levels along Pennant Hills Road. Modelled reductions in traffic noise along Pennant Hills Road are:

- In 2019, traffic noise reductions between 1.4 dB(A) and 2.4 dB(A) during the day time and between 2.0 dB(A) and 3.2 dB(A) during the night time.
- In 2029, traffic noise reductions between 1.3 dB(A) and 1.8 dB(A) during the day time and between 1.7 dB(A) and 2.4 dB(A) during the night time.

Issue description

Submissions raised concern that West Pennant Hills is getting more than its fair share of noise and disruption compared to suburbs further north.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide a construction and operational noise assessment, including an assessment of potential noise at West

Pennant Hills. The noise assessment has been conducted in accordance with applicable assessment guidelines, including the Interim Construction Noise Guideline (DECCW, 2009), the Road Noise Policy (DECCW, 2011), the Environmental Noise Management Manual (RTA, 2001) and the NSW Industrial Noise Policy (EPA, 2000).

These assessment guidelines and the relevant noise assessment thresholds and criteria have been applied consistently across all areas potentially affected by the project, including West Pennant Hills and the suburbs further north.

The Technical Working Paper: Noise and Vibration (Appendix F to the environmental impact statement lists properties that have been identified as eligible for consideration of at-property acoustic treatment (Table 75 and Table 78). These current lists of properties eligible for consideration of at-property acoustic treatment indicate that:

- There are 74 properties in the suburb of Wahroonga.
- There are 17 properties in the suburb of Carlingford.
- There are six properties in the suburb of West Pennant Hills.
- There are 19 properties in the suburb of North Rocks.
- There are five properties in the suburb of Northmead.

In addition to these properties, a further six properties have been identified as eligible for consideration of at-property acoustic treatments. These properties are located along Coral Tree Drive, Carlingford (refer to **Section 4.4** of this report).

Northern interchange

Issue description

Submissions raised concerns that properties on Hewitt Avenue will be exposed to increased noise. This would include noise bouncing between houses and noise from speeding trucks and cars.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provides an operational noise assessment, including an assessment of potential traffic noise on Hewitt Avenue. This assessment considers the potential increase in operational traffic noise and feasible and reasonable mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

In this location, the assessment has identified that the existing noise barrier between Hewitt Avenue and the M1 Pacific Motorway would be increased in height in order to reduce operational traffic noise levels. A number of properties in this location have also been identified as eligible for consideration of at-property treatment.

Further analysis of this issue would be conducted during detailed design of the project. The aim of this analysis would be to identify further feasible and reasonable noise mitigation measures that could be applied to reduce noise impacts at this property. This may include application of at-property acoustic treatments.

Hills M2 Motorway

Issue description

Submissions raised concerns regarding increased traffic noise impacts as a result of the Hills M2 Motorway integration works. Specific areas identified include Darling Mills Creek Bridge and the area to the west of the Barclay Road Bridge.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide an operational noise assessment, including an assessment of potential traffic noise along the Hills M2 Motorway. This assessment considers the potential increase in operational traffic noise and feasible and reasonable mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

Based on the current design of the project, it is anticipated that for the southern interchange and the Hills M2 Motorway integration works, reasonable and feasible noise mitigation measures would include increasing the height of one noise barrier located immediately to the west of the Barclay Road overbridge up to Darling Mills Creek bridge (reference noise barrier NWM2WB01) and anticipated consideration of at-property treatment acoustic treatments for 47 properties. Of these 47 properties identified, 45 would have been exposed to acute noise levels in 2029 regardless of the project. Only one residential receiver would experience an increase in noise levels greater than 2 dB(A). The other property eligible for consideration of at-property treatment is the Royal Institute for Deaf and Blind Children. These mitigation measures would be considered further based on additional noise modelling carried out for the detailed design of the project.

Issue description

Submissions raised concerns that the Royal Institute for Deaf and Blind Children is a particularly sensitive location. The noise amenity needs to be maintained.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provides an operational noise assessment, including an assessment of potential traffic noise along the Hills M2 Motorway. This assessment considers the potential increase in operational traffic noise and feasible and reasonable mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

The assessment has identified that the traffic noise levels at the Royal Institute for Deaf and Blind Children are predicted to be around 57 dB(A) during the daytime (external to the building). The applicable internal noise criterion of 40 dB(A) may therefore be exceeded within the building.

Further analysis of this issue would be conducted during detailed design of the project, including consultation with the Royal Institute for Deaf and Blind Children. The aim of this analysis would be to identify further feasible and reasonable noise mitigation measures that could be applied to reduce noise impacts at this property. This may include application of at-property acoustic treatments.

Issue description

The bushland behind homes along the Hills M2 Motorway to the west of Barclay Road currently filters traffic noise levels. The removal of this bushland will increase noise.

Response

Although it may provide a visual screening to traffic on the Hills M2 Motorway, vegetation does not provide a barrier to the transmittal of noise. As such, the presence of bushland between residential receivers and the motorway would not provide a reduction in noise levels. Therefore whilst the removal of this vegetation may result in receivers being able to see the traffic, it would not result in a measurable increase in traffic noise levels.

Issue description

The proposal to widen the current ramp to Pennant Hills Road for the new northbound on-ramp would result in noise impacts to residents in Gum Grove Place, Larchmont Avenue and Savoy Court.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provides an operational noise assessment, including an assessment of potential traffic noise along the Hills M2 Motorway. This assessment considers the potential increase in operational traffic noise and feasible and reasonable mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

In relation to the section around the new northbound connection from the Hills M2 Motorway to the NorthConnex tunnel, there is only one receiver in this vicinity which receives a noise increase to the extent of being eligible for consideration of at-property acoustic treatment.

Operational traffic noise monitoring will be carried out within a year of construction completion to ensure that the noise barriers are resulting in a noise level consistent with the prediction from the environmental impact statement.

8.9.2 Vibration

Three submissions raised issues regarding vibration during operation.

Issue description

Concerns regarding vibration at houses above the tunnel during operation.

Response

Vehicles using the project tunnels during operation would not generate vibration transmitted through the tunnel and overlying rock at levels likely to lead to vibration or ground-borne impacts at the surface. This is because:

- Vehicles would generate relatively low intensity vibration, particularly relative to other project scenarios such as the use of road headers during construction tunnelling.
- The road pavement wearing course would not have expansion joints and would therefore not generate the noise and vibration effects from jointed concrete pavements.
- The vehicle vibration sources are not in direct contact with the transmitting rock above the tunnel, with significant vibration attenuation provided by the tunnel structure and the air column within the tunnel.
- The tunnel would be located at significant depth in most locations. By comparison, the more vibration intensive use of road headers for construction tunnelling only result in elevated ground-borne noise levels around tunnel portals and shallower sections of the project tunnels (reflecting the effect of deep tunnel locations and attenuation through significant rock depths).

8.9.3 Noise attenuation

Five submissions raised issues regarding noise attenuation during operation.

Issue description

Submissions raised concerns relating to noise attenuation for the project.

In summary, the submissions raised the following issues:

- There appears to be no effort made to reduce impending increase in noise or improve the existing noise barriers.
- The best noise reducing road surface should be used.
- Concerns regarding the process to determine eligibility for treatment.

Response

The environmental impact statement includes an assessment of the potential operational traffic noise impacts from the NorthConnex project for the year of opening (2019) and ten years after opening (2029). This included operational traffic noise along the section of Pennant Hills Road adjacent to the Motorway Operations Complex (between the Pennant Hills Road on and off ramps, and the Hills M2 Motorway). The design of the project has included a low noise road pavement in all surface road locations.

Consistent with the requirements of the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001), this assessment has considered the feasibility and reasonableness of providing noise barriers before consideration of at-property treatments.

Subject to obtaining planning approval further detailed design would be carried out together with more detailed noise modelling to confirm the reasonable and feasible operational noise mitigation measures to be applied to the project.

Issue description

Further acoustic screening is required along Pennant Hills Road near the Motorway Operations Complex because the roof line is not high enough (ie road noise will pass over the top) and no screening has been provided (the screen must be higher than truck exhaust pipes).

Response

The environmental impact statement includes an assessment of the potential operational traffic noise impacts from the NorthConnex project for the year of opening (2019) and ten years after opening (2029). This included operational traffic noise along the section of Pennant Hills Road adjacent to the Motorway Operations Complex (between the Pennant Hills Road on and off ramps, and the Hills M2 Motorway).

Consistent with the requirements of the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001), this assessment has considered the feasibility and reasonableness of providing noise barriers prior to consideration of at-property treatments.

Based on the assessment presented in the environmental impact assessment, only one receiver location to the west of the Motorway Operations Complex (ID 3481 - 20 Gum Grove Place, Carlingford) has been identified as exceeding the relevant noise goals described in

the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001). It is not reasonable to provide a noise barrier for mitigating operational traffic noise at one receiver. This property has been identified as being eligible for consideration of at-property acoustic treatment(s).

Subject to obtaining planning approval further detailed design would be carried out together with more detailed noise modelling to confirm the reasonable and feasible operational noise mitigation measures to be applied to the project.

8.9.4 Provision and location of noise barriers

Seventy three submissions raised issues regarding the provision and location of noise barriers.

General noise barrier concerns

Issue description

Submissions raised concerns relating to the provision and location of noise barriers for the project.

In summary, the submissions raised the following issues:

- Where noise walls are likely to be constructed, the design of other infrastructure should not result in excessive costs.
- The provision of noise mitigation should not be prevented by uneconomical costs of the original design.

Response

The environmental impact statement includes an assessment of the need for, location and height of noise barriers for the project. Consistent with the requirements of the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001), noise barriers are considered where receivers exceed noise goals identified in these guidance documents. Noise barriers have been proposed for the project, as part of a broader suite of noise mitigation measures, with the aim of achieving the criteria outlined in the Road Noise Policy (DECCW, 2011).

This assessment will be re-visited during detailed design to ensure that noise barriers are designed and installed where required.

Noise monitoring would be carried out during operation of the project to confirm the modelled noise levels. If exceedances are identified during this monitoring, additional feasible and reasonable noise mitigation measures would be investigated. The project has been designed to ensure that additional or different noise barrier designs and locations are not precluded, if it is determined this is required.

Issue description

Submissions raised concerns that that noise barriers will not be effective.

Response

Noise barriers have been utilised to mitigate noise from infrastructure projects including road and rail over a long period of time. Barriers are proven to be an effective noise attenuation measure. Operational traffic noise monitoring will be carried out within a year of construction completion to ensure that the noise barriers are resulting in a noise level consistent with the prediction from the environmental impact statement.

Issue description

Concerns that the condition and height of many of the existing noise barriers along the M1 Pacific Motorway are substandard and the environmental impact statement does not contain an adequate assessment of their existing condition.

Requests for a condition assessment of the existing noise barriers to be carried out and areas where new noise barriers are required due to the condition of the existing noise barriers to be identified.

Response

The environmental impact statement is not required to provide an assessment on the condition of the existing noise barriers.

In the event that noise barriers within the project area do not need to be directly impacted by construction works, NorthConnex would investigate the condition of the barrier and undertake any necessary repair works to ensure it adequately mitigates potential road traffic noise impacts from the project. Additionally, operational traffic noise monitoring will be carried out within a year of construction completion to ensure that the noise barriers are resulting in a noise level consistent with the prediction from the environmental impact statement.

Issue description

Submissions raised concerns relating to the provision and location of noise barriers for the project.

In summary, the submissions raised the following issues:

- The environmental impact statement does not clearly identify which existing noise barriers will need to re-located or replaced – and has not undertaken a noise assessment for sensitive receivers where their noise wall are temporarily removed.
- NorthConnex should commit to erecting new permanent noise barriers prior to removal of existing barriers where possible.
- Where noise barriers are relocated to a lower RL (ie down a hill), the height of the noise barrier should be increased by the same amount.
- Where noise barriers are relocated to a higher RL (ie up a hill), the height of the noise barrier should still be the same height as the existing wall.
- Noise barriers should be replaced where there is expected to be increased noise at ultimate capacity of the tunnel, and / or where properties in the local vicinity are predicted not to meet operational noise targets.

Response

It is not possible to determine exactly which existing noise barriers would need to be re-located or replaced until detailed design and construction methods have been further developed. At this stage, it has been assumed that all existing noise walls in the project area would need to be removed during the construction period. The construction assessment has been undertaken in this basis.

Mitigation measures NV15 identifies that permanent barriers would be scheduled for completion as early as possible in the construction period.

The operational noise assessment has identified locations where noise walls would need to be maintained at the same height or where increases to the height are required. This has been undertaken in accordance with the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

Issue description

Objection to the noise barriers being moved at any time as this will be very disruptive.

Response

Noise barriers would need to be relocated to allow construction works to occur, and to ensure that noise barriers are appropriately located to minimise traffic noise impacts to surrounding receivers. Relocation of noise barriers would be conducted in the same manner as other construction activities, with the application of all feasible and reasonable measures to minimise or avoid impacts on surrounding receivers.

Hills M2 Motorway

Issue description

Requests to raise the noise barrier for more effective noise protection for residents in Murray Farm Road/ Boundary Road.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide an operational noise assessment, including an assessment of potential traffic noise increases along the Hills M2 Motorway. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

Based on the current design of the project, the operational noise barrier in the vicinity of Murray Farm Road / Boundary Road would be maintained at its existing height. Noise mitigation measures would be reviewed during detailed design to ensure that reasonable and feasible noise mitigation measures are provided, including noise barriers where appropriate, to meet the requirements of the Road Noise Policy and the Environmental Noise Management Manual.

Issue description

Request that the noise wall parallel to Coral Tree Drive be increased in height by five metres, along with the addition of new noise reduction wall pads as per other sections of the Hills M2 Motorway.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide an operational noise assessment, including an assessment of potential traffic noise increases along the Hills M2 Motorway. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

The need for, height and location of noise barriers has been considered in more detail for receivers along Coral Tree Drive, Carlingford. This has led to a revision of the configuration of noise barriers at this location and identification of six additional properties that would be eligible for consideration of at-property acoustic treatments. Further details of this issue are provided in **Section 4.4** of this report.

Issue description

The environmental impact statement identifies that the noise barrier along the Hills M2 Motorway to the west of Barclay Road will be increased in height. It is unclear how much higher the noise barrier will be in absolute terms compared to the existing noise barriers. It is requested that the noise barrier be built considerably higher.

Response

Table 7-86 of the environmental impact statement provides the recommended heights of noise barriers. Based on this assessment, it has been recommended that the barrier to the west of Barclay Road along the Hills M2 Motorway be increased in height to five metres high.

The location and height of noise barriers would be confirmed during the detailed design phase of the project.

Issue description

Requests that the new noise barrier next to Hepburn Road North Rocks be constructed before the actual works to the road.

Response

Mitigation measure NV15 in Table 7-85 of the environmental impact statement commits to completion of permanent noise barriers as early as possible in the construction program, however in most locations the new road formations would need to be constructed prior to construction of the new noise barrier in the appropriate location.

Issue description

Concern regarding the lowering of the noise barriers along the Hill M2 Motorway for the residences overlooking the ramps. Request to leave the noise barriers as they are or to make them higher.

Response

The need for, height and location of noise barriers has been considered in more detail for receivers along Coral Tree Drive, Carlingford. This has led to a revision of the configuration of noise barriers at this location and identification of six additional properties that would be eligible for consideration of at-property acoustic treatments. Further details of this issue are provided in **Section 4.4** of this report.

Issue description

Submissions request that the best possible noise barriers be installed ensuring they overlap and there are no gaps at the bottom.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide an operational noise assessment, including an assessment of potential traffic noise increases along the Hills M2 Motorway. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

Noise barriers would be constructed from a similar material as the existing barriers on the Hills M2 Motorway. Operational traffic noise monitoring will be undertaken within a year of construction completion to ensure that the noise barriers are resulting in a noise level consistent with the prediction from the environmental impact statement.

Northern interchange

Issue description

Submissions raised concerns that there is a noise barrier missing next to the M1 Pacific Motorway behind properties 1626, 1617, 1648, 1656 and 1661 (northern interchange) and next to the Lucinda Avenue side of the M1 Pacific Motorway.

Response

In this location, five properties have been identified as exceeding the relevant traffic noise assessment thresholds from the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001). Three of these properties would be exposed to acute noise levels in 2029 regardless of the project, whilst two would have noise level increases of 2.1 and 2.2 dB(A) respectively.

Based on these predicted noise levels, consideration of feasible and reasonable noise mitigation is required. Following adoption of feasible and reasonable at-source mitigation through the selection of road pavements included in the project, further consideration has been given to:

- Installation of noise barriers.
- Potential at-receiver noise mitigation (through at-property acoustic treatments).

In this location the M1 Pacific Motorway is located within a cutting. The provision of an operational noise barrier in this location was not considered feasible or reasonable because any noise barrier in this location would need to be located at the top of the cutting to be effective. This would result in:

- A significant increase in vegetation clearing beyond that required for the road widening.
- An increase in construction work closer to residential properties.
- Potential for significant visual and overshadowing impacts to residential properties.

Because noise barriers were not considered feasible and reasonable in this location, further consideration was given to potential at-property acoustic treatments. Five properties have been identified as being eligible for consideration of at-property acoustic treatments.

Operational traffic noise and feasible and reasonable noise mitigation would be considered further during detailed design (subject to the project being approved), and the final form of feasible and reasonable noise mitigation measures would be confirmed at that time.

Issue description

Submissions raised concerns relating to the provision and location of noise barriers for the project.

In summary, the submissions raised the following issues:

- Concerns regarding the new noise barrier at the end of Hewitt Avenue being built closer to homes.
- There is no mention of the height of the noise barrier at the end of Hewitt Avenue or the level of sound proofing it will provide.
- An integrated safety barrier/ noise barrier should be built.

Response

The height of the barrier is provided in Table 7-86 of the environmental impact statement. Based on the concept design this barrier would be 3.5 metres in height.

Noise mitigation measures would be reviewed during detailed design to ensure that reasonable and feasible noise mitigation measures are provided, including noise barriers where appropriate, to meet the requirements of the Road Noise Policy and the Environmental Noise Management Manual.

Consideration of the need for and location of safety barriers on the M1 Pacific Motorway would be carried out during the detailed design phase.

Issue description

Submissions request that adequate noise barriers be included along the M1 Pacific Motorway southbound exit onto Pennant Hills Road as current timber walls are inadequate.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide an operational noise assessment, including an assessment of potential traffic noise increases along the Hills M2 Motorway. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

In this location, based on the concept design, the noise modelling and assessment has determined that existing noise barrier would be increased in height to 3.5 metres. Modern noise barrier materials would be used for the construction of this noise barrier, similar to barriers recently constructed on motorway projects throughout Sydney.

Issue description

Submissions raised concerns that post construction, the anticipated increase in the number of vehicles using the M1 Pacific Motorway will exacerbate the current noise levels along the Cockle Creek valley and adjacent residential area of Wahroonga. Existing and proposed noise barriers are an attempt to address the noise issues but with limited success.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide an operational noise assessment, including an assessment of potential traffic noise increases along the Hills M2 Motorway. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

This assessment included consideration of feasible and reasonable noise barriers along the M1 Pacific Motorway. Following consideration of barriers, a number of properties are also identified which are eligible for consideration of at-property acoustic treatment.

Issue description

The environmental impact statement needs to provide more information to ensure the receivers affected by the Northern Interchange where noise barriers are to be replaced are provided with replacement noise barriers of at least the equivalent performance of the existing barriers

Response

Noise barriers have been recommended in accordance with Roads and Maritime policy and in accordance with the Road Noise Policy (DECCW, 2011) and Environmental Noise Management Manual (RTA, 2001).

Section 7.1 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement) states:

> *"the top of the new noise barrier should be no lower than the top of the existing noise barrier (that is, the reduced level (RL) of the top of the existing barrier must be maintained)." The performance would therefore be at the least equivalent."*

Southern interchange

Issue description

Submissions raised concerns relating to the provision and location of noise barriers for the project.

In summary, the submissions raised the following issues:

- The exact location of the noise barriers in the vicinity of the southern interchange has not been made clear.
- Request for a six metre high noise barrier near the southern ventilation outlet
- Request for noise barriers for properties along southern interchange compound (C5) construction vehicle route.

Response

Figure 7-15 identifies the general location of noise barriers around the southern interchange. The exact location of the noise barriers would be subject to the detailed design phase of the project.

It is not considered reasonable or feasible to install noise barriers along construction routes, given the temporary nature of construction activities. Installation of noise barriers along construction haulage routes would also have significant environmental and land use impacts in many cases (such as visual amenity, access restrictions and land use severance), particularly where the noise barriers would be located between the road and adjacent residential/ commercial/ industrial receivers.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). These changes would avoid the use of local roads by heavy vehicles, including Aiken Road, Oakes Road, Karloon Road and Eaton Road.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

The most affected residential receiver is predicted to experience 41 dB(A) ($L_{Aeq(15\text{-}minute)}$) due to the operation of the southern ventilation facility and the southern interchange portal under worst case meteorological conditions. This noise impact complies with the applicable noise criterion at this location of 41 dB(A). As such, there is no justification for a noise barrier in this location.

8.9.5 At-property acoustic treatment

Eleven submissions raised issues regarding at-property acoustic treatment.

Issue description

Submissions raised concerns relating to at-property acoustic treatment for the project.

In summary, the submissions raised the following issues:

- Request for at-property treatment in the form of double glazing to mitigate the impact of the new lane on the Hills M2 Motorway.
- Noise levels should comply with the criteria set out in clause 102 of *State Environmental Planning Policy (Infrastructure) 2007*.

Response

Section 7.2.4 and Appendix F of the environmental impact statement provide an operational noise assessment, including an assessment of potential traffic noise increases along the Hills M2 Motorway. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise mitigation measures where receivers are above the criteria identified in the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (RTA, 2001).

Receivers eligible for consideration of at-property treatment are identified in Table 78 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement). Properties eligible for consideration of at-property treatment would be confirmed during the detailed design phase.

The type of at-property acoustic treatment that will be considered at each eligible property will be informed by an inspection of the property and consultation with the affected landowner. Broadly, two categories of at-property treatments would be considered:

- Type 1 – for exceedances of up to 10 dB(A), at-property treatments may include fresh air ventilation, sealing of wall vents and upgrading door and window seals.
- Type 2 – for exceedances of more than 10 dB(A), at property treatments may include the treatments listed for Type 1 above, plus additional upgrades to windows and doors.

The noise standards specified in clause 102 of *State Environmental Planning Policy (Infrastructure) 2007* are design criteria for new developments along major road corridors and do not apply to the project.

Issue description

Submissions request at-property treatment to mitigate the impact of the construction noise around the northern ventilation facility.

Response

Receivers eligible for consideration of at-property treatment are identified in Table 78 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement). Properties eligible for consideration of at-property treatment would be confirmed during the detailed design phase.

Further information on construction noise mitigation and management is provided in **Section 4.5** of this report. Generally, at-property acoustic treatments are not considered feasible or reasonable during construction given the limited duration of construction works.

Issue description

Concerns that the at-property acoustic treatments would not fit aesthetically with the heritage-listed homes in Wahroonga.

Response

Section 7.10.3 of the environmental impact statement provides consideration of potential acoustic treatment and heritage items. This section identifies that the need for acoustic treatment at each property would be confirmed during detailed design, in consultation with the relevant landowners, and with consideration of potential impacts on heritage values.

Should at-property acoustic treatment be required for listed heritage items, this may result in impacts to the fabric of these items. Treatment would be sympathetic to the heritage values of each item and would be carried out in accordance with the Burra Charter, which stipulates that changes which reduce cultural significance should be reversible.

Issue description

Concerns that the at property noise treatments would not be effective.

Response

Receivers eligible for consideration of at-property treatment are identified in Table 78 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement). Properties eligible for consideration of at-property treatment would be confirmed during the detailed design phase.

The type of at-property acoustic treatment that will be considered at each eligible property will be informed by an inspection of the property and consultation with the affected landowner. Broadly, two categories of at-property treatments would be considered:

- Type 1 – for exceedances of up to 10 dB(A), at-property treatments may include fresh air ventilation, sealing of wall vents and upgrading door and window seals.
- Type 2 – for exceedances of more than 10 dB(A), at property treatments may include the treatments listed for Type 1 above, plus additional upgrades to windows and doors.

8.9.6 Noise from ancillary facilities

Seventeen submissions raised issues regarding the noise from ancillary facilities.

Issue description

Submissions raised concerns regarding noise from the ventilation facilities, particularly at night.

Response

The design of the ventilation facilities includes noise attenuation measures such as dampers on fans and noise treatment of the façade of the buildings.

Operational noise modelling has been carried out as part of the environmental impact assessment, including an assessment of the potential noise levels from fixed facilities (such as the ventilation facilities). The assessment of fixed facilities was carried out in accordance with the Industrial Noise Policy (EPA, 2000).

This assessment concluded that the ventilation facilities would comply with applicable noise criteria during the day time, evening and night time periods. In particular, at night time:

- The most affected residential receiver is predicted to experience 41 dB(A) ($L_{Aeq(15\text{-}minute)}$) due to the operation of the southern ventilation facility and the southern interchange portal under worst case meteorological conditions. This noise impact complies with the applicable noise criterion at this location of 41 dB(A).
- The most affected residential receiver is predicted to experience 28 dB(A) ($L_{Aeq(15\text{-}minute)}$) due to the operation of the northern ventilation facility and the northern main alignment portals under worst case meteorological conditions. This noise impact complies with the applicable noise criterion at this location of 45 dB(A).

A noise level of 40 to 45 dB(A) is around the noise level of a typical household living room.

Issue description

Submissions raised concerns relating to noise from ancillary facilities for the project.

In summary, the submissions raised the following issues:

- Noise from the motorway control centre and the maintenance facility.
- The use of earth mounds is an efficient and cost effective way to deal with traffic noise. Whilst flattening of the site during construction may be appropriate, it would seem more logical and reasonable to use earth mounding along the Eaton Road frontages to reduce the visual impact of the site whilst simultaneously addressing some of the noise pollution issues that will be created at the operational phase.

Response

The design of the operational ancillary facilities includes noise attenuation measures such as noise treatments of the façade of the buildings, where necessary.

Operational noise modelling has been carried out as part of the environmental impact assessment (refer to Section 7.2.4), including an assessment of the potential noise levels from fixed facilities (such as the motorway operations complex). The assessment of fixed facilities was carried out in accordance with the Industrial Noise Policy (EPA, 2000).

This assessment concluded that the operation of the motorway operations complex (including the control centre and maintenance facilities) would comply with applicable noise criteria during the day time, evening and night time periods.

In particular, at night time the most affected residential receiver is predicted to experience 36 dB(A) ($L_{Aeq(15\text{-}minute)}$) due to the operation of the motorway operations complex under worst case meteorological conditions. This noise impact complies with the applicable noise criterion at this location of 41 dB(A).

Issue description

Concerns regarding increased noise from the tunnel portal in Wahroonga.

Response

Section 7.2.4 of the environmental impact statement provides an assessment of potential operational noise from the tunnel portal at Wahroonga.

This assessment concluded that noise from the tunnel portal would comply with applicable noise criteria during the day time, evening and night time periods. In particular, at night time the most affected residential receiver is predicted to experience 14 dB(A) ($L_{Aeq(15\text{-}minute)}$) due to the operation of the main alignment tunnel portals under worst case meteorological conditions. This noise impact complies with the applicable noise criterion at this location of 45 dB(A).

Issue description

Concerns regarding noise from the tunnel support facilities.

The environmental impact statement clearly indicates that residential properties would be affected by noise from the Wilson Road tunnel support facility.

Response

Tables 7-83 and 7-84 of the environmental impact statement provide an assessment of likely noise levels from the tunnel support facilities. This assessment has been undertaken against the most stringent night-time criteria for the facility.

This shows that, under all scenarios and weather conditions, the predicted noise levels would be:

- At Wilson Road, 28 dB(A) which is lower than the applicable noise criterion of 35 dB(A).
- At Trelawney Street, 21 dB(A) which is lower than the applicable noise criterion of 44 dB(A)

These noise levels are equivalent to the noise level in a typical library.

Issue description

Submissions request that noise-generating maintenance activities need to be undertaken during normal hours only.

Response

Wherever possible maintenance works would be restricted to standard daytime construction hours only.

Motorway maintenance works often involves works to the traffic carriageway which cannot be carried out during daytime hours in order to avoid unacceptable traffic impacts and to ensure the safety of the maintenance workers.

Issue description

Concern that the circular driveway at the northern ventilation facility with two gates will expose residents to unnecessary noise. One gate is sufficient for the purpose.

Response

The gates through the noise wall at the northern ventilation facility would have the same noise attenuation properties as the noise wall itself. As such, these are not breaks in the noise wall but provide a continuous noise wall through this section. Access requirements to the facility would be infrequent. It is anticipated these gates would be opened to allow access or egress and then closed once the vehicle has accessed or egressed the site.

The provision of two gates and a circular driveway allows for a safer access and egress arrangement by avoiding the need to reverse heavy vehicles within a small space.

8.9.7 Modelling and assessment methodology

Twenty one submissions raised issues regarding the modelling and assessment methodology.

Issue description

Operation ground-borne noise has not been considered in the assessment. To what extent will residents and other sensitive receivers hear the rumble or trucks, or their engine brakes as they pass through the tunnel?

Response

Vehicles using the project tunnels during operation would not generate vibration transmitted through the tunnel and overlying rock at levels likely to lead to ground-borne impacts at the surface. This is because:

- Vehicles would generate relatively low intensity vibration, particularly relative to other project scenarios such as the use of road headers during construction tunnelling.
- The vehicle vibration sources are not in direct contact with the transmitting rock above the tunnel, with significant vibration attenuation provided by the tunnel structure and the air column within the tunnel.
- The tunnel would be located at significant depth in most locations. By comparison, the more vibration intensive use of road headers for construction tunnelling only result in elevated ground-borne noise levels around tunnel portals and shallower sections of the project tunnels (reflecting the effect of deep tunnel locations and attenuation through significant rock depths).

On this basis, the project is not expected to result in significant operational vibration and ground-borne noise issues during operation.

Issue description

Uncertainty regarding the “existing” noise wall locations in the model and that some shown do not exist. Predictions at many receivers may be wrong if they have been factored into the modelling. Request that the correct locations of noise barriers be identified through Hills M2 Motorway design drawings or a site visit and these are fed into the noise model.

Response

Existing noise walls were identified through an aerial surveys and ground-truthed where possible along the alignments. In relation to this particular location, the presence or absence of noise barriers does not change the findings of the noise assessment in terms of the requirements for mitigation measures.

Operational traffic noise and feasible and reasonable noise mitigation would be considered further during detailed design (subject to the project being approved), and the final form of feasible and reasonable noise mitigation measures would be confirmed at that time.

Issue description

Calibration certificates for noise monitoring equipment are not provided in the noise assessment.

Response

Nosie loggers and other noise monitoring equipment used all had valid calibration certificates at the time of monitoring. It is not standard practice to provide copies of calibration certificates as part of the noise assessment.

Issue description

The assessment of the existing peak noise levels has not been carried out. There has been no noise assessment carried out on peak traffic levels.

Response

The maximum noise level assessment is provided in Section 5.1.9 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement) and has been carried out in accordance with the Roads and Maritime Environmental Noise Management Manual (RTA, 2001). Details of the existing situation have been provided along with indicative impacts as a result of the project opening. Maximum noise levels are not expected to increase with the project, however the number of events may increase.

As noted in the Technical Working Paper: Noise and Vibration mitigation options are not made on the basis of the maximum noise level assessment, rather the assessment can be used to prioritise the installation of noise mitigation measures recommended on the basis of the L_{Aeq} road traffic noise assessment.

Issue description

Attended noise monitoring results are not provided.

Response

As identified in Section 2.4 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement), attended noise monitoring was carried out to determine the nature of the local noise environment and confirm road traffic noise was the controlling noise source. Attended noise monitoring results are not used to set background noise levels.

The results of this monitoring are not required to be provided.

Issue description

There is no discussion on the suitability of the monitoring period in terms of traffic flows recorded during the monitoring in relation to typical traffic flows. It is noted that some of the monitoring was carried out in December – which generally does not experience typical traffic flows due to Christmas and school holidays. Also corresponding traffic monitoring was not undertaken for noise monitoring associated with the Hills M2 Motorway integration works. Without traffic counts and more importantly vehicle types, the calibration of the noise model cannot be carried out with any confidence.

Response

The suitability of the monitoring period in terms of traffic volumes in discussed Section 3.2.5.1 of the Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement). The surveys period was reviewed against other typical periods throughout the year and was found to be consistent.

As identified in Section 2.4 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement), concurrent traffic numbers to the noise logging along the Hills M2 Motorway were provided based on traffic counts undertake by the Hills M2 Motorway Intelligent Transport System.

Issue description

Existing industrial noise influences have not been identified. For operational noise goals, no comment on existing industrial noise influence has been provided. Amenity noise goals should be established with consideration to the presence, or otherwise, of existing industrial noise impact. This is a requirement of the NSW Industrial Noise Policy.

Response

Section 3.5.3 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement) identifies that traffic noise is the dominant noise source and that industrial noise is not a feature of the relevant areas, therefore no corrections are required to be applied to the amenity criteria in accordance with the NSW Industrial Noise Policy.

Issue description

Relevant internal noise goals need to be identified as well as the feasibility of achieving these for specific noise affected sensitive receivers.

Response

Noise goals for the project have been identified in accordance with the relevant guidelines for the various noise sources and stages of the project. Internal noise goals are identified where required by these guidelines (such as for non-residential receivers – hospitals, places of worship, child care centres).

There is no requirement to determine internal noise goals for other receivers.

Issue description

The Road Noise Policy (DECCW, 2011) requires an assessment of operational noise impacts for a minimum of 600 metres from the subject road. The operational noise assessment indicates that on advice from Roads and Maritime this minimum distance has been reduced in some locations. However the report provides no details of where this has occurred. While this may be appropriate in some locations, without knowing which areas have had a reduced envelope it is impossible to know whether all reductions are justified. For example in east Wahroonga the M1 Pacific Motorway is audible over one kilometre from the road corridor – and it would not be appropriate to adjust the assessment boundary.

Response

For the southern interchange and Hills M2 Motorway integration works, the entire 600 metre catchment area has been modelled as there are less competing noise sources in this location.

For the northern interchange and M1 Pacific Motorway tie-in the study area was reduced from the 600 metres area by applying the 'highly urban' area approach. This is due to the other significant sources of noise (such as other major road and rail lines) which would impact the results of the modelling. This approach does not affect the noise mitigation outcomes of the project.

Issue description

The requirement for and the design of operational noise walls it only based upon traffic numbers ten years after opening (2029). The noise walls should be designed for a higher traffic through put. The noise walls and other mitigation measures (including fitting low road noise pavement to all portals, and minimising the gradients at the portals and dive structures) should be based upon the approved maximum capacity of the project, rather than 10 years after opening.

Response

The operational noise assessment and consideration of mitigation measures has been carried out in accordance with the requirements of the Road Noise Policy (DECCW, 2011) and the Environmental Noise Management Manual (Roads and Maritime, 2001). These guidelines require an assessment of operational noise levels at opening and ten years after opening.

Issue description

The cumulative noise impacts from operational traffic and the operation of mechanical equipment (such as the ventilation building) has not been assessed.

Response

In accordance with Environment Protection Authority policy, noise from the northern ventilation facility and from jet fan noise emitted from the M1 Pacific Motorway main alignment portals has been assessed against the Industrial Noise Policy (EPA, 2000).

Noise from road traffic on the surface road and from the tunnel portals has been assessed in accordance with the Road Noise Policy (DECCW, 2011).

There is no requirement to assess combined noise from fixed facilities and road traffic. Additionally, there are no criteria against which to assess this potential cumulative impact.

Regardless, the assessed worst-case noise levels from the northern ventilation facility and the portal jet fans combined is 29 dB(A). The traffic noise levels in this area are in the order of 55 to 65 dB(A). As such, there would not be a cumulative noise impact from the combination of these two sources.

Issue description

No sample model output noise files have been provided.

Response

The assessment has been carried out in accordance with the Director-General’s environmental assessment requirements and relevant guidelines.

Sample noise output files are not typically provided for projects of a similar nature and scale. This does not impact the outcomes of the noise assessment.

Issue description

Noise impact assessments have not been carried out for two storey residences (ie upper storey).

Response

The assessment has considered the all façades and floors for each building. Further analysis of traffic noise impacts and mitigation would be conducted during detailed design of the project. This process would include further ground-truthing of receivers around the project. The aim of this analysis would be to identify further feasible and reasonable noise mitigation measures that could be applied to reduce noise impacts.

Issue description

It is unclear from the environmental impact statement, whether noise modelling took into account dwellings that are to be demolished.

Response

The noise modelling carried out took into account the properties which are to be demolished.

Issue description

Submissions raised concerns relating to the modelling and assessment methodology for the project.

In summary, the submissions raised the following issues:

- Concerned that the appropriate level of noise monitoring in the appropriate locations for the appropriate durations have not been undertaken near the northern ventilation facility and portals.
- Placement of the monitor near the motorway does not provide an adequate baseline for residents.
- The noise barriers have been design without a detailed local noise study.

Response

The noise assessment undertook background noise monitoring in the vicinity of the northern ventilation facility and portals in December 2013. The locations and duration of this monitoring comply with the requirements of the Interim Construction Noise Guidelines (DECC, 2009) and the Road Noise Policy (DECCW, 2011).

Issue description

Noise catchment areas should be further subdivided to ensure that each catchment represents a similar existing acoustic environment. Additional noise monitoring should be carried out to determine background levels for the revised catchment areas.

Additional noise monitoring should be carried out, where required, to determine existing traffic noise levels for the revised catchment areas.

Response

The number of noise catchment areas is considered appropriate for the scale of the project and the likely change in background levels across the area. Generally the change in noise catchment area has very little impact on the background noise levels. The background noise levels are controlled by the existing motorways. The distance between the receiver locations and these motorways do not change between noise catchment areas.

The background noise levels are considered conservative as they have typically been measured further from major roads than the closest sensitive receivers.

The noise catchment areas are used for the consideration of impacts of construction noise.

The road traffic noise model considers all affected sensitive receivers regardless of which noise catchment area they fall into. Measured road traffic noise levels are used to calibrate the road traffic noise model.

As such, further sub-dividing the noise catchment areas is not warranted.

Issue description

Further information should be provided regarding the Northern Ventilation Facility and tunnel portal jet fans and a review of potential sleep disturbance from the operation of the Northern Ventilation facility.

Response

The Road Noise Policy (DECCW, 2011) states:

> *"A summary of the current literature concerning sleep disturbance due to noise indicates that the main noise characteristics that influence sleep disturbance are the number of noisy events heard distinctly above the background level, the emergence of these events and the highest noise level."*

Noise from the operation of the ventilation facility would be steady and consistent and as such the L_{Aeq} and L_{A1} noise levels would be within 2-3 dB(A) of each other. The noise assessment of the northern ventilation facility indicates that, under the worst case weather conditions and during low speed or emergency conditions when the facility would be operating at its maximum capacity, noise from the facility would be 29 dB(A), compared the applicable noise criteria of 45 dB(A). As such, complying with the L_{Aeq} noise criteria would also ensure compliance with the sleep disturbance noise criteria.

Issue description

Details should be provided to clarify how the study area was derived (ie how was it calculated that the project adds no more than 2.0 dB(A) to the total noise level) and the boundary of the study area should be defined.

Response

For the northern interchange and M1 Pacific Motorway tie-in the study area was reduced from the 600 metres area (as recommended by the Road Noise Policy) by applying the 'highly urban' area approach. This is due to the other significant sources of noise (such as other major road and rail lines) which would impact the results of the modelling. This approach does not affect the noise mitigation outcomes of the project.

For the southern interchange and Hills M2 Motorway integration works, the entire 600 metre catchment area has been modelled (as recommended by the Road Noise Policy) as there are less competing noise sources in this location.

Issue description

Operational daytime $L_{Aeq,15hr}$ and night-time $L_{Aeq,9hr}$ traffic noise contours should be provided.

Response

Provision of operation traffic contours are not a requirement of the Road Noise Policy (DECCW, 2011) or the Director-General's environmental assessment requirements. They have not been included in the presentation of this project because they are not as accurate as façade calculations and in some circumstances can be misleading. Noise levels at individual receiver locations have been provided to community members on request.

This does not affect the result of the operational traffic noise assessment.

Issue description

More information is required as to how the open graded asphalt (OGA) corrections for the M1 Pacific Motorway southbound carriageway were derived. The environmental impact statement should include a commitment to provide a road surface with similar acoustic performance to OGA when the road is resurfaced in future.

With regard to pavement corrections it should be clarified whether the corrections were applied equally for each vehicle emission string (car exhaust/engine; car/truck tyre noise; truck engines and truck exhaust) or just for the car/truck tyre noise emission string.

Response

Existing pavement corrections were derived based on a combination of site measurements and calculations.

Future pavement corrections were obtained from the Environmental Noise Management Manual (RTA, 2001).

Pavement corrections were appropriately applied to the road / tyre interface only.

The wearing course on the M1 Pacific Motorway is Open Graded Asphalt. The proposed surface for the M1 Pacific Motorway (excluding the portal ramps) is also Open Graded Asphalt. The design surface would be maintained in the future.

Issue description

It is not clear why the southbound carriageway of the M1 Pacific Motorway has assumed to be resurfaced with open graded asphalt (OGA) for the 'no build opening year' and 'design year' scenarios. This would imply that the resurfacing is not project related and has perhaps already been undertaken post environmental impact statement noise monitoring (ie after December 2013).

Response

This observation is correct. Resurfacing of the M1 Pacific Motorway with Open Graded Asphalt was undertaken around one month after noise logging was completed.

Issue description

Details should be provided to clarify whether ARRB corrections or any other calibration corrections and safety factors have been applied to operational traffic noise predictions.

Response

Corrections are discussed in Table 57 and Section 5.1.1 of the Technical Working Paper: Noise and Vibration (Appendix F of the environmental impact statement). The standard ARRB correction was not used; rather specific corrections were derived from the measured and modelled noise levels. A safety factor was not applied, however it is noted that the

model was calibrated to provide a conservative approach, ie on average the predicted road traffic noise levels are slightly higher than the measured road traffic noise levels.

Issue description

There is no modelling of noise from the tunnel portals. The assessment also needs to consider the change in speeds of vehicles.

Response

An assessment of noise from the project portals is provided in Tables 7-82 to 7-84 of the environmental impact statement. These tables show that noise from the tunnel portals would comply with the applicable noise criterion under all scenarios.

The traffic noise assessment considers the grade of the road and the need for vehicles to accelerate to maintain speeds. Vehicles have been assumed to be travelling at 80km/h, consistent with the design of the project as a motorway standard road connection.

Issue description

Operational noise levels for the properties on Coral Tree Drive have not been assessed.

Response

Operational noise levels for properties on Coral Tree Drive have been assessed as part of the Technical Working Paper: Noise and vibration (Appendix F of the environmental impact statement). Further consideration of the proposed design in this location has been undertaken. A revised assessment of noise barriers and operational noise levels along Coral Tree Drive is provided in **Section 4.4** of this report.

Issue description

Submissions raised concerns that the noise study only dealt with noise emitted from the site during construction and that there is no examination of the noise created during the operation phase of the complex, such as from air conditioning systems, vehicles moving about the site as well as entering and leaving, maintenance of vehicles and plant, and staff noise with voices, mobile phones etc.

Response

The design of the operational ancillary facilities includes noise attenuation measures such as noise treatments of the façade of the buildings, where necessary.

Operational noise modelling has been carried out as part of the environmental impact assessment (refer to Section 7.2.4 of the environmental impact statement), including an assessment of the potential noise levels from fixed facilities (such as the motorway operations complex). The assessment of fixed facilities was undertaken in accordance with the Industrial Noise Policy (EPA, 2000).

This assessment concluded that the operation of the motorway operations complex (including the control centre and maintenance facilities) would comply with applicable noise criteria during the day time, evening and night time periods. In particular, at night time the most affected residential receiver is predicted to experience 36 dB(A) ($L_{Aeq(15\text{-}minute)}$) due to the operation of the motorway operations complex under worst case meteorological conditions. This noise impact complies with the applicable noise criterion at this location of 41 dB(A).

Vehicle numbers during the operational phase would be relatively low and would not result in noticeable increases in traffic noise at receivers.

8.10 Construction air quality

8.10.1 Dust generation

Fifty eight submissions raised issues regarding dust generation during construction.

Issue description

Air quality related issues raised from dust include:

- Belief that no assessment of potential air quality impacts during construction has been carried out. Air quality impacts during construction need to be comprehensively assessed and human health risks determined.
- Impacts to air quality from dust during construction including from vegetation clearing, earthworks and the relocation of noise barriers.
- Request that additional dust assessment is undertaken.
- Request that adequate dust control measures are put in place. Will these measures be working 24 hours per day?
- Impacts to air quality from dust during tunnelling due to the shallow depth of the tunnel.

Response

Section 7.3.4 of the environmental impact statement assesses the potential for dust generation during the construction phase, including from exposed surfaces as a result of vegetation clearing. The assessment of dust has been carried out in accordance with the Director-General's environmental assessment requirements and at a similar level of details for similar projects.

Tunnelling works are confined to underground areas with little or no openings to the surface. Where surface openings are provided, these are generally covered by acoustic sheds during the construction period. Ventilation equipment at these locations would have dust extraction and filtration systems installed to minimise dust impacts. Additionally, as the road headers would use water for dust suppression while cutting rock, dust generation beyond the tunnel from tunnelling activities is expected to be minimal.

Construction air quality management measures are identified in Section 7.3.5 of the environmental impact statement. These include measures such as:

- Water carts, sprinklers, sprays and dust screens to control dust emissions.
- Modifying construction activities during high or unfavourable wind conditions.

These measures would be in place whenever construction works or vehicle movements are occurring to and from the compounds.

A proactive dust observation program involving daily reviews of weather forecasts, observations of meteorological conditions and on site dust generation. This would inform mitigation measures or alterations to construction activities to be implemented during unfavourable weather conditions.

Issue description

Impact of soil dust on residents from each heavy tunnel truck passing through suburban streets. Will all trucks be covered? How will this be controlled 24 hours per day and seven days per week?

Response

The project would require the removal and transport of a large volume of spoil from the construction sites, however this volume of trucks is relatively low compared to the current use of Pennant Hills Road. Along Pennant Hills Road the project would generate around 2,675 heavy vehicles per day and around 1,240 light vehicles per day. This compares to the current volumes on Pennant Hills Road (for the section north of the Hills M2 Motorway) of around 79,000 vehicles in total of which around 11,000 are heavy vehicles.

As identified in Section 7.3.5 of the environmental impact statement, loaded haulage trucks would be covered at all times on public roads and on-site where there is a risk of release of dust or other materials. This approach would avoid the potential generation of dust from heavy vehicle loads and potential impacts on surrounding receivers. This would be managed by the construction contractor. The NSW Environment Protection Authority also have an existing program to regulate trucks to ensure loads are covered.

Issue description

Concerns regarding dust generation during construction at the Trelawney Street compound (C7) including from tunnel ventilation during construction. Are there any provisions in place to alleviate this issue?

Response

The environmental impact statement provides an assessment of construction air quality and dust in Section 7.3.4 and Appendix G.

This assessment identified that construction activities could result in the generation of dust. The management of spoil at the Trelawney Street compound would be primarily managed within an enclosed acoustic shed which would limit the potential for dust generation. Dust generation during the construction phase would also be managed through standard construction mitigation measures such as water spraying of unsealed areas, wetting down of dusty activities, covering loads of spoil removal trucks and progressive stabilisation works.

Tunnel ventilation equipment would have dust extraction and filtration systems installed to minimise dust impacts. Additionally, as the road headers would use water for dust suppression while cutting rock, dust generation (beyond the tunnel) from tunnelling activities is expected to be minimal.

8.10.2 Emissions from plant and equipment

Seventy one submissions raised issues regarding the emissions from plant and equipment during construction.

Issue description

Impact of air pollution from plant and equipment and truck emissions on surrounding residents.

Control should ensure that emissions are within the requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2010.*

Response

The use of construction equipment and heavy vehicles to deliver and remove material from the construction sites would generate exhaust emissions. These are anticipated to be relatively minor in comparison to the vehicle emissions from the surrounding road network.

Additionally, plant and equipment used during construction would comply with the emissions concentration limits outlined in the *Protection of the Environment Operations (Clean Air) Regulation 2010*.

Issue description

A compressor will be located outside the acoustic shed at the Trelawney Street site. The extent of air emissions is unclear. It is requested that the compressor be relocated into the acoustic shed.

Response

Compressors are required as part of the tunnelling activities at this site. Emissions from compressors would be negligible compared to the existing emissions from the surrounding road network. Plant and equipment used during construction would comply with the emissions concentration limits outlined in the *Protection of the Environment Operations (Clean Air) Regulation 2010*.

8.10.3 Odour impacts during construction

Three submissions raised issues regarding odour impacts during construction.

Issue description

Concerns raised regarding potential odour impacts from the water treatment plant. Further details should be provided to ensure no odour impacts.

Response

The potential for odour generation is considered in Section 7.3.4 of the environmental impact statement.

The water treatment plant designed to treat groundwater from the project tunnels is aimed at removing dissolved metals and other anions/ cations dissolved in the groundwater through its exposure to rock. The water treatment plant is not a biological treatment process, such as typically involved in sewage treatment plants.

The nature of any odours would depend on the degree and type of any contamination present in the groundwater. Based on investigation carried out to date, contaminated groundwater is not expected to be encountered. Strong or unpleasant odour is not predicted.

Management measures would be developed, and incorporated into the Air Quality Management Plan, to address any odours should contamination be encountered and if odours arise. The plan would include identification of odours, identification of the extent to which the odours are detectable, and, if necessary, mitigation measures to reduce any odours affecting sensitive receivers. Such mitigation measures could include modifications to the operating process, or the installation of carbon filters to capture odorous compounds before they are emitted.

8.11 Operational air quality

8.11.1 Assessment methodology

Five hundred and sixty five submissions raised issues regarding the assessment methodology.

Accuracy and adequacy

Issue description

Submissions question the accuracy and adequacy of the air quality assessment methodology and the dispersion modelling. The models to predict air quality around ventilation outlets depend on multiple variables that are not easy to take into account including variation in emissions level throughout the day, traffic congestion, type of vehicles and emissions standards. Appendix G of the environmental impact statement acknowledges that days of low wind speed and emissions that are non-buoyant are a problem for the model.

Information on the analysis of the dispersal is based on mathematical and statistical models alone rather than collation of direct research data.

Suggestion that outlets and portals cannot be treated as part of the airshed. They are specific localised, permanent pollution sources, similar to industrial chimneys and must be treated as such. In addition, the particulate matter emissions from outlets are fundamentally different from those found in the general airshed, and, on the best available knowledge, are significantly more harmful, gram for gram, than emissions from other sources.

Given the tunnel is significantly longer than other in Australia and the uncertainty around the impacts of pollution in general, it seems likely that there will be at worst significant impacts and at best the impact will be uncertain.

There is a continual assumption that if pollution impacts cannot be measured or are not predicted by the modelling, that there will be no harm resulting.

The air quality assessment did not contain sufficient information to allow a full expert review of the modelling to be undertaken. The emissions calculation worksheets, model configuration files and other relevant technical information should be provided to allow a comprehensive technical review of the modelling.

Perceived flaws in methodology are detailed below.

General queries:

- The tunnel is built for three lanes. Why is the environmental impact assessment modelling for two lanes?
- Why does the environmental impact assessment model only model from opening to 10 years? Why not 30 years?
- Estimate of fuel emissions does not recognise changes in the mix of vehicle types and mix of fuel types that can be expected in the future.
- Does the modelling accurately reflect the normal and minimum operating configuration of extraction fans that will be actually used by the tunnel operator?
- Comparison of tunnel exhaust with background air quality based on open fires and off road vehicles etc are spurious and misleading as those influences are transient, seasonal and decreasing.

- Comparisons to the Harbour tunnel, Lane Cove tunnel and Cross City tunnel are misleading.
- Building wake effects, apart from the ventilation building itself, do not appear to have been considered in the modelling.
- There is significant information on vehicle numbers and the resultant in tunnel air quality for other tunnels in Sydney. This data has not been used to "calibrate" the vehicle emissions estimates for NorthConnex.
- The increased electricity usage for the project has not been taken into account.
- Assumptions used are not conservative and have not been presented for assessment.
- Vegetation around northern ventilation facility was not taken into account, which would impact on the dispersion model.
- Dilution of plumes should not be automatically assumed.
- The methodology and assumptions used to calculate the contaminant concentrations of plumes downwind of the ventilation outlet must be explained.

Traffic volumes:

- Given this recent history, it is reasonable to question the accuracy of the current estimates in relation to both the traffic volumes and the plume modelling of particulate matter and nitrogen dioxide.
- Modelling doesn't adequately consider the effect of increased traffic volumes which will be induced by the project, which will generate increased air pollution.
- Unrealistic traffic projections used to inform air quality assessment.
- Does not consider traffic re-distribution from other areas. The impact assessment should include effects of tunnel avoidance, changes to surface road usage, tunnel access ramps and interchanges, greater congestion on surface roads near interchanges.

Topography, meteorology and background air quality:

- Coarse topographical model. This was not sufficiently accurate to be used to predict air quality around the outlets.
- Lack of information regarding particulates.
- Not all particulate matter has the same chemical composition, eg diesel is a mixture of over 450 different components including vapours and fine particles coated with organic substances.
- Does not consider polluted intake air from Pennant Hills Road / Hills M2 Motorway interchange as part of the project contribution to air quality at Wahroonga. No adequate discussion of the quality of the intake air in an already polluted environment. Air quality monitoring from the two motorways should be provided. The quality of air intake may also be impacted by the proximity of the ventilation outlets to the entry portals.
- Background air quality is being collected on high ground at around 1250 metres from the outlet. Use of Rainbow Park Reserve is invalid due to it being placed in an elevated position with robust cross-winds. Background monitoring of air quality must be collected at the site of the outlet. Provide the background air quality data from across the street on Woonona Avenue, or the corner of Woonona Avenue and Bareena Avenue.
- Air quality monitoring upwind of the emissions point is required.
- Modelling does not include the use of studded tyres.

- Particulate levels are based on estimates (not actual measurements) of $PM_{2.5}$ from monitoring stations in other parts of Sydney. Belief that this has underestimated $PM_{2.5}$ by up to 40 per cent.
- Does not consider the placement of the northern ventilation outlet in a valley.
- Does not consider the placement of both ventilation facilities in areas with little to no wind.
- No data on the micro climate at the tunnel exits.
- Contains no data on ultrafine particles <$PM_{0.1}$
- No modelling of PM_1 (microparticles and ultrafine particles).
- The use of data from 2008 is too old to be useful.
- The AERMOD, not CALPUFF, model should have been used.
- The forecasts by CALMET to determine winds are invalid.

Suggestions include:

- Sufficient steps should be taken to ensure that silica dust particles not exceed the national exposure standard of 0.1mg/m^3.
- More study needs to be undertaken regarding the effects of air pollution on tunnel users and residents in close proximity to ventilation facilities and portals.
- Air quality from the ventilation outlets need to remain within guidelines set by the World Health Organisation.
- The use of non-toxic marker plumes observed by aerial drone under a wide range of wind and micro-climates should be undertaken to test ventilation outlet function.

Response

Further details and clarifications relating to the air quality impact assessment are provided in **Chapter 2**.

The air quality modelling has been undertaken in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants (Approved Methods) (DEC, 2005a), the National Environmental Protection Measure for Ambient Air Quality (Air NEPM) (National Environment Protection Council, 2003) and the Director-General's environmental assessment requirements.

The air quality assessment and the human health risk assessment in Section 7.3 and 7.4 of the environmental impact statement provide a thorough consideration of the potential impacts from particulates and a robust assessment of potential project contribution of particulate levels for both PM_{10} and $PM_{2.5.}$

Chapter 2 of this report provides further information on the inputs and assumptions that have been applied to the air quality impact assessment for the project, including in relation to background air quality data, topography and meteorological conditions. This information demonstrates that the assumptions and inputs into the air quality impact assessment are reasonable and conservative.

The environmental impact statement is seeking approval to operate the tunnel at two lanes only. If three lanes are required in the future, this would be subject to separate assessment and approval.

Comparisons to other sources of pollution such as open fires have been provided in some communication material to provide the community with context when considering the potential impacts. These comparisons do not affect the validity or outcomes of the air quality modelling.

The modelling reflects changes to vehicle emissions through to the year 2020, which the timeframe to which accurate forecasts have been produced. In reality, improvements to fuel technology are likely to continue beyond this date. As such, this is a conservative assessment within the modelling.

The traffic volumes used for the operational traffic assessment are based on a strategic traffic model. This strategic traffic model used for the project has been developed, progressively updated and enhanced. The forecasting approach comprises:

- A strategic highway network model of the Sydney metropolitan area including Sydney's motorway network and all major state roads within the network.
- Anticipated future land use as a basis for estimating future travel demand for cars and trucks.
- Anticipated changes and updates to the road network up until 2031.
- Representation of future vehicle travel demand to model varying travel patterns and behaviours.
- Explicit modelling of all tolls, existing and future, on the network.
- Accommodation of different motorist behaviours including willingness to pay a toll to save travel time.

Further details regarding the assumptions including predicted land use and population changes are provided in the traffic and transport technical working paper in Appendix E of the environmental impact statement.

To provide confidence about the performance of the project in the event that actual traffic demand exceeds traffic forecasts in the future, the air quality impact assessment also considers 'design analysis A'. This design analysis is based on the project operating at its maximum theoretical design capacity during the peak hour (4,000 passenger car units). Design analysis A therefore represents a credible upper limit to the potential operation of the project. Although it is considered unlikely that design analysis A would eventuate in reality, based on traffic forecasting, it provides a 'worst-case' scenario for the purpose of assessment potential air quality impacts. The environmental impact statement demonstrates that design analysis A would meet applicable ambient air quality criteria.

Dispersion modelling from the project ventilation outlets utilised the CALPUFF suite of models which have been approved for use in NSW by the Environment Protection Authority and internationally by bodies such as the United States Environmental Protection Agency. The CALPUFF model is an advanced Gaussian modelling system for the simulation of atmospheric dispersion. It was first developed in the late 1980s and issued for use in 1990. Since that time, it has continued to be refined and updated, and continues to be an internationally-recognised air dispersion model.

The United States Environmental Protection Agency has designated CALPUFF as a 'Guideline Model' which means that it has undergone an extensive, multi-year (15 years) model assessment and evaluation process, including:

- Evaluation of the model performance relative to real-life observations.
- Requirements for model documentation, access and computer codes.

- An open, public review process involving public hearings.
- Formal peer review by committees created by the United States Environmental Protection Agency, professional organisations such as the United States Air and Waste Management Association (A&WMA), and private sector industry groups such as the American Petroleum Institute (API), the United States Utility Air Regulatory Group (UARG) and the United States Electric Power Research Institute (EPRI).

The CALPUFF model has been accepted for use in several international jurisdictions, including Australia, Canada, Chile, Iceland, Italy, New Zealand, Saudi Arabia and the United States of America (among others).

The CALPUFF model has been evaluated against most well-known classic data sets, including in relation to long-range transport, short to intermediate-range transport and offshore/ coastal data sets. Some key evaluation and verification studies based on monitored, real-life data include:

- The Lovett Power Station Study (New York) which compared modelled and monitored concentrations of sulfur dioxide from the power station ventilation outlet for the CALPUFF, CTDMPLUS and RTDM models. The study demonstrated that the CALPUFF model most accurately reflected actual monitoring data, and in most cases over-estimated ambient concentrations.
- The European Tracer Experiment (ETEX), which evaluated the performance of five models based on experimental release and monitoring of a perfluoromethylcyclohexane (PMCH) tracer. Of the five models that were evaluated, the combination of the CALPUFF model with MM5 meteorological data (as was used to model and assess the NorthConnex project) was identified at most accurately reflecting behaviour of the PMCH tracer in the atmosphere.
- The Kincaid Data Set, which compared modelled and monitored concentrations of a sulfur hexafluoride (SF6) tracer using the CALPUFF and the AERMOD models. The study demonstrated that the CALPUFF model most accurately reflected monitored tracer concentrations in the atmosphere, and in most cases over-estimated the actual ambient concentrations (within 10 kilometres of the source).

On the basis of extensive evaluation studies and adoption of the model by several international jurisdictions, including within New South Wales, the CALPUFF model and modelling approach taken for the NorthConnex project are considered to be robust and appropriate.

Issue description

Concerns raised regarding the use of the temperature variable in the model. The greenhouse gas assessment (Table 8-36 in the environmental impact statement) states that the in-tunnel environment is expected to be cooler due to the inflow of groundwater. The use of the Lane Cove Tunnel temperature data has not been appropriately adjusted to the NorthConnex conditions.

Response

The temperature differential used for the NorthConnex air quality assessment utilised three years of temperature data from the Lane Cove Tunnel ventilation outlet compared to the ambient temperature. The NorthConnex project is expected to have a higher proportion of heavy vehicles than the Lane Cove Tunnel which is expected to result in higher emission temperatures from the ventilation outlets due to their larger engine capacities and resultant larger exhaust volumes. As such, the temperature differential from Lane Cove Tunnel is expected to result in a conservative estimate of temperature differentials for the NorthConnex tunnels. As such, this is considered an appropriate approach.

An analysis has been undertaken to determine the impact on the modelling results based on using negative temperature differentials (ie, tunnel air being cooler than the outside air). Under this scenario there would be a very minor change in the concentrations (in the order of a 0.001 µg/m^3 increase for $PM_{2.5}$ (annual average) at the location with the maximum predicted ground level concentration) with the inclusion of times during the year where the tunnel temperature could conceivably be cooler than the outside air temperature.

Issue description

There is no understanding of the interactions between air pollutants and their compounded effects. Air pollutants are modified by meteorological factors such as temperature and humidity and by the interactions and mix of pollutants. This can lead to formation of particles of different sizes that are more complex to investigate and were not in the original mix of pollutants.

Response

Oxides of nitrogen undergo reactions with ozone in the atmosphere, through well-understood atmospheric chemistry associated with the formation of photochemical smog. These reactions have been taken into account in the air dispersion modelling and impact assessment presented in the environmental impact statement.

Carbon monoxide can be involved in many different atmospheric reactions, including having a role in ozone and photochemical smog formation. Carbon monoxide typically eventually oxidises to carbon dioxide in the atmosphere. In the context of the air quality impact assessment for the NorthConnex project, carbon monoxide has been assumed to not react in the atmosphere. This is a conservative approach, noting that carbon monoxide is a more significant air quality and potential human health issue than carbon dioxide.

Under normal atmospheric conditions, volatile organic compounds and polycyclic aromatic hydrocarbons may undergo reactions and/ or degrade to form a series of other hydrocarbon compounds. These reactions are typically complex, and in some cases not well understood. This level of atmospheric chemical complexity has not been taken into account in the air quality impact assessment for the project. Instead, volatile organic compounds and polycyclic aromatic hydrocarbons have been considered in two groups (despite both groups containing several different compounds), and conservatively compared with the most stringent ambient air quality criterion from the compounds in each group. These most stringent ambient air quality criteria relate to benzo[a]pyrene and benzene, for polycyclic aromatic hydrocarbons and volatile organic compounds, respectively.

In the case of particulate matter, it is recognised that under some conditions, particles can combine in the atmosphere to generate coarser particulates. This mechanism has not been taken into account in the air dispersion modelling. This is a conservative approach, because an important focus of the air quality impact assessment and human health risk assessment presented in the environmental impact statement is fine particulates ($PM_{2.5}$). Any reaction, combination or agglomeration of fine particulates to produce larger particulate matter would generally reduce the concentration of fine particulates, and as a corollary, the key air quality and human health risks considered in the environmental impact statement.

Issue description

The environmental impact statement defines New South Wales air quality as generally good, and the NorthConnex project defines Sydney air quality as very good.

The Organization for Economic Cooperation and Development (OECD) report in May 2014 reveals that in Australia, deaths and years of life lost in related to air pollution have

significantly increased, we have failed to halt the dangerous rise in air pollution and the health impacts of air pollution, particularly from road transport were 'much higher than previously thought'.

The National Environment Protection Measures (NEPM) tell us that "some local areas such as those exposed to road tunnels need a different approach to that directed at meeting ambient standards of general air quality" (references to general (ambient) air quality are irrelevant when considering areas such those surrounding NorthConnex project's proposed unfiltered ventilation outlets).

The precautionary principle should apply and the lack of filtration is sufficient for the NorthConnex project to be refused.

It is recognised that reducing emissions at the source is the most effective way of controlling general emissions, however:

- There is no coherent plan by the government to force the existing truck fleet to effectively upgrade engine technologies or to maintain particle filters already installed.
- Clean modern diesel engines still produce excessive levels of ultrafine particles
- Many reports question the long term effectiveness of particle filters.
- No strategies are in place to drive this change.

Response

Air quality in Sydney and in New South Wales is generally very good. This is supported by monitoring and reporting through reports such as the State of the Environment (EPA, 2012).

The Cost of Air Pollution: Health Impacts of Road Transport (OECD, 2014) presents an analysis of deaths attributable to air pollution in 36 countries, with a comparison of data between 2005 and 2010. The OECD report indicates that Australia is one of 16 countries where data suggests a worsening of the health related impacts of air pollution from 2005 to 2010. Other countries reported as experiencing a worsening in impacts over that period include New Zealand, Canada, Japan, Ireland, Iceland and South Korea. In context, Australia dropped from the 8th fewest deaths attributable to air pollution, to 11th (of the 36 countries reviewed by the OECD).

The OECD report does not present an analysis or assessment of air quality. Rather, it recognises that air pollution has a human health impact and has assigned a cost to that impact. In the case of Australia, the OECD report does not comment on whether or not air quality is good, but simply notes that based on its assessment, there has been an increase in deaths attributable to air pollution.

The NSW Government, principally through the Environment Protection Authority, continues to work to improve air quality in Sydney and across New South Wales. Action for Air (EPA, 1998) and regular updates, the most of recent of which was released in 2009, provides an air quality management for Sydney, the Illawarra and the Hunter regions. It also details the initiatives and actions being undertaken to manage and improve air quality across these regions.

The NorthConnex project will not generate air pollution. Emissions from the project's ventilation outlets are vehicle emissions that are currently released at ground level along Pennant Hills. These emissions currently occur and would continue to occur, irrespective of the NorthConnex project. Importantly, the NorthConnex project would collect, manage and effectively disperse these emissions in a controlled manner and would lead to an overall improvement in air quality and human health outcomes along the Pennant Hills Road corridor.

The environmental impact statement has demonstrated that the project would comply with applicable ambient air quality standards. However, recognising that there is no threshold below which there is no observable health effects for some vehicle exhaust components, particularly fine particulate matter (measured as $PM_{2.5}$), a detailed human health risk assessment has also been conducted. This approach recognises that reliance on ambient air quality standards as a measure of potential human health effects is insufficient, and that a more detailed analysis of health risks is warranted. This more detailed analysis is presented in Section 7.4.4 and Appendix H of the environmental impact statement. The human health risk assessment demonstrates that the project is expected to have a net positive effect on human health outcomes along the Pennant Hills Road corridor. Where increased incidence of human health effects are predicted, these effects would not be discernible from background incidence rates.

Based on compliance with both the ambient air quality standards and demonstration of a negligible human health risk, there is no basis for requiring the application of tunnel filtration technology to the project.

Issue description

The environmental impact statement states that under normal conditions this tunnel will be self-ventilating. This is due to every vehicle entering the tunnel having a piston effect of dragging a parcel of fresh air into the tunnel. Will the motorway air external to the entry point be fresh? The 'fresh' air is immediately contaminated with vehicle exhausts - and the piston (or vacuum) effect behind each moving vehicle will also attract the already contaminated surrounding air within the 112 square metre cross-section.

Response

The pollutant load of ambient air drawn into the tunnel has a relatively minor contribution of pollutant loads to in-tunnel air quality. This includes air drawn into the tunnel via the entry portals (through the piston effect of vehicles entering the tunnel) and via mechanically assisted ventilation (by fans either within the tunnels or within the emergency smoke extraction facilities under certain conditions).

It is recognised, however, that any air drawn into the project tunnels will carry with it a certain level of background pollution, and that the concentration of this pollution will vary over time depending on conditions external to the project tunnels. To demonstrate the effect of drawing ambient pollution into the project tunnels, the air quality model used for the NorthConnex project has been used to consider the implications of this additional pollutant load on the ambient air quality impacts of the project. The model has been run assuming that background pollution at each main alignment tunnel entry portal is added to the emissions inventory within the project tunnels before discharge from the project's ventilation outlets. This analysis is presented in **Section 2.9** of this report, and demonstrates a negligible change in the predicted air quality impacts of the project.

Reference to 'normal operating conditions' in the environmental impact statement means all operational scenarios other than emergency situations and periods of heavy congestion. During emergency situations, additional ventilation may be required from the project's ventilation system to maintain acceptable in-tunnel air quality. In the case of congestion with slow moving vehicles, additional ventilation may be required in the absence of the piston effect provided by moving vehicles.

Issue description

It is irrelevant to use a comparison of Sydney's air quality, measured against other cities, in explaining the actual impact of fallout from a ventilation outlet in the local community of Wahroonga.

Response

Reference to air quality in other major cities has been presented in some of the material prepared for the NorthConnex project in an endeavour to demonstrate and contextualise Sydney's good air quality.

The air quality impact assessment presented in Section 7.3.4 and Appendix G of the environmental impact statement relies on background air quality data relevant to Sydney, and does not compare the potential impacts of the NorthConnex project to air quality in other locations.

Issue description

Submissions relating to operational air quality raised issues regarding accuracy and adequacy.

In summary, the submissions raised the following issues:

- Belief that the air quality impacts around the ventilation outlets have been underestimated.
- Recommendation for the air quality assessment to be revised.
- Twelve months of site specific data must be acquired and the meteorological forecasts must be rerun with real data for each site.
- Collection of air quality and meteorological data from proposed outlet location in Wahroonga.

Response

The air quality modelling has been undertaken in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants (Approved Methods) (DEC, 2005a), the National Environmental Protection Measure for Ambient Air Quality (Air NEPM) (National Environment Protection Council, 2003) and the Director-General's environmental assessment requirements.

Chapter 2 of this report provides further information on the inputs and assumptions that have been applied to the air quality impact assessment for the project, including in relation to background air quality data, topography and meteorological conditions. This information demonstrates that the assumptions and inputs into the air quality impact assessment are reasonable and conservative.

Issue description

Submissions query whether the NorthConnex project will be forced to comply with the NEPC National Plan for Clean Air recommendations once they are introduced.

Response

It is not possible to comment on the applicability or relevance of a potential future National Plan for Clean Air to the NorthConnex project until such time as a plan is prepared and published by the National Environment Protection Council. Further, application of the recommendations of a future National Plan for Clean Air will depend on the nature and

mechanism of implementation of any of those recommendations by relevant regulatory authorities in New South Wales.

Issue description

The impacts have been obscured by including long term averages that include dust storms and bushfires. The impacts should be determined on a normal basis. That is, what is the normal level of pollutants at the proposed ventilation outlet site today and what will be the impact from the project.

Impacts should be stated as a percentage of the current levels. The environmental impact statement only states the impact as a percentage of maximum allowable values that are over 10 years old. The environmental impact statement never makes a direct comparison between the current levels of pollutants and the new levels after the project. This is misleading and deceptive.

Response

The air quality modelling has been undertaken in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants (Approved Methods) (DEC, 2005a), the National Environmental Protection Measure for Ambient Air Quality (Air NEPM) (National Environment Protection Council, 2003) and the Director-General's environmental assessment requirements.

The potential increases have been shown based on relevant averaging periods of the applicable impact assessment criteria. This includes both longer term averaging periods such as an annual average, and shorter term averaging period such as 24 hour or hourly averages. Direct comparisons of the project contribution to existing pollutant levels are available from Table 7-97 and Figures 7-20 through 7-27 of the environmental impact statement.

Events such as bushfires and dust storms are important considerations as they are a considerable contributor to background air quality levels in Sydney. These events have not affected the conclusions of the air quality assessment.

Issue description

The impacts have been obscured by the practice of averaging over 24 hours or even a year. It is important for people to understand the incremental pollution that they will be exposed to over and above the normal level for that location at any given time of day, especially AM and PM peak traffic periods.

Response

The air quality modelling has been carried out in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants (Approved Methods) (DEC, 2005a), the National Environmental Protection Measure for Ambient Air Quality (Air NEPM) (National Environment Protection Council, 2003) and the Director-General's environmental assessment requirements.

The potential theoretical increases have been shown based on relevant averaging periods of the applicable impact assessment criteria. The criteria have been identified and adopted for use in New South Wales by the Environment Protection Authority to assess potential air quality impacts from proposed development. The criteria have been developed based on consideration of relevant factors, including environmental protection, human health and amenity. Details of the adopted criteria and their source are provided in the Approved Methods guideline.

Air quality assessment criteria include both longer term averaging period such as annual average, and shorter term averaging period such as 24 hour or hourly averages. The project contribution over and above the 'normal' level for the location is provided in Table 7-97 and Figures 7-20 through 7-27 of the environmental impact statement.

Issue description

The environmental impact statement assesses NO_2 against the New South Wales standard of 246 µg/m^3 which is more than 10 years old and finds this to be similar to the US EPA standard of 189 µg/m^3. This is a difference of 30 per cent. Vehicle emissions account for around 60 per cent of NO_2 pollutants in Australian cities.

Response

The air quality modelling has been carried out in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants (Approved Methods) (DEC, 2005a), the National Environmental Protection Measure for Ambient Air Quality (Air NEPM) (National Environment Protection Council, 2003) and the Director-General's environmental assessment requirements.

The air quality impact assessment criteria applied to the NorthConnex project have been identified and adopted for use in New South Wales by the Environment Protection Authority to assess potential air quality impacts from proposed development. The criteria have been developed based on consideration of relevant factors, including environmental protection, human health and amenity. Details of the adopted criteria and their source are provided in the Approved Methods guideline.

Section 4.3.2 of the Technical Working Paper: Air Quality (Appendix G of the environmental impact statement) provides a comparison of the New South Wales impact assessment criteria to the United States Environmental Protection Agency and the World Health Organization criteria. This section notes that, for NO_2 the New South Wales one hour criterion is higher than the United States Environmental Protection Agency. Conversely, the New South Wales annual average criterion is lower (or more stringent) than the United States Environmental Protection Agency.

Even though the World Health Organization and United State Environmental Protection Agency NO_2 criteria do not apply to the NorthConnex project, comparison of these criteria with the predicted concentrations of NO_2 in Table 7-97 of the environmental impact statement indicates that:

- For one-hour maximum NO_2 concentrations, the predicted peak project contribution of 74.6 µg/m^3 and the peak cumulative concentration of 166.7 µg/m^3 both comply with the United State Environmental Protection Agency criterion (189 µg/m^3) and the World Health Organization criterion (200 µg/m^3).
- For annual average concentrations of NO_2, the predicted peak project contribution of 1.7 µg/m^3 and the peak cumulative concentration of 42.8 µg/m^3 both comply with the United State Environmental Protection Agency criterion (100 µg/m^3). When compared with the World Health Organization criterion (40 µg/m^3), a minor exceedance is predicted. This exceedance is the result of elevated NO_2 background concentrations of 41.4 µg/m^3, rather than the relatively low project contribution of 1.4 µg/m^3 (around a maximum of four percent of the World Health Organization criterion).

Issue description

The environmental impact statement does not consider ozone in its own right. Rather the environmental impact statement tells us it's only important for its role in the creation of NO_2. The Department of Infrastructure and Transport lists ozone as a significant pollutant from vehicle emissions.

Response

The air quality modelling has been carried out in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants (Approved Methods) (DEC, 2005a), the National Environmental Protection Measure for Ambient Air Quality (Air NEPM) (National Environment Protection Council, 2003) and the Director-General's environmental assessment requirements.

Ozone is not a component of vehicle emissions and would not be generated by the NorthConnex project. Ozone is formed in the Earth's atmosphere as a result of ultraviolet light and electrical discharges (such as lightning). Emissions of volatile organic compounds and oxides of nitrogen from vehicles and other sources, react with ozone in the atmosphere in complex ways. These reactions are responsible for generation of photochemical smog which can be a significant air quality issue in major cities.

In some cases, emissions of oxides of nitrogen from vehicles and other sources can lead to an increase in atmospheric ozone concentrations. Agencies such as the Department of Infrastructure and Transport (now the Department of Infrastructure and Regional Development) and the Environment Protection Authority recognise the significance of ozone generation as a potential secondary consequence of emissions from vehicles and other sources, particularly in the context of the role of ozone in the generation of photochemical smog.

Issue description

The breakdown scenario modelled in the environmental impact statement is not the worst-case according to Permanent International Association of Road Congresses.

Response

An air quality assessment was carried out as part of the environmental impact statement (refer to Section 7.3 and Appendix G of the environmental impact statement). This assessment comprised a range of scenarios including the forecast traffic flows, a breakdown scenario within the tunnels and an analysis of the theoretical maximum design capacity of the tunnels. The latter scenario provides an indication of the potential 'worst-case' whilst the breakdown scenario was developed based on a credible breakdown and conservative assumptions around incident response times.

The assessment found that, under all of these scenarios, the project would contribute a negligible amount of pollutants to the local air shed when compared to the applicable impact assessment criteria and the existing background levels.

Issue description

Submissions request justification for Minister Gay's comment that fuel fires provide more pollution that exhaust emissions. It is believed to be wrong especially since fuel fires are only used on the North Shore of Sydney for a couple of months.

Response

Statistics regarding the percentage of existing particulate matter pollution in Sydney presented in the environmental impact statement and the overview document are accurate

representations and have been sourced from the Air emissions inventory for the Greater Metropolitan Region in NSW 2008 calendar year (EPA, 2012). These percentages are averaged over the year.

Issue description

The medical and scientific community have recently revised our current National Environmental Protection Measures (NEPM) to better reflect the growing and substantive health impacts from vehicular air pollutants in the medical literature.

These changes are described in depth at:
http://www.environment.gov.au/system/files/pages/dfe7ed5d-1eaf-4ff2-bfe7-dbb7ebaf21a9/files/aaq-nepm-draft-variation-impact-statement-executive-summary.pdf

The new NEPM guidelines state:

> *"The need to reduce atmospheric concentrations of particulate matter (PM) derives principally from its well-recognised and quantified effects upon human health. The recent historical trend of decreasing ambient concentrations of PM_{10} and $PM_{2.5}$ is expected to be reversed in the future due to growth in population, economic activity and emissions, with subsequent increases in population exposure and the incidence of adverse health outcomes, and increases in the monetary costs of air pollution to society.*
>
> *It is likely to be more difficult to meet the national air quality standards and goals for particulate matter in the future without proactive intervention, risking sufficient protection for Australian public health. Intervention is considered necessary to prompt and accelerate policies and measures to reduce population exposure to particulate air pollution. Updating the AAQ NEPM will reduce these adverse effects by highlighting potential problems and assisting jurisdictions in the formulation of air quality policies to reduce emissions from different sectors.*

The WHO numerical guideline for 24-hour PM_{10} of 50 $\mu g/m^3$ has been adopted in Australia and elsewhere (but not in the United States), even though the number of permitted exceedances is greater in Australia than in the WHO guideline. However, fewer exceedances of the standard are provided for in Australia than in most other countries/regions (an exception being New Zealand).

The annual advisory mean standard for $PM_{2.5}$ of 8 $\mu g/m^3$ in Australia is lower than the current WHO guideline. The current 24-hr $PM_{2.5}$ advisory reporting standard of 25 $\mu g/m^3$ is identical to the WHO 2005 guideline."

Although the Australian particulate matter standards are numerically lower than, or equivalent to, those in other countries and regions, it is not straightforward to interpret such comparisons and they do not necessarily mean that the Australian standards are more stringent. For example, the proponents state that the Australian guidelines are more stringent than other countries, and as long as the "average" levels over 24 hours and 12 months meet the standards the project will be safe. However, averages of pollutants over a given timeframe, do not account for exposures to emission plumes (large amounts of emissions) from emission outlets for the population in close proximity to the outlets.

As noted earlier, there would still be health benefits in Australia from setting the particulate matter standards as low as reasonably achievable, given there is no safe threshold for particulate matter exposure. Also, there are differences in implementation of standards in Australia compared with other countries. For example, there are no sanctions associated

with non- compliance with the standards and goals in Australia, whereas there are in other countries and regions.

The air quality and human health assessment need to be updated to include consideration of the new draft guidelines

Response

The air quality modelling has been carried out in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants (Approved Methods) (DEC, 2005a), the National Environmental Protection Measure for Ambient Air Quality (Air NEPM) (National Environment Protection Council, 2003) and the Director-General's environmental assessment requirements.

The setting of future standards and the implementation of those standards in Australia compared to other countries is beyond the scope of the NorthConnex project.

In relation to particulate matter, the environmental impact statement does not state that meeting the relevant criteria means the project will be 'safe' or have no impact. Rather, the human health risk assessment acknowledges that there is no safe level for particulate and, as such, this pollutant has been subject to a more detailed assessment of potential impacts. This assessment has shown that the risks to human health would be very low.

It is also noted that, when considering the project as whole (that is the incremental increase around the ventilation outlets and the benefits along Pennant Hills Road) the project would provide an overall improvement to regional air quality.

Issue description

The assessment does not consider power outages which could shut down the ventilation system.

Response

The tunnels will have two independent power sources in order to avoid power outages. Additionally a back-up generator would supply essential loads for up to 30 minutes in the event of both power sources failing. This period would be sufficient for all vehicles and people to be evacuated from the tunnel. In the event vehicles cannot be evacuated they would be directed to switch off their engines which would remove the source of air pollution.

As such, this scenario would not credibly result in elevated air emissions or health impacts within the tunnel or to receivers nearby to the ventilation outlets.

Issue description

In-tunnel exposures should be estimated for the worst-case operating conditions such as during congestion or when there is an incident.

Response

The issue of in-tunnel exposures during various scenarios, including worst case in-tunnel conditions, is analysed in detail in response to the submission received from NSW Health (refer to **Section 7.1.2.2** of this report).

Issue description

There are many large multi-storey houses, more than five storey apartment buildings (Woniera Apartments are approximately 230 metres from the northern outlet) and multi-

storey school buildings in close proximity to the ventilation outlet. Concentrations of key air quality pollutants may be significantly higher at upper storeys of these buildings.

It is unclear from the information provided if the air quality impacts have been assessed at multi-storey buildings.

Response

The issue of air quality impact for elevated receivers has been considered in detail in response to the submission received from Ku-ring-gai Council (refer to **Section 7.2.3.1** of this report).

Issue description

There is no consideration of asbestos from vehicles that will be dispersed into the air from the ventilation outlets. Asbestos particles are in the brakes and clutches on cars and trucks built before 1993 and vehicles that have had these replaced prior to late 2003.

Response

Asbestos in these older vehicles is released through the function of brakes and clutches. The asbestos released is largely trapped inside the brake housing or clutch space. The potential for exposure to this asbestos occurs during replacement or repair work. This practice is now banned for vehicles made or imported to Australia, and these older vehicles are being progressively phased out of the fleet.

Appropriate WorkCover guidelines are in place to manage exposures during the replacement and repair of these items.

Issue description

The consequence and likelihood rating in Chapter 10 of the environmental impact statement for operational air quality need to be reconsidered. There are predicted increases for pollutants. Therefore the likelihood must be likely.

Response

The ratings are considered to be accurate based on the outcomes of the assessment. The assessment predicts that the NorthConnex project would meet ambient air quality criteria. As such, while there may be theoretical increases, impacts are considered to be unlikely and if they do occur are considered to be negligible.

Vehicle emissions

Issue description

The environmental impact statement underestimated tunnel vehicle emissions. A figure of 19,500 daily vehicles has been used in the environmental impact statement when the capacity of each tunnel is 50,000 vehicles per day.

Design analysis A does not represent the capacity of the tunnel. This is underestimated by a factor of 1.5. Design analysis A should have been based on a hypothetical 50,000 vehicles per day with an 8:1 split of light vehicles to heavy vehicles.

Response

The project has a theoretical design capacity of 2,000 passenger car units per lane per hour. The project includes two lanes in each direction, which equates to a theoretical design capacity of 4,000 passenger car units per hour in each direction. Over the course of an entire day, this is equivalent to 96,000 passenger car units for each of the main alignment

tunnels. Based on traffic forecasts for the NorthConnex project, it is considered unlikely that either main alignment tunnel would reach its theoretical design capacity in the foreseeable future. Further, it is extremely unlikely that a situation would occur involving one or both of the main alignment tunnels operating at theoretical design capacity for a full 24-hour period.

Passenger car units and total vehicles are not the same. Passenger car units are used as a consistent measure to take into account that passenger vehicles and trucks take up different amounts of space within a traffic lane. Table 5-3 of the Technical Working Paper: Traffic and Transport (Appendix E of the environmental impact statement) includes conversion factors for different vehicle types. Articulated trucks, for example, are equivalent to 2.9 passenger car units.

Traffic forecasts for the NorthConnex project are around 15,000 vehicles per day in each direction in 2019, and around 20,000 vehicles per day in each direction in 2029. Based on the expected traffic mix in each year and in each direction of travel, this is expected to be:

- Around 23,000 passenger car units per day in each main alignment tunnel in 2019.
- Around 29,000 passenger car units per day in each main alignment tunnel in 2029.

The air quality impact assessment presented in Section 7.3 and Appendix G of the environmental impact statement includes air dispersion modelling and assessment of potential air quality impacts based on these forecast traffic scenarios.

To test the environmental performance of the project under 'worst case' potential traffic conditions, the environmental impact assessment also includes consideration of design analysis A. Design analysis A assumes that the theoretical design capacity of 4,000 passenger car units is reached during the peak hour. As noted above, it is extremely unlikely that the maximum design capacity would be experienced for an entire 24-hour period, with traffic volumes likely to ebb and flow during the day around peak periods. A realistic traffic scenario for design analysis A was therefore established by:

- Comparing the theoretical design capacity of each main alignment tunnel (4,000 passenger car units) with the expected peak hour traffic volumes in 2019, which were around 1,790 passenger car units in the southbound main alignment tunnel (morning peak) and around 1,930 passenger car units in the northbound main alignment tunnel (afternoon peak).
- Noting that the theoretical design capacity was around a factor of 2.1 times the maximum forecast peak in 2019 (ie 4,000 is around 2.1 times 1,930).
- Scaling the forecast traffic flows for 2019 by a factor of 2.1 for each hour of the day, to obtain the traffic flows used for design analysis A.

The total daily traffic volumes for design analysis A were therefore around 48,000 passenger car units in each main alignment tunnel. This is considered to be a reasonable and realistic estimate of a worst case scenario (albeit one that is extremely unlikely to eventuate) for operation of the NorthConnex project.

Issue description

Submissions relating to operational air quality raised issues regarding vehicle emissions.

In summary, the submissions raised the following issues:

- Emissions from the Australian vehicle fleet remain high and there is no guarantee that future vehicle emissions targets will be achieved. Vehicle emission rates are a key input into the air quality assessment – and for the air quality assessment there are some unrealistic assumptions about improvements in vehicle emission rates.
- Given that the proportion of diesel vehicles has doubled over the past four years and that modern diesel vehicles contribute high levels of $PM_{2.5}$ and smaller particles, it appears that the contribution of the diesel passenger vehicles has been significantly underestimated.
- Vehicle emission estimates need to be revised to include more conservative future emission standards and an increased proportion of diesel passenger cars needs to be included in the estimates.
- Claims that overall vehicle emissions are improving enough to allow the proposed outlet arrangements do not stand up to logic, past experience or common sense.

Response

The air quality assessment includes improvements in vehicle and fuel technology out of the year 2020. This is the date to which reliable forecasts have been produced and are available from bodies such as the Environment Protection Authority. In reality, it is likely that improvements will continue beyond this date and the potential impacts predicted for 2029 are therefore conservative.

Further information on the calculation of the emissions inventory for the project is provided in **Section 2.8** of this report. This includes a discussion of vehicle fleet and fuel mix assumptions, including consideration of the percentage of diesel vehicles in the future.

In relation to diesel vehicles, it is acknowledged that the proportion of diesel vehicles has grown in Sydney and Australia in the recent past. It is also relevant to note that the assessment of diesel particulate matter undertaken as part of the human health risk assessment assumed that 100 per cent of the particulate matter from the project was from diesel sources. This conservative assumption would allow for a continued growth in diesel vehicles up to an unrealistic 100 per cent of all vehicles being diesel powered.

Issue description

Submissions relating to operational air quality raised issues regarding vehicle emissions.

In summary, the submissions raised the following issues:

- The emission generation estimates appears to use a 23 tonnes as a standard for heavy vehicles when a high proportion of the heavy vehicles are greater than 23 tonnes. Many trucks on Pennant Hills Road are B-Doubles (which are more than 32 tonnes).
- Clarity needs to be provided around the weight and fleet types used to generate heavy vehicle emissions. Justification of the mix or average heavy vehicle weight used in the modelling needs to be provided.
- The environment impact statement has understated the emissions from the truck fleet. The in-tunnel emissions must be recalculated once relevant data has been obtained.

Response

Further information on the calculation of the emissions inventory for the project and in-tunnel air quality are provided in **Section 2.8** and **Section 2.9** of this report. This includes a discussion of vehicle fleet and fuel mix assumptions.

Issue description

Submissions query whether the air quality emissions estimates include increased traffic at Pearces Corner.

Response

The surface road air quality modelling includes consideration of future traffic volumes along Pennant Hills Road, the Hills M2 Motorway, the M1 Pacific Motorway and around the interchanges.

Particulate matter

Issue description

The air quality modelling provided particulate matter in $\mu g/m^3$ and attempts to compare to health standards quoted in ppm. This is not helpful.

Response

The human health risk assessment generally provides pollutant concentrations in $\mu g/m^3$ for comparison against relevant impact assessment criteria. Where ppm units have been used in the air quality assessment or the human health risk assessment the conversion of mg/m^3 or $\mu g/m^3$ to ppm has been provided.

Issue description

PM_{10} emission rates from the proposed NorthConnex tunnel will be up to three times greater than those from the M5 East Motorway Tunnel outlet and up to ten times the level from Lane Cove Tunnel.. The total emissions from the NorthConnex project tunnels will be greater than those experienced at any time during the operation of the M5 East Motorway Tunnel.

Response

The NorthConnex project should be assessed on its merits as an individual project, independent of the history, performance and requirements applied to other road tunnels. This assessment should be based on the legislation, environmental standards and assessment policies applicable in New South Wales.

Notwithstanding, if the NorthConnex project is to be compared to other road tunnels, the comparison needs to be made on a consistent basis. Differences between road tunnels need to be taken into account if such a comparison is to be made.

Concentrations of vehicle emissions in road tunnels will depend on several factors, including:

- Traffic volumes and traffic mix (light vehicles and heavy vehicles).
- Traffic flow conditions (free flowing or congested).
- Fuel quality and fuel mix (petroleum, diesel or liquefied petroleum gas (LPG).
- Fleet age.
- Tunnel design, including tunnel length and tunnel gradient.
- Ventilation design, including the nature and rate of ventilation through the tunnel.

- Ambient conditions, including temperature, humidity and background concentrations of pollutants (such as ozone).

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project in its current form would meet ambient air quality criteria and would pose a very low risk to human health.

Issue description

The environmental impact statement does not assess airborne particulates larger than PM_{10} which will have an impact on the health of residents within a 200 metre radius of the ventilation facilities.

Response

The air quality modelling and human health risk assessment have been undertaken in accordance with the Director-General's environmental assessment requirements and the relevant guidelines including the:

- Approved Methods for the Modelling and Assessment of Air Pollutants (Approved Methods) (DEC, 2005a).
- National Environmental Protection Measure for Ambient Air Quality (Air NEPM) (National Environment Protection Council, 2003).
- Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012).

Total suspended particulates (with a diameter up to 50 micrometres) have been considered in the human health risk assessment (refer to Section 4.4.2 of Appendix H to the environmental impact statement). Most particulate matter present in vehicle exhaust is less than 10 micrometres in diameter (PM_{10}) and it is this fraction of particulate matter (and particularly fine particulate matter within $PM_{2,5}$) that is recognised as the principal cause of particulate-related human health effects.

The environmental impact statement assesses pollutants likely to be generated by the operation of the project and those with the potential to impact on human health. Particulate patter (PM) greater than 10 microns in diameter, if inhaled, are generally trapped in the upper respiratory system and do not reach the lungs. The fine particles (PM_{10} and less) tend to be transported further from the source and are of more concern with respect to human health as these particles can penetrate into the lungs. Hence not all of the dust characterised as total suspended particulates is relevant for the assessment of health impacts, and total suspended particulates as a measure of impact has not been evaluated in detail within the assessment. The assessment has only focused on particulate matter of a size where significant associations have been identified between exposure and adverse health effects.

Plume behaviour

Issue description

No modelling of plumes is provided for the actual proposed locations of the project's ventilation outlets. Concern expressed in relation to the potential impacts from the dispersion of vehicle emissions when released from ventilation outlets, resulting in more wide-spread air quality impacts.

The impact of the outlet plumes and plume strikes on the surrounding residential areas must be modelled using its current proposed position and height and also modelled with the alternative locations, including the southern ventilation outlet positioned on the golf course side of Pennant Hills Road, where it is topographically higher. This would allow an objective,

impartial, scientifically based assessment to be made of the most effective location for the outlet. The modelling must take into consideration the topography, vegetation and likely wind direction and speed.

The populations at risk of plume strikes must be advised.

Response

The air quality assessment for the NorthConnex project includes consideration of changing meteorological conditions and the dispersion modelling has calculated plume behaviour over time in order to determine any likely changes to air pollution levels at receiver locations (at ground level) surrounding the ventilation facilities. Ground level concentrations have been modelled for direct comparison to applicable air quality criteria set by the Environment Protection Authority, which typically apply to ground level receivers and other locations likely to be inhabited by human receivers.

The area over which the plume would disperse at any point in time would be different depending on the different meteorological conditions. Illustrations such as Figure 7-28 and 7-29 in the environmental impact statement provide an indication of the modelled extent of air quality impacts and improvements along the Pennant Hills Road corridor. Further Figure 11 to Figure 34 of the Technical Working Paper: Air Quality show the spatial distribution of the ground level concentrations for different pollutants and different averaging periods.

Although the air dispersion modelling has taken into account the behaviour of the NorthConnex plumes in the atmosphere, graphics showing this behaviour (including for example, the height of the plume or its shape in the atmosphere) have not been prepared because:

- The most relevant and important outcome of the air dispersion modelling is to determine potential pollutant concentrations at locations likely to be inhabited by human receivers. This has been completed and is presented in the Environmental Impact Statement in figures and in text.
- The complexity and variability of plume behaviour in the atmosphere over time means that it is not possible to produce just one figure showing the representative shape and spatial distribution of the plume. In reality the plume will have a different shape and spatial distribution for each point in time modelled over the course of the three years of meteorological data used in the NorthConnex air quality assessment. On an hourly basis and in a modelling context, this would be equivalent to more than 26,000 plume shapes.

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Issue description

Monitoring of air quality data is averaged over 12 months which means that plume effects are not accounted for. Short bursts of highly polluted air will be released from the outlet to the immediate vicinity. Modelling should be split into peak and non-peak periods. Plume effect is difficult to measure since most measurement devices estimate hourly ambient air quality or average ambient air quality over a period of time such as 12 months.

Response

The air quality impact assessment presented in Section 7.3 and Appendix G of the environmental impact statement includes air dispersion modelling using the CALPUFF suite

of programs. The air dispersion modelling has calculated the behaviour of emissions from the project ventilation outlets for every hour over the course of a three year period.

The outputs of the air dispersion modelling have been processed to determine average and maximum ground level concentrations for various pollutants over relevant averaging periods, including one-hour, eight-hour, 24-hour and annual averages. This processing based on averaging period is for direct comparison with the ambient air quality criteria set by the Environment Protection Authority for use in New South Wales.

Based on the pollutants and averaging periods for ambient air quality criteria set by the Environment Protection Authority, it is not relevant to separately model and assess peak and non-peak traffic conditions. The air dispersion modelling presented in the environmental impact statement includes the peak and non-peak flows of traffic during each day.

Depending on the particular equipment, ambient air quality monitoring equipment is available which can monitor air quality on a continuous basis. This equipment and processing of the data which is gathered, is typically aligned with the averaging periods relevant to the air quality criteria set by the Environment Protection Authority (for example, on a one-hour, eight-hour, 24-hour or annual average).

Background and meteorological data

Issue description

Submissions raised issues with the location that the meteorological data represented. Key aspects include:

- Use of Prospect, Lindfield and Airport monitoring stations to represent local conditions around the ventilation outlet. Predicted meteorological data should be compared against actual monitored data to validate the predictions
- The lack of studies of the ambient air in Wahroonga or anywhere within one kilometre of the proposed northern outlet. Assumptions around wind speed are not relevant to Wahroonga where many still days occur, due it being in a valley. If the air mass is stable there will be no dispersion. The plume will descend into the valley and remain there. The frequency of calm conditions appears to have been underestimated.
- Emissions will be become meteorologically trapped. Emissions could also be trapped by a temperature inversion.
- Data should only be taken from within two kilometres of the ventilation facilities. Three years of local data should be collected.
- Independent meteorological monitoring should be undertaken locally (within 40 metres of the proposed outlet).
- Forecasts on wind patterns have not been based upon where you are proposing the site for the northern outlet. Data has been based on Terry Hills which is not representative.
- A lot of assumptions about air quality, the height of the outlet, and where it should be placed have been made.
- The years selected for modelling and assessment of air quality were years when extreme climatic events occurred. No meaningful assessment was undertaken to determine whether these years were appropriate for use in modelling.

Response

The air quality impact assessment for the NorthConnex project has been conducted in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC, 2005) (the Approved Methods guidelines). This involved preparing a dispersion model with site-specific background air quality data and meteorological data inputs.

Chapter 2 of this report provides further information on the inputs and assumptions that have been applied to the air quality impact assessment for the project, including in relation to background air quality data, topography and meteorological conditions. This information demonstrates that the assumptions and inputs into the air quality impact assessment are reasonable and conservative.

Portal emissions

Issue description

The environmental impact statement does not provide an assessment for emissions from the portal. Key aspects raised include:

- No verification that there will be no portal emissions from the current proposal. The NorthConnex project needs to ensure this.
- An independent review of the ventilation system should be undertaken to ensure no portal emissions.
- Future provision of portal emissions in densely populated areas will result in emissions remaining at ground level and hence exposing the local population to pollutants. Future portal emissions form the project should be banned.
- Trucks will drag emissions out of the tunnel behind them.
- Clarification on dispersion patterns for portals emissions.
- Pollutants from the tunnel portal will cause significant air quality problems within the local community.

Response

The project does not propose any emissions from the tunnel portals under normal operating conditions. Air within the section of tunnel beyond the ventilation off-take would be drawn back against the flow of traffic to be emitted and dispersed through the ventilation outlet. As such, the assessment has not considered portal emissions. If portal emissions are considered in the future, this would be subject to appropriate assessment and approval.

The environmental impact statement includes a statement that the planning application made for the NorthConnex project is not seeking approval for portal emissions. If approved, any approval granted by the Minister for Planning would therefore not authorise portal emissions.

Further details regarding the operation of the project ventilation system is provided in Section 5.2.5 of the environmental impact statement.

In-tunnel incidents

Issue description

The environmental impact statement has not included an evaluation of the worst case scenario in the event of a serious fire and the impact of smoke from the portals, tunnel support facilities and ventilation outlets.

Furthermore the emissions from the emergency smoke extraction facilities, ventilation facilities or portals in the event of an emergency or the build-up of particles inside the tunnel have not been modelled. The types of fumes released in an emergency and the proximity to residents is likely to have a significant effect on air quality and human health.

A series of plausible emergency situations should be modelled and the air quality and human health impact assessed.

Response

Section 2.7.2 of this report provides further discussion of tunnel incidents that may lead to emergency emissions from the project tunnels (principally fire related incidents). The discussion demonstrates that a combination of a very low probability of such events, and the design of the project to minimise potential consequences, would result in a very low risk of significant impacts to the surrounding environment and communities in the unlikely event of a tunnel incident.

The environmental impact statement assesses the potential impacts of the NorthConnex project for a series of credible construction and operational scenarios. A reasonable level of conservatism has been applied to these scenarios to allow for flexibility in the implementation of the project, and to give regulatory authorities, the community and other stakeholders confidence in the veracity and robustness of the relevant environmental impact assessments.

The environmental impact statement does not present a detailed, quantitative assessment of scenarios including force majeure events, very low risk (ie very low likelihood and/ or very low consequence) incidents or other outcomes that are either not realistically or credibly foreseeable during the normal operation of the project. This is consistent with the approach take for the assessment of other major infrastructure and developments in New South Wales, including major surface road and tunnel projects, rail infrastructure, ports and airports. These types of developments consider the risk of an emergency or unexpected event occurring (such as a major road crash, a train derailment, or an aircraft crash), but do not provide a detailed, quantified assessment of the potential environmental impacts of such an event occurring. Instead, the focus in these cases is ensuring that feasible and reasonable measures are applied to the particular development to minimise the likelihood and the consequence of emergency events.

8.11.2 Ventilation system

Six hundred and ninety one submissions raised issues regarding the ventilation system.

Filtration

Issue description

Submissions raised concerns regarding filtration, issues include:

- Ventilation facilities should be filtered and run 24 hours per day, 365 days per year. Government has a duty of care to provide filtration.
- Concern that the exclusion of filters due to the cost is putting money ahead of people's lives. The justification against filtration appears to be based cost and the questionable effectiveness of older ventilation systems. The justification for not providing filtration is cursory and unconvincing.
- Filtration would also improve in-tunnel air quality if done progressively along the tunnel. The natural variations and uncertainty within the tunnel ventilation system makes it certain that portions of the in-tunnel atmosphere will inevitably exceed the

1000ug/m^3 PM_{10} concentration noted by the NHMRC report as “clearly dangerous to health”.

- Public must be informed of the criteria used to assess ‘value for money’ regarding filtration. Were the health and well-being of Australians included in this cost analysis? Were hospital and medical costs included?
- Effective filtration equipment is readily available. There is evidence to suggest that using modern filtration systems in longitudinally ventilated tunnels (using progressive filtration throughout the tunnel) can make the overall ventilation process more efficient and cheaper. Also a belief that filtration of a zero grade tunnel would be cheaper.
- An independent report on the effectiveness of filtration, specifically relating to the nine kilometre NorthConnex tunnel should be undertaken and made publically available.
- Request a full review of current technologies for air filtering technologies to identify current state of the art mechanisms that will efficiently and effectively remove waste. A life cycle analysis, fully costs proposal and assessment should be undertaken for the provision of filtration. The small increase in cost per journey for filtration would be far less than the cost to public health.
- Lessons that can be learnt for other tunnels such as the Lane Cove Tunnel and M5 East Motorway tunnels have not been taken into account. The M5 East Motorway tunnel is not being monitored carefully as a basis for research and assumptions for the new NorthConnex tunnel.
- Lane Cove Tunnel is not an adequate example of why filtration is not needed due to the differences between Lane Cove Tunnel and NorthConnex.
- A parliamentary inquiry into the Lane Cove Tunnel recommended that future tunnel projects incorporate a requirement to design and cost in-tunnel filtration. The enquiry also recommended that the decision of whether or not to install in-tunnel filtration in future road tunnel project be made by the Budget Committee of Cabinet. Please provide the report from the Budget Committee of Cabinet on why filtration was not required on the NorthConnex project.
- Why, knowing that the M5 East Motorway tunnel filtration was not as efficient as expected, was effective filtration not an integral requirement for this “Unsolicited Bid’?

The transverse ventilation design has been regarded as the safest and most reliable ventilation system for decades. The departure from established norms of tunnel design means that it is essential that the assumptions, both explicit and implicit, upon which the ventilation engineering, air quality and operational systems are based, be rigorously examined. The literature suggests that there are two basic filtration design options:

- Filtration could be affected through a three tier system – a pre-screening filter to remove large PM (so as not to overload the electrostatic precipitator equipment) and a contemporaneous electrostatic precipitator capability to remove the very fine PM; in addition, activated charcoal filters to remove the gases such as NO_2.
- Install electrostatic precipitator units in the ceiling at approximately two kilometre intervals along the length of the tunnel.

Suggestions include:

- NorthConnex should be made to investigate the best quality air filtration system using the latest in world class technological design and to install this system in all four ventilation outlets of the twin tunnels. ie southern ventilation outlet, northern ventilation outlet, Wilson Road emergency outlet and Trelawney Street emergency outlet.
- As a condition of any further progress in the planning process, Transurban must be required to issue an international registration of interest by suitably qualified and

experienced filtration suppliers for the design, supply, installation and commissioning of an efficient filtration system for the NorthConnex tunnel. Results of the registration should be made public to enable an assessment of the actual cost and likely impact of the use of such equipment on both the economics of the tunnel operation and its long term health and environmental impacts.

- The ventilation system should be upgraded as technology in this area is improved.
- Provision should be made to allow retro-fitting of filtration should the need arise.
- Harvested particles from filtration could be used to extract substances such as mercury and sulfur which could be used in industry, or used to generate electricity. This would reduce the running costs of the tunnel system.
- Shamantra should be used to filter the ventilation facilities, as it will filter the exhaust and produce not waste, but a material suitable for fertiliser.

Response

The environmental impact statement includes an analysis of tunnel filtration systems and explains why such systems are not warranted for the NorthConnex project (refer to Section 7.3.1 of the environmental impact statement). The environmental impact statement demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health. In this context, there is no technical basis to justify installation of filtration systems.

Further information on the availability and efficacy of in-tunnel air treatment systems (including filtration) is provided in **Section 3.1** of this report. The analysis of ventilation system design options and alternatives in **Section 3.2** of this report considers the application of in-tunnel air treatment systems to the NorthConnex project and concludes that these systems are not feasible and reasonable.

The use of filtration systems within the tunnel ventilation outlets has been proven to be costly and inefficient. Learnings from the M5 East Motorway tunnel filtration trial have unequivocally demonstrated that greater improvements in air quality can be achieved through investment in programs targeting other emission sources that contribute higher levels of pollution to the surrounding environment. For example, improvements have been demonstrated through the smoky vehicle strategy investigated by Roads and Maritime and the Environment Protection Authority on the M5 East Motorway. Further details of the effectiveness of this strategy are provided in Section 7.3.1 of the environmental impact statement.

For the NorthConnex project, the aim has been to take on board the learnings from the M5 East Motorway tunnel and mitigate emissions through improved tunnel design. This has included:

- A flatter tunnel gradient.
- A large cross-sectional area.
- An efficient ventilation system that does not circulate air from one main alignment tunnel to the other.
- Removal of smoky vehicles through the use of the smoky vehicle camera system.

Issue description

Based on international experience, filtration technology for NorthConnex is not proposed. What international experience is this based on? Effective electrostatic precipitator filtration technologies are in use on Japan, Norway, South Korea and Vietnam.

The main users of tunnel filtration, Japan and Norway, report that the constructive use of filtration can reduce the overall cost of running tunnel ventilation systems, without factoring in reduced health costs

International tunnels which have been identified as having filtration include:

- Spanish Madrid (Calle 30) Ring Road Tunnel System.
- Japanese Kanetsu (11km) Tunnel.
- French Paris (A86) Ring Road Tunnel.
- Simplon in Switzerland.

The Government should require Transurban to investigate filtration systems that are working more effectively, efficiently and cheaply in other countries.

Belief that the percentage of diesel powered cars in Japan is very low.

Response

The environmental impact statement includes an analysis of tunnel filtration systems and explains why such systems are not warranted for the NorthConnex project (refer to Section 7.3.1 of the environmental impact statement). The environmental impact statement demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health. In this context, there is no technical basis to justify installation of filtration systems. This analysis considered international studies Shamantra by the New Zealand Transport Agency and the French Government.

Further information on the availability and efficacy of in-tunnel air treatment systems (including filtration) is provided in **Section 3.1** of this report. The analysis of ventilation system design options and alternatives in **Section 3.2** of this report considers the application of in-tunnel air treatment systems to the NorthConnex project and concludes that these systems are not feasible and reasonable.

The use of filtration systems within the tunnel ventilation outlets is not warranted. These systems have been proven to be costly and inefficient. Learnings from the M5 East Motorway tunnel filtration trial have demonstrated that greater improvements in air quality could be achieved through investment in programs targeting other emission sources that contribute higher levels of pollution to the surrounding environment. For example, improvements have been demonstrated through the smoky vehicle strategy investigated by Roads and Maritime and the Environment Protection Authority on the M5 East Motorway. Further details of the effectiveness of this strategy are provided in Section 7.3.1 of the environmental impact statement.

For the NorthConnex project, the aim has been to take on board the learnings from the M5 East Motorway tunnel and mitigate emissions through improved tunnel design. This has included:

- A flatter tunnel gradient.
- A large cross-sectional area.
- An efficient ventilation system that does not circulate air from one main alignment tunnel to the other.
- Removal of smoky vehicles through the use of the smoky vehicle camera system.

Internationally, there are a very small number of road tunnels with filtration systems chiefly in Japan and Norway and they are provided mainly to assist in maintaining in-tunnel visibility.

In Japan they are required to address the combination of a high fraction of diesel powered cars and a very high percentage of heavy goods vehicles. In Norway filtration systems are required for the high dust concentration related to the use of spiked tyres used in icy conditions and large amounts of sand and salt dispersed in wintertime. Sydney tunnels do not have these issues and as such conventional ventilation systems without filtration have been proven to work very safely and effectively.

The Simplon tunnel connecting Switzerland and Italy is a rail tunnel which opened in 1906. This tunnel is not filtered and, like most rail tunnels, is ventilated to provide fresh air into the tunnel and maintain in-tunnel temperature.

Issue description

NorthConnex has decided not to filter the tunnels as it 'did not represent value for money' basing their argument on the $65 million cost of the M5 East Motorway tunnel system. Clearly the $65 million cost of the installation in the M5 East Motorway tunnel does not provide any guidance as to the likely cost of a system such as would be appropriate for the NorthConnex tunnels. The problematic M5 East Motorway tunnel filtration system does not mean that State and Federal Governments allow the proposers of this unsolicited bid to have no filtration system at all. What it should mean, is that in the interests of Australian citizens' health, well-being and safety, the Government requires Transurban to investigate systems that are working more effectively, efficiently and cheaply in other countries.

The prospect of installing filtration to the emissions has been inadequately dealt with and has been compared to local examples where filtration was attempted to be applied retrospectively (M5 East Motorway tunnels)) at great expense and with unsatisfactory effect. We understand that air filtration systems are most economical and effective when designed and installed at the time of construction.

Filtration technology is not proposed based on the M5 East Motorway filtration trial. This trial was:

- Installed by a supplier who had never installed a full scale filtration system.
- Average monthly availability period of the equipment was 84 per cent, compared to a 99.5 per cent target.
- Over the 56 week trial period, no week included five days fault free operation.
- The operating results were reduced by 75 per cent as a result of averaging over a 24 hour period.
- The cost calculation was based on the final total trial costs of approximately $65 million which included costs extraneous to a realistic operational cost.
- 65 per cent of particulate matter was removed.

Other filtration systems have removed more than 90 per cent of particulate matter.

Given these trial details, how can NorthConnex claim that filtration technology is not as efficient and sustainable option? Such an outcome is considered very good value for money when set against the cost of providing long term health care for those affected by the air pollution.

A number of other issues were identified by stakeholders regarding the validity of the M5 East Motorway tunnel data used by NorthConnex including:

- There has been no significant difference or decrease in particulate emissions from the smoky vehicle strategy for the M5 East Motorway tunnel as claimed by Roads and Maritime.
- There are a number of outstanding issues with the monitoring record for M5 East Motorway tunnel including:
    - The number of outright monitoring failures.
    - The number of times when the monitors have obviously lost calibration and readings have drifted either up or down.
    - The time it takes the operator to respond to and fix the faults.
- Although the Roads and Maritime clean fleet actions have probably had some impact, the fact that over this period the filtration system was operating, the claimed 50 per cent reduction in outlet emission since February 2013 from the smoky vehicle strategy is not credible. The effect of the filtration system in the westbound M5 East Motorway tunnel would be included in the 2012-2013 figures as the system was operating then.
- NorthConnex air quality document misrepresents what the M5 East Motorway tunnel filtration trail set out to do.
- At no stage was there a mention of effects on external air quality and, because of the size and nature of the proposed trial these would always be small possibly a 15 per cent reduction in particulate outlet emissions. No measurements were made specifically to assess the impact of the trial outside of the tunnel.
- The trial was successful in what it set out to do however it also demonstrated that the selected electrostatic precipitator technology was not suitable and did not meet the standards of operability or removal efficiency.

NorthConnex should be filtered as:

- Particulate matter is likely to cause the most discomfort and long term harm.
- There appears to be significant health benefits which would accrue from the reduction of both peak levels and total in-tunnel exposures to pollutants.
- The ventilation system for the project should be determined by the need to maintain low PM_{10} levels.
- Tunnel ventilation is usually the most expensive part of the total tunnel operating system because of the large amount of electricity required to drive the fans. It is estimated that the NorthConnex ventilation system is likely to cost $10 million per year to run. This is where the use of in-tunnel particle filtration gives a real possibility for reducing operating costs.

Response

The environmental impact statement includes an analysis of the potential costs and benefits of tunnel filtration systems and explains why such systems are not warranted (refer to Section 7.3.1 of the environmental impact statement). The environmental impact statement demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health. In this context, there is no technical basis to justify installation of filtration systems.

The analysis of filtration systems presented in the environmental impact statement considered international studies undertaken by the New Zealand Transport Agency and the French Government as well as the results of the M5 East Motorway filtration trial.

Further information on the availability and efficacy of in-tunnel air treatment systems (including filtration) is provided in **Section 3.1** of this report. The analysis of ventilation system design options and alternatives in **Section 3.2** of this report considers the application of in-tunnel air treatment systems to the NorthConnex project and concludes that these systems are not feasible and reasonable.

The use of filtration systems within the tunnel ventilation outlets is not warranted. These systems have been proven to be costly and inefficient. Greater improvements in air quality could be achieved through investment in programs targeting other emission sources that contribute higher levels of pollution to the surrounding environment. For example, improvements have been demonstrated through the smoky vehicle strategy instigated by Roads and Maritime and the Environment Protection Authority on the M5 East Motorway. Further details of the effectiveness of this strategy are provided in Section 7.3.1 of the environmental impact statement.

General concerns

Issue description

It is appreciated that the efficiency of diesel vehicles has been regulated since 2002 and that CSIRO anticipate a significant reduction of emissions by 2030. However, it must also be noted that the proportion of diesel vehicles in the national fleet increased by almost 40 per cent between 2006 and 2013.

Response

It is acknowledged that the percentage of diesel vehicles in Australia has increased in the recent past. The air quality modelling has been undertaken based on anticipated fleet composition and likely improvements to fuel technologies to the year 2020.

Further information on the calculation of the emissions inventory for the project is provided in **Section 2.8** of this report. This includes a discussion of vehicle fleet and fuel mix assumptions, including consideration of the percentage of diesel vehicles in the future.

It is also relevant to note that the assessment of diesel particulate matter undertaken as part of the human health risk assessment assumed that 100 per cent of the particulate matter from the project was from diesel sources. This conservative assumption would allow for a continued growth in diesel vehicles up to an unrealistic 100 per cent of all vehicles being diesel powered.

Issue description

Air quality will be severely compromised due to the location of the ventilation outlets and volume of heavy vehicle use.

Response

The environmental impact statement includes and assessment of potential changes to air quality around the two ventilation outlets (refer to Section 7.3.1 of the environmental impact statement). The environmental impact statement demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Issue description

Do not approve of the ventilation outlets being relocated from the proposed location to someone else's backyard.

Response

The project does not propose to alter the location of either of the ventilation outlets from the location described and assessed within the environmental impact statement.

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health. In this context, there is no basis to justify relocation of the ventilation outlets.

Issue description

Pollution will not disperse and will return to ground level.

Response

The operation of the project ventilation system is described in Section 5.2.5 of the environmental impact statement. Each main alignment tunnel would be longitudinally ventilated. That is, air would be pushed by the movement of cars and jet fans (when required) to a ventilation offtake located near the tunnel exit portal. Fans within the ventilation facility would remove the air from the tunnels. The project ventilation facilities would effectively disperse those emissions in a controlled manner high in the atmosphere. The net effect would be a reduction in the concentration of vehicle pollution at ground level where it may affect the local community.

The environmental impact statement includes an assessment of operational air quality impacts from the ventilation outlets (refer to Section 7.3.4 of the environmental impact statement). The assessment undertaken considers the ground level concentrations. That is, the modelled pollutant levels which reach the ground level after effective dispersion in the atmosphere. The assessment demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Ventilation outlets have been shown, on other road tunnel projects, to effectively disperse pollutants.

Issue description

In reality there will be no consequences if the operators do not meet the required air quality standards.

Operating standards should be defined for the operation of the tunnel and ventilation facilities to ensure optimum operation.

No confidence in the future maintenance of the ventilation facilities.

Response

The NorthConnex project will be operated in compliance with the conditions of approval applied to the project if approved by the Minister for Planning, as well as the requirements of other approvals that may be granted for the project. The *Environmental Planning and Assessment Act 1979* provides for penalties and enforcement powers for the Department of Planning and Environment in the event of a breach of those conditions of approval.

Operational plans and procedures will be developed during the detailed design phase, including in relation to the tunnel ventilation system. These plans and procedures will

specify operating parameters to ensure efficient operation of the ventilation system and maintenance of acceptable in-tunnel air quality.

Issue description

Nuisance of dust released from ventilation facilities.

Response

Most particulate matter present in vehicle exhaust is less than 10 micrometres in diameter (PM_{10}) and will tend to remain suspended in the atmosphere, rather than depositing and generating a dust nuisance. The concentration of particulate matter in the atmosphere generated by the project's ventilation outlets is also very low, and the potential for dust-related nuisance impacts is therefore also very low.

Issue description

Belief that the design of the exhaust outlets will ensure that air quality adjacent to the exhaust outlets will be well within acceptable limits.

Response

Comments about the design of the ventilation outlets and compliance with ambient air quality criteria are noted.

Issue description

The environmental impact statement shows that the Hills M2 Motorway westbound is already at capacity in the PM peak. Therefore, traffic will bank up in the tunnel and result in increased pollution.

Response

The environmental impact statement in Table 7-8 identifies that the Hills M2 Motorway westbound, to the west of Pennant Hills Road is currently operating at capacity. The project includes the provision of a new westbound lane along the Hills M2 Motorway between Pennant Hills Road and Windsor Road. This new lane would increase the capacity and improve the traffic performance of the Hills M2 Motorway westbound.

Table 7-26 of the environmental impact statement provides the predicted traffic performance of the project tunnels in 2019 and 2029. This table shows that the tunnels would operate as a free flowing traffic environment.

The NorthConnex project, including the Hills M2 Motorway integration works, has been designed to avoid traffic queuing into the project tunnels under normal operating conditions. Operational management measures would be developed and implemented to address potential congested traffic conditions, including in the event of breakdowns and incidents.

Notwithstanding, the air quality impact assessment includes consideration of congested traffic conditions within the project tunnels.

Issue description

Submissions question how the grade of the Pennant Hills Road southbound ramp will be reduced to ensure truck speeds are maintained, therefore reducing particulate pollution and improving air quality.

Response

The lessons learnt from the design of the M5 East Motorway tunnel have been included in the design of the NorthConnex tunnel. This includes flatter grades throughout the tunnel including off-ramps.

The grade of all sections of the tunnel has been considered in the air quality modelling undertaken and presented in Section 7.3.4 and Appendix G of the environmental impact statement. The assessment demonstrates that the NorthConnex project would meet ambient air quality criteria, including in relation to particulates, and would pose a very low risk to human health.

Issue description

One of the recognised benefits of tunnels is that they provide the opportunity to collect pollutants from vehicle emissions and either treat them or discharge them away from people. This opportunity is missed with this project proposing to discharge them in a residential area.

Response

The NorthConnex project realises the opportunity from the tunnel to improve regional air quality.

The NorthConnex project would collect vehicle emissions that are currently released in an uncontrolled manner at ground level, adjacent to residential and other sensitive receivers, and effectively disperse those emissions in a controlled manner high in the atmosphere. The net effect would be a reduction in the concentration of vehicle pollution at ground level where it may affect the local community.

Issue description

The potential for fan boosting to reduce wind resistance and emissions should be considered.

Response

The ventilation system is based on the piston effect of vehicles pushing air flow through the tunnel in the direction of travel. Jet fans mounted within the tunnels would be used to supplement air flow during times of low speed or low volume traffic.

It is expected that there would be limited wind resistance against the flow of traffic within the tunnels.

Other pollution sources

Issue description

The environmental impact statement talks about other pollutants such as open fires, smoking, driving, etc. In most cases people make a choice to subject themselves to these effects. In the case of ventilation outlets, the residents will not have the choice whether to be exposed to this pollution or not.

Response

The NorthConnex project will not generate air emissions that are not already experienced along Pennant Hills Road and other major roads in Sydney, and that are already present in the airshed across the Sydney region. Populations along the Pennant Hills Road corridor and around the ventilation outlets are currently exposed to these pollutants to varying degrees. The NorthConnex project will more effectively collect, manage and disperse existing vehicle emissions than is currently the case along Pennant Hills Road. The environmental impact statement has demonstrated that the air quality impacts of the project will be within the existing background variability of air pollution in Sydney.

Issue description

According to the environmental impact statement, the fact that there are other sources of pollutants makes it acceptable for NorthConnex to pollute. It also suggests it would be better for the other sources to be cleaned up instead of stopping NorthConnex from creating more pollution. Once it is understood that certain pollutants can cause harm, it is imperative that any further source be restricted in addition to having other sources stopped.

The NorthConnex project blames pollution on the tunnel users. Blame for the concentration of the pollutants lies with the NorthConnex project.

Response

The environmental impact statement does not justify pollution based on the fact that there are other pollution sources. The NorthConnex project would not produce new emissions or new pollution. The NorthConnex project would collect vehicle emissions that are currently released in an uncontrolled manner at ground level, adjacent to residential and other sensitive receivers, and effectively disperse those emissions in a controlled manner high in the atmosphere. The net effect would be a reduction in the concentration of vehicle pollution at ground level where it may affect the local community.

Emissions managed by the NorthConnex project originate from the exhaust of vehicles using the project, in the same way as vehicles currently using Pennant Hills Road are the principal source of air pollution along that road. It is accepted that the NorthConnex project is responsible for the appropriate and efficient collection, management and dispersion of in-tunnel vehicle emissions. The environmental impact statement has demonstrated that the project's ventilation system, including ventilation outlets, will achieve this outcome and will effectively disperse vehicle emissions below applicable ambient air quality criteria.

Heavy polluting vehicles

Issue description

Suggestion was made that vehicles which pollute heavily would somehow be identified and encouraged to clean up their act. No data was supplied in support of this suggestion.

Questions raised include:

- What is a heavy polluter?
- How many are there in the fleet?
- What about other heavy polluting vehicles like cars, vans and trade vehicles?
- Who is going to enforce the clean-up?
- Why not just ban smoky vehicle from entering the tunnel in the first place?
- What is proposed to ensure that offending vehicles are brought up to standard?

Furthermore, no meaningful tests are performed on all new cars at point of sale or old cars at registration to ensure they meet the applicable standards. Request to prohibit old and/or smoky trucks in the tunnels and force older trucks onto surface roads.

Response

Roads and Maritime and the Environment Protection Authority successfully installed a smoky vehicle camera system on the M5 East Motorway in 2006.

The smoky vehicle camera system detects, identifies and records smoky vehicles using smoke detectors, video and still cameras to detect the vehicles, and optical recognition software to capture the identity of large 'smoky' vehicles.

The Smoky Vehicle Enforcement Project started on 1 March 2013 and includes increased fines for operators of smoky vehicles. Vehicle operators will now face fines of $2,000 for the first two offences, A third offence will attract a $2,000 fine as well as an automatic three month suspension of vehicle registration. Operators of heavy vehicles detected emitting excessive smoke inside the M5 East Motorway Tunnel will be invited to participate in the Diesel Retrofit and Repair Initiative. This will have air quality benefits for not only the M5 East Motorway Tunnel but also for the wider Sydney network.

This strategy has proved to be effective and has resulted in improvements to air quality within the M5 East Motorway tunnels, and therefore the air which is exhausted from the M5 East Motorway tunnels to the environment. Further details of the effectiveness of this strategy are provided in Section 7.3.1 of the environmental impact statement.

The NorthConnex project would implement a similar strategy to identify and regulate smoky vehicles.

Smoke emissions

Issue description

Control of the smoke emission will need to include control of odour emission as well as control of the particulate emission to not exceed $PM_{2.5}$.

Response

The air quality impact assessment included in the environmental impact statement has considered pollutants relevant to the NorthConnex project, including $PM_{2.5}$. The relevant pollutants have been identified using the emissions inventory from the Permanent International Association of Road Congress (2012). The assessment demonstrates that the NorthConnex project would meet applicable NSW ambient air quality criteria, and would not exceed the current advisory reporting standards for $PM_{2.5}$ on an annual or 24-hour basis.

There are no known odour issues with other road tunnel ventilation systems and the types of emissions from the ventilation outlets would be unlikely to contribute to or result in odour

impacts. As such, consideration of odour was not required by the Director-General's environmental assessment requirements issued by the then Department of Planning and Infrastructure (now the Department of Planning and Environment).

Issue description

Smoke during an emergency would also be directed towards the portals and the ventilation facilities for release.

Response

The environmental impact statement assesses the potential impacts of the NorthConnex project for a series of credible construction and operational scenarios. A reasonable level of conservatism has been applied to these scenarios to allow for flexibility in the implementation of the project, and to give regulatory authorities, the community and other stakeholders' confidence in the veracity and robustness of the relevant environmental impact assessments.

Section 2.7.2 of this report provides further discussion of tunnel incidents that may lead to emergency emissions from the project tunnels (principally fire related incidents). The discussion demonstrates that a combination of a very low probability of such events, and the design of the project to minimise potential consequences, would result in a very low risk of significant impacts to the surrounding environment and communities in the unlikely event of a tunnel incident.

The environmental impact statement does not present a detailed, quantitative assessment of scenarios including force majeure events, very low risk (ie very low likelihood and/ or very low consequence) incidents or other outcomes that are either not realistically or credibly foreseeable during the normal operation of the project. This is consistent with the approach take for the assessment of other major infrastructure and developments in New South Wales, including major surface road and tunnel projects, rail infrastructure, ports and airports. These types of developments consider the risk of an emergency or unexpected event occurring (such as a major road crash, a train derailment, or an aircraft crash), but do not provide a detailed, quantified assessment of the potential environmental impacts of such an event occurring. Instead, the focus in these cases is ensuring that feasible and reasonable measures are applied to the particular development to minimise the likelihood and the consequence of emergency events.

Ventilation system design

Issue description

Support for the proposed ventilation method for the NorthConnex tunnels. The ventilation method should not be replaced by alternative sub-optimum arrangements that provide little or no improvement at extraordinary cost. The items detailed in the Advisory Committee's 2014 "Initial Report on Tunnel Air Quality" should be included during detailed design and construction to ensure the project is completed as envisaged whilst slowing the Advisory Committee's aims to be achieved.

Response

Support for the proposed ventilation system is noted. The NorthConnex tunnel ventilation system design is generally consistent with the Advisory Committee's Initial Report on Tunnel Air Quality.

Issue description

The project will concentrate existing air pollution, currently spread over nine kilometres, into just two small community areas with a large number of schools and children.

Air quality for residents along Pennant Hills Road will improve at the expense of air quality in the vicinity of the portals. Pollution currently confined to a narrow, mainly industrial and retail corridor along Pennant Hills Road will be spread over a broader residential area around the proposed outlets. The environmental impact statement should clearly state that the project improves air quality for those living along Pennant Hills Road at the expense of those living around the ventilation outlets.

It is not credible that nine kilometres of vehicle pollutants (including the estimated 5,000 truck movements per day) can be diverted into a tunnel 'improving air quality along the nine kilometre stretch of Pennant Hills Road' and emerge from the exhaust outlet without causing any decline in the local air quality in Wahroonga and West Pennant Hills.

The environmental impact statement is contradictory. How can there be a five to 35 per cent improvement along Pennant Hills Road and such a negligible increase in pollutants near the outlets? Common sense says that overall particulates would not be significantly reduced and may in fact be increased as more traffic takes a more convenient route. It seems there is gap in the environmental impact statement as these pollutants will not just disappear.

Comparisons to other tunnels are meaningless given the other tunnels are much shorter, handle less traffic and nowhere near 5,000 heavy vehicle movements per day. The project would be six times the length of the Sydney Harbour Tunnel or the Lane Cove Tunnel and only includes two ventilation outlets.

Suggestions include:

- More ventilation outlets to even out pollution.
- Locate ventilation outlets closer to the centre of the tunnel.
- A central section of the tunnel should be open to aid natural ventilation.
- Fresh air should be injected into the tunnel midway.
- Identify alternative designs that will release pollutants away from residential areas.
- Place a third ventilation facility in the middle of the tunnel.
- The Wilson Road and Trelawney Street sites should also include ventilation facilities, allowing three ventilation points for each tunnel.

Additional ventilation outlets would also improve the in-tunnel air quality.

Response

The NorthConnex project would collect vehicle emissions that are currently released in an uncontrolled manner at ground level, adjacent to residential and other sensitive receivers, and effectively disperse those emissions in a controlled manner high in the atmosphere. The net effect would be a reduction in the concentration of vehicle pollution at ground level where it may affect the local community.

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health. In this context, there is no technical basis to consider additional ventilation outlets. These assessments are provided in Section 7.3 and Section 7.4 of the environmental impact statement respectively.

Pennant Hills Road is mainly surrounded by residential land uses and several schools, as well as some pockets of retail and industrial areas. The assessment undertaken indicates that the improvements along Pennant Hills Road would be orders of magnitude larger than the negligible increases around the ventilation outlets.

The predicted project contribution of $PM_{2.5}$ in 2029 as a percent of the advisory reporting standard (annual average) would be around 1.25 per cent around the northern ventilation outlet and around 1.63 per cent around the southern ventilation outlet. For comparison, the project would provide reductions in $PM_{2.5}$ for receivers along Pennant Hills Road of between five to 35 per cent of the annual average advisory reporting standard.

Overall, the project would result in improvements local air quality along the Pennant Hills Road corridor.

When considering the relative changes in air quality as a result of the project, including areas of improvement along Pennant Hills Road and impacts around the ventilation outlets, it is important to recognise that the total number of vehicle trips and the mix of vehicles making those trips is unlikely to significantly change (between scenarios with and without the project). The total mass of vehicle emissions along the Pennant Hills Road corridor (as a total on the surface and in the project tunnel emissions) would therefore be generally similar with and without the project at any point in time. There would be some reduction in emissions from vehicles using project tunnels as a result of a more efficient journey, particularly avoidance of stopping and starting, and heavy congestion experienced along Pennant Hills Road.

The key issue would be how vehicle emissions are collected and managed in scenarios with and without the project. Without the project, vehicle emissions would be released in an uncontrolled manner at ground level along Pennant Hills Road. Emissions would tend to accumulate along the road corridor, with limited dispersion available only from local meteorology and the generally slow movement of vehicles. Dispersion would be hindered in areas where high or dense development is located along the road corridor.

The project would remove a significant proportion of vehicles from Pennant Hills Road, particularly heavy vehicles which typically emit more emissions than passenger cars. The removal of these vehicles, and associated improvements in traffic flow, are the principal reason for expected improvements in air quality along Pennant Hills Road.

In contrast to vehicle emissions along Pennant Hills Road, vehicle emissions within the project tunnels would be controlled, captured and emitted from ventilation outlets at high velocities (up to around 20 metres per second or about 70 kilometres per hour). This would send the emissions high into the atmosphere (rather than being discharged at ground level) and would contribute to the effective dispersion of the emissions.

The major difference in the expected significant improvements in air quality along Pennant Hills Road and the negligible impacts around ventilation outlets is because of these different methods of dispersion. The project's ventilation outlets would more rapidly disperse vehicle emissions and through a much larger volume of air that emissions along Pennant Hills Road, which would slowly disperse from the relatively confined corridor of air along the road.

With respect to the ventilation system design suggestions presented in submissions:

- It is recognised that more ventilation outlets would, as a general principal, reduce peak air quality impacts by reducing the total amount of pollutants release from each ventilation outlet. Additional ventilation outlets have not been pursued for the NorthConnex project because:

- The environmental impact statement, including the air quality impact assessment and human health risk assessment, demonstrates that the NorthConnex project would comply with ambient air quality criteria and would generate essentially negligible human health impacts. Acceptable air quality and human health outcomes can be achieved with the two ventilation outlets currently proposed.
- Additional ventilation outlets would introduce other undesirable environmental and amenity consequences, including additional land acquisition, construction amenity impacts, operational visual amenity and noise impacts.
- Additional ventilation outlets would introduce extra unnecessary capital and ongoing operational costs.

- Ventilation outlets closer to the centre of the tunnel would require a ventilation system drawing air through the tunnel from both of its ends. This would be an inefficient ventilation design because for at least half of the tunnel, additional fan capacity would be required to draw air in the opposite direction to the piston effect of vehicles travelling through the tunnels. This would introduce extra unnecessary capital and ongoing operational costs.
- An open section of tunnel to allow natural ventilation would require additional measures to be implemented to manage in-tunnel air to prevent its release from the opening. One method for achieving this may through a significantly enhanced ventilation system with additional fans and ventilation capacity. As noted above this would introduce extra unnecessary capital and ongoing operational costs. Alternatively, an intermediate ventilation outlet could be considered at the open section of tunnel. As discussed above in relation to provision of additional ventilation outlets, this would be undesirable based on environmental and amenity impacts, and additional cost.
- The environmental impact statement, including the air quality impact assessment and human health risk assessment, demonstrates that the NorthConnex project would comply with ambient air quality criteria and would generate very low human health impacts. There is therefore no air quality or human health basis for locating or relocating ventilation outlets to target specific land use zonings or developments.

Issue description

Questions raised regarding how the tunnel will be ventilated to the western side of Pennant Hills Road and the connection of the twin tunnels to the southern ventilation facility.

Response

A ventilation offtake would transfer the air from the southbound main alignment tunnel to the southern ventilation facility. Details of the ventilation offtake are provided in **Section 4.2** and **Figure 4-1** of this report.

The location of the ventilation connection between the project tunnels and the southern ventilation facility does not affect the assumptions, methodology or conclusions of the air quality impact assessment conducted for the NorthConnex project and included in the environmental impact statement.

Notwithstanding, it is recognised that this issue is of interest to some community members. As such, this information has been added to the project website (www.northconnex.com.au) and was included within the presentation to the community at the air quality forum.

Issue description

The connection shaft, connecting the tunnels to the southern ventilation outlet does not appear to have been designed. The efficiency and air quality of the ventilation system therefore cannot be assessed. The efficiency of the southern exhaust outlet is based on an assumption that it would be the same as being directly above the southern exit portal.

Response

The location of the ventilation offtake connecting the southbound main alignment tunnel to the southern ventilation outlet is detailed in **Section 4.2** and **Figure 4-1** of this report.

The assessment undertaken as part of the environmental impact statement have been undertaken based on the ventilation design of the preferred tenderer. The ventilation system includes a connection between the southbound main alignment tunnel and the southern ventilation facility.

The location of the ventilation connection between the project tunnels and the southern ventilation facility does not affect the assumptions, methodology or conclusions of the air quality impact assessment conducted for the NorthConnex project and included in the environmental impact statement.

Notwithstanding, it is recognised that this issue is of interest to some community members. As such, this information has been added to the project website (www.northconnex.com.au) and was included within the presentation to the community and stakeholders at the air quality forum on 29 July 2014.

Issue description

NorthConnex will be longitudinally ventilated – which makes it more difficult to manage, capture and disperse polluted air effectively (in comparison to a transverse ventilated tunnel).

Response

The longitudinal ventilation system provides an effective and efficient ventilation system for the project. By placing the ventilation offtakes as close to the portal as practical, air from within the tunnels is easily managed and captured for release and dispersion through the two ventilation outlets.

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project in its current form would effectively disperse air from the ventilation outlets and would meet ambient air quality criteria.

Further details on the operation of the ventilation system are provided in Section 5.2.5 of the environmental impact statement.

Issue description

The tunnel is highly likely to become congested frequently, despite this the cheapest and least effective ventilation system has been selected. It is designed on false principles, such as the piston effect which does not work significantly in road tunnels, it is for rail tunnels. How can the piston effect function with so much space around the vehicles.

The piston effect will be inadequate when the tunnel is three lanes. The proposed tunnel design and ventilation systems including the effectiveness of the 'piston effect' should be independently reviewed by competent engineers outside of NSW.

Response

Detailed and robust traffic predictions have been undertaken as part of the environmental impact statement. These show that the tunnels are not anticipated to be congested at any time. The forecast performance of the main alignment tunnels is provided in Table 7-26 of the environmental impact statement. This table shows that the main alignment tunnels would operate with a level of service ranging from A to C. This indicates that the main alignment tunnels would operate as free flowing traffic with spare capacity.

In the unlikely event that congestion does occur, the project includes traffic management measures which would be implemented when vehicle speeds drop below 40 kilometres per hour. This would effectively limit the volume of vehicles entering the tunnels to prevent significant congestion from occurring.

The piston effect is caused by moving vehicles entering a tunnel. This effect occurs whether the vehicle is a train, car, truck or any other vehicle type. The ventilation system design for NorthConnex is highly effective and highly efficient.

Height of ventilation outlets

Issue description

Consideration should be given to raising the height of the northern outlet. Submissions include:

- The presence of the northern ventilation outlet in a valley will detract from the height of the outlet. The height should be increased to at least 70 metres to enable effective dispersion. Suggest the outlet should be 100 metres tall.
- The Cross City Tunnel outlet is much higher at 65 metres and would not have the same high concentration of large goods vehicles.
- Outlet height is unacceptable, it should be higher and take into account wind patterns in the area.
- The effectiveness of the northern ventilation outlet in terms of dispersion as it is only 25 metres high. Need for morning fog, valley terrain and wind conditions to be considered.
- Ventilation outlet should be as high as possible so ground level concentrations are as low as possible.

Response

The Cross City Tunnel ventilation outlet is required to be higher as it located within the Sydney CBD. The higher outlet is required in order for effective dispersion to occur outside the wake effect of the numerous tall buildings in the area.

The environmental impact statement includes and assessment of potential changes to air quality around the two ventilation outlets (refer to Section 7.3.1 of the environmental impact statement). The environmental impact statement demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Despite this, consideration has been given to additional feasible and reasonable ventilation system design options. This analysis is provided in **Section 3.2** of this report. Based on this balanced consideration of environmental and land use impacts, engineering feasibility and cost, an increase to the ventilation outlets by five metres has been determined to be feasible and reasonable. As such, the project has been amended to include this increase the height

of the ventilation outlets. A revised assessment of this increased ventilation outlet height is provided in **Section 9.2** of this report.

Issue description

There is no good location for the southern ventilation outlet. The only solution is to make it taller; the current design is too low, particularly during low wind conditions.

Suggest the outlet should be 100 metres tall.

Response

The environmental impact statement includes and assessment of potential changes to air quality around the two ventilation outlets (refer to Section 7.3.1 of the environmental impact statement). The environmental impact statement demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Despite this, consideration has been given to additional feasible and reasonable ventilation system design options. This analysis is provided in **Section 3.2** of this report. Based on this balanced consideration of environmental and land use impacts, engineering feasibility and cost, an increase to the ventilation outlets by five metres has been determined to be feasible and reasonable. As such, the project has been amended to include this increase the height of the ventilation outlets. A revised assessment of this increased ventilation outlet height is provided in **Section 9.2** of this report.

Issue description

The proposed ventilation outlets are too low to disperse emissions. Making the southern ventilation outlet considerably higher than the proposed design would improve projected emissions statistics. There are no restrictions on the building height associated with aircraft and aviation hazards.

Much is made of the intention to discharge the polluted air through the outlet at 13 to 19 metres per second. Given that the outlet is only 15 metres above Pennant Hills Road, a simple calculation indicates that the particles will be ejected to a height of between 23 metres and 33 metres above Pennant Hills Road. That will only be sufficient for them to be dispersed by prevailing winds if there is wind and it is strong enough. For instance, the weather history graph showing the wind speed and direction at West Pennant Hills measured on 24 August 2014 indicated that there was no wind until 9 am and what wind there was, came from the west. Wind speeds of less than two metres per second (ie about eight kilometres per hour) are not considered sufficient to disperse pollution from the outlet. Only a very few gusts on this day were in excess of eight kilometres per hour.

Response

The environmental impact statement includes and assessment of potential changes to air quality around the two ventilation outlets (refer to Section 7.3.1 of the environmental impact statement). The environmental impact statement demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health.

Despite this, consideration has been given to additional feasible and reasonable ventilation system design options. This analysis is provided in **Section 3.2** of this report. Based on this balanced consideration of environmental and land use impacts, engineering feasibility and cost, an increase to the ventilation outlets by five metres has been determined to be feasible and reasonable. As such, the project has been amended to include this increase the height

of the ventilation outlets. A revised assessment of this increased ventilation outlet height is provided in **Section 9.2** of this report.

The height the plume would travel when it exits the outlets is based on a number of factors, of which the exit velocity is just one. Other factors include the temperature of the plume and the meteorological conditions which impacts the buoyancy of the plume.

Air quality forum

Issue description

Insufficient information provided at the Hornsby air quality forum regarding ventilation and pollutants.

Response

The air quality presentation provided factual information from the air quality and human health risk assessments undertaken as part of the environmental impact statement. Further, the forum provided an opportunity for residents to ask questions to a panel of key project personnel and technical specialists.

The air quality forum was not intended to provide a detailed presentation of all air quality and human health material already provided in the environmental impact statement. Instead, its aim has been to provide a high level summary of the outcomes of the air quality and human health risk assessments in the environmental impact statement, in a form that would be readily accessible to the community and stakeholder. The additional community and stakeholder information mechanisms outlined in Section 6 of the environmental impact statement remain in place for community members and stakeholders to access information on the project, including a project email address, telephone number and website.

8.11.3 Impacts around the northern ventilation outlet

One hundred and sixty four submissions raised issues regarding the air quality impacts around the northern ventilation outlet

Issue description

Submissions queried how excessive pollution from congested traffic on the M1 Pacific Motorway will be managed.

Response

The air quality impact assessment includes consideration of congested traffic conditions within the project tunnels.

The air quality impact assessment has taken into account the air quality implications of traffic conditions directly related to operation of the project (both within the tunnel and the surrounding local road network). This does not include the ongoing operation of the M1 Pacific Motorway beyond the direct, local influence of the NorthConnex project.

The traffic impact assessment does, however, consider the potential broader implications of the project on the road network. In relation to the M1 Pacific Motorway Tables 7-30 and 7-31 provide a mid-block performance assessment between the Ku-ring-gai Interchange and the Windy Banks Interchange. This assessment shows that the NorthConnex project would not result in any change in traffic performance of the M1 Pacific Motorway.

The project would be managed to prevent the escalation of congestion within the tunnel to a point that may result in significant queuing onto surface roads, including the M1 Pacific Motorway.

Issue description

Submissions raised concerns regarding impacts around the northern ventilation outlet from the ventilation facility, issues include:

- Impact of fallout from an exhaust outlet emitting nine kilometres of vehicle pollution into the local community at Wahroonga.
- Deterioration in air quality will occur in Wahroonga.
- Traffic going uphill towards the northern portal exit will release four to five times more exhaust pollution than is there was no gradient.
- Introduction of additional pollutants and heat to the surrounding area which include schools, aged care facilities and a hospital.
- Impacts will include dirty houses, health impacts and odour.
- Residents will not want to go outside when the wind is blowing in their direction.

Response

An air quality assessment was carried out as part of the environmental impact statement (refer to Section 7.3 and Appendix G of the environmental impact statement). This assessment comprised a range of scenarios including the forecast traffic flows, a breakdown scenario within the tunnels and an analysis of the theoretical maximum design capacity of the tunnels.

The assessment found that, under all these scenarios, the project would contribute a small amount of pollutants to the local air shed when compared to the applicable impact assessment criteria and the existing background levels.

There are no known odour issues with other road tunnel ventilation systems and the types of emissions from the ventilation outlets would be unlikely to contribute to or result in odour impacts. As such, consideration of odour was not required by the Director-General's environmental assessment requirements issued by the then Department of Planning and Infrastructure (now the Department of Planning and Environment).

Issue description

The spread of adverse emissions in the vicinity of the northern outlet compares unfavourably with the smaller area at the southern end.

Response

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project in its current form would meet NSW ambient air quality criteria and would pose a very low risk to human health. The differences in the shape and distribution of the plume are related to localised differences between the two locations such as topography and prevailing wind directions.

Issue description

The eventual increase in traffic flows will increase pollution in Wahroonga.

Response

An air quality assessment was carried out as part of the environmental impact statement (refer to Section 7.3 and Appendix G of the environmental impact statement). This assessment comprised a range of scenarios including the forecast traffic flows, a breakdown

scenario within the tunnels and an analysis of the theoretical maximum design capacity of the tunnels. The assessment takes into account expected increases in traffic volumes into the future, and also considers a scenario during which the project reaches its theoretical maximum capacity. This approach ensures that potential future air quality impacts are fully accommodated in the environmental impact statement.

The assessment found that, under all these scenarios, the project would contribute a small amount of pollutants to the local air shed when compared to the applicable impact assessment criteria and the existing background levels.

Issue description

For NO_2 it is assumed the current background level is 20 $\mu g/m^3$. The maximum from the project will be around 70 $\mu g/m^3$. The environmental impact statement states this isn't an impact as its only 30 per cent of the New South Wales ambient NO_2 criterion. It is in fact a 450 per cent increase

Response

The background level of NO_2 of 20 $\mu g/m^3$ is not correct. The background levels of NO_2 can be derived from Table 7-97 of the environmental impact statement for predicted worst-case modelling results.

In relation to the annual average, the peak cumulative concentration of NO_2 ranges from 38.7 $\mu g/m^3$ to 42.8 $\mu g/m^3$ and the peak project contribution from 1.2 $\mu g/m^3$ to 1.7 $\mu g/m^3$. The background levels would be in the order of 37 $\mu g/m^3$ to 41 $\mu g/m^3$.

The peak contribution of NO_2 as a percentage of the criterion is 30 per cent for the one hour maximum and 2.7 per cent of the annual average. As an annual average, the largest increase in NO_2 over the background concentration is around 4.2 per cent.

Issue description

Concern regarding emergency accidents in the tunnel, such as fire and chemical leaks, the effects of which will be ventilated through the northern ventilation facility.

Response

The environmental impact statement assesses the potential impacts of the NorthConnex project for a series of credible construction and operational scenarios. A reasonable level of conservatism has been applied to these scenarios to allow for flexibility in the implementation of the project, and to give regulatory authorities, the community and other stakeholders confidence in the veracity and robustness of the relevant environmental impact assessments.

Section 2.7.2 of this report provides further discussion of tunnel incidents that may lead to emergency emissions from the project tunnels (principally fire related incidents). The discussion demonstrates that a combination of a very low probability of such events, and the design of the project to minimise potential consequences, would result in a very low risk of significant impacts to the surrounding environment and communities in the unlikely event of a tunnel incident.

The environmental impact statement does not present a detailed, quantitative assessment of scenarios including force majeure events, very low risk (ie very low likelihood and/ or very low consequence) incidents or other outcomes that are either not realistically or credibly foreseeable during the normal operation of the project. This is consistent with the approach take for the assessment of other major infrastructure and developments in New South Wales, including major surface road and tunnel projects, rail infrastructure, ports and

airports. These types of developments consider the risk of an emergency or unexpected event occurring (such as a major road crash, a train derailment, or an aircraft crash), but do not provide a detailed, quantified assessment of the potential environmental impacts of such an event occurring. Instead, the focus in these cases is ensuring that feasible and reasonable measures are applied to the particular development to minimise the likelihood and the consequence of emergency events.

Issue description

Contrary to the claims of the environmental impact statement, the pollution from the outlet can, at times run close to the ground and at other times be swept into the community.

Response

An air quality assessment has been carried out as part of the environmental impact statement (refer to Section 7.3 of the environmental impact statement). The air quality assessment considered a range of meteorological conditions and traffic flows over a three year period. The assessment presents the maximum ground level concentrations at the maximum affected receiver.

The assessment found that, under all these scenarios, the project would have a small impact on the local air shed when compared to the applicable impact assessment criteria and the existing background air quality.

8.11.4 Impacts around the southern ventilation outlet

One hundred submissions raised issues regarding the air quality impacts around the southern ventilation outlet.

Issue description

Local air quality impacts as a result of the location of the southern ventilation outlet. Impacts will include dirty houses, health impacts and odours.

Response

An air quality assessment has been carried out as part of the environmental impact statement (refer to Section 7.3 of the environmental impact statement). This assessment included a range of scenarios including the forecast traffic flows, a breakdown scenario within the tunnels and an analysis of the theoretical maximum design capacity of the tunnels.

The assessment found that, under all these scenarios, the project would have a small impact on the local air shed when compared to the applicable impact assessment criteria and the existing background air quality.

There are no known odour issues with other road tunnel ventilation systems and the types of emissions from the ventilation outlets would be unlikely to contribute to or result in odour impacts. As such, consideration of odour was not required by the Director-General's environmental assessment requirements issued by the then Department of Planning and Infrastructure (now the Department of Planning and Environment).

8.11.5 Tunnel support facilities

Sixteen submissions raised issues regarding the tunnel support facilities.

Issue description

Concerned regarding pollution from living next to the Wilson Road and the Trelawney Street tunnel support facilities.

Request a guarantee that the emergency smoke extraction outlets are for emergency use only and will not for vehicle exhaust fumes at any point in the future.

Request to be notified prior to use of the tunnel support facilities to extract smoke.

Response

The environmental impact statement assesses the potential impacts of the NorthConnex project for a series of credible construction and operational scenarios. A reasonable level of conservatism has been applied to these scenarios to allow for flexibility in the implementation of the project, and to give regulatory authorities, the community and other stakeholders confidence in the veracity and robustness of the relevant environmental impact assessments.

Section 2.7.2 of this report provides further discussion of tunnel incidents that may lead to emergency emissions from the project tunnels (principally fire related incidents). The discussion demonstrates that a combination of a very low probability of such events, and the design of the project to minimise potential consequences, would result in a very low risk of significant impacts to the surrounding environment and communities in the unlikely event of a tunnel incident.

The environmental impact statement does not present a detailed, quantitative assessment of scenarios including force majeure events, very low risk (ie very low likelihood and/ or very low consequence) incidents or other outcomes that are either not realistically or credibly foreseeable during the normal operation of the project. This is consistent with the approach take for the assessment of other major infrastructure and developments in New South Wales, including major surface road and tunnel projects, rail infrastructure, ports and airports. These types of developments consider the risk of an emergency or unexpected event occurring (such as a major road crash, a train derailment, or an aircraft crash), but do not provide a detailed, quantified assessment of the potential environmental impacts of such an event occurring. Instead, the focus in these cases is ensuring that feasible and reasonable measures are applied to the particular development to minimise the likelihood and the consequence of emergency events.

There are no plans to use the emergency smoke extraction facilities for any other function other than that described in the environmental impact statement.

Issue description

Two emergency smoke extraction facilities for a nine kilometre tunnel is negligence.

Response

The location and design of the emergency smoke extraction points has been undertaken in consultation with Fire and Rescue NSW.

The project has been designed in accordance with the following standards:

- Australian Standard AS4825 – Tunnel fire safety.
- National Fire Protection Association (NFPA) 502 - Standard for Road Tunnels, Bridges and Other Limited Access Highways.
- Permanent International Association of Road Congress (PIARC) including:
  - Systems and equipment for fire and smoke control in road tunnels, 2007.
  - Road tunnels: Vehicle emissions and air demand for ventilation, 2012.
  - Fire and Smoke Control in Road Tunnels, 1999.
  - Operational Strategies for Emergency Ventilation, 2008.

8.11.6 In-tunnel air quality

Three hundred and ninety nine submissions raised issues regarding the in-tunnel air quality.

Issue description

As each vehicle proceeds through the tunnel at 80 kilometres per hour the piston (or vacuum) effect continues to mix the in-tunnel air with any freshness gradually deteriorating until nearing nine kilometres in the air quality will be extremely toxic.

Lack of ventilation within the tunnel will lead to dangerous levels of pollutants in the confined space in peak hour or times of traffic congestion.

In-tunnel air quality will be an occupational hazard for truck drivers who are forced to use the tunnel.

The in-tunnel levels of pollution should be recalculated taking into account the velocity of air moving the emissions through the tunnel assuming fans alone are not effective.

Response

The Permanent International Association of Road Congress (2012) defines a 'clear air tunnel' as having a visibility of $0.003m^{-1}$ measured as an extinction coefficient.

The air quality impact assessment in Section 7.3 and Appendix G of the environmental impact statement provides an assessment of in-tunnel air quality. As expected, this shows that the air quality gradually deteriorates with distance through the tunnels.

The assessment shows that, under the likely traffic flow scenario and using the NSW traffic fleet, the extinction coefficient in 2029 is calculated to be $0.0014m^{-1}$ in the both the southbound and northbound tunnels at around nine kilometres into the tunnels during the respective peak periods. As such, the NorthConnex project would be considered a 'clear air tunnel' based on international guidance documents.

The human health risk assessment provided in Section 7.4 of Appendix H of the environmental impact statement provides an assessment of potential in-tunnel exposures to pollutants by comparing potential exposures to other tunnels around the world and to adopted standards from around the world where they are available. The assessments found that the predicted concentrations are lower than or comparable to other tunnels around the world, and below guidelines available for the United States and parts of Europe.

Further discussion and analysis of in-tunnel air quality, including potential in-tunnel exposures, is provided in response to the submission received from NSW Health (refer to **Section 7.1.2.3** of this report.

Issue description

Concern about the air quality within the tunnel, which is shown in the environmental impact statement to have exceedences above standards for pollutants such as NO_2, and haze from particulate matter at the ends of the tunnel. The grade of the tunnel has resulted in poor in-tunnel air quality and should be minimised.

Tunnel design should not be based on carbon monoxide levels alone and should include the development of a health-based exposure limit for nitrogen dioxide and particulate matter (particularly $PM_{2.5}$ and PM_1).

Response

No criteria or standards are available in relation to short term exposures to pollutants which would be applicable to in-tunnel air quality. Design criteria for in-tunnel air quality have been based on recommendations from international bodies including the World Health Organisation and the Permanent International Association of Road Congress.

For the NorthConnex project, the aim has been to take on board the learnings from the M5 East Motorway tunnel and mitigate emissions through improved tunnel design. This has included a flatter tunnel gradient.

In-tunnel air quality is considered in Section 7.3.4 of the environmental impact statement and the associated potential human health impacts in Section 7.4.5.

This assessment identified that:

- In relation to visibility, the NorthConnex tunnel would be considered a ‘clear air tunnel’ according the Permanent International Association of Road Congress (2012).
- In-tunnel concentrations of nitrogen dioxide are consistent with other tunnels in Sydney and around the world and are below the limits adopted in other countries including Norway, Belgium and France.
- In-tunnel concentrations of particulate matter ($PM_{2.5}$) are consistent with other tunnels in Sydney and around the world.

The human health risk assessment provided in Section 7.4 of Appendix H of the environmental impact statement provides an assessment of potential in-tunnel exposures to pollutants by comparing potential exposures to other tunnels around the world and to adopted standards from around the world where they are available. The assessments found that the predicted concentrations are lower than or comparable to other tunnels around the world, and below guidelines available for the United States and parts of Europe.

Issue description

Emissions on Pennant Hills Road may be the same as in the tunnel, but in the tunnel they will be more concentrated, having no air current to disperse them.

Response

In-tunnel vehicle emissions are predicted to be less than the current emissions on Pennant Hills Road as the project would provide improved travel times, reduced gradients, and a free flowing road as opposed to the stop / start nature of travelling along Pennant Hills Road. In-tunnel air currents are formed from the piston effect of vehicles travelling through the tunnels and supplemented by jet fans as required.

In-tunnel air quality is considered in Section 7.3.4 of the environmental impact statement and the associated potential human health impacts in Section 7.4.5.

This assessment identified that:

- In relation to visibility, the NorthConnex tunnel would be considered a 'clear air tunnel' according the Permanent International Association of Road Congress (2012).
- In-tunnel concentrations of nitrogen dioxide are consistent with other tunnels in Sydney and around the world and are below the limits adopted in other countries including Norway, Belgium and France.
- In-tunnel concentrations of particulate matter ($PM_{2.5}$) are consistent with other tunnels in Sydney and around the world.

The human health risk assessment provided in Section 7.4 of Appendix H of the environmental impact statement provides an assessment of potential in-tunnel exposures to pollutants by comparing potential exposures to other tunnels around the world and to adopted standards from around the world where they are available. The assessments found that the predicted concentrations are lower than or comparable to other tunnels around the world, and below guidelines available for the United States and parts of Europe.

Issue description

How effective are jet fans when there is a fire?

Response

The ventilation and fire suppression systems have been design to effectively manage a fire incident in the tunnels. In the event of a significant incident in the tunnels, the longitudinal ventilation system would direct smoke in the direction of traffic flow from the fire source towards an emergency smoke extraction point or tunnel portal.

Further details regarding the management of incidents in the tunnels is provided in Section 8.2.1 of the environmental impact statement and in **Section 2.7.2** of this report.

Issue description

Figures for maximum concentrations of PM_{10} emissions at the tunnel end are significantly higher than those recorded in the M5 East Motorway tunnel outlet between February and June 2014.

Figures provided in text in the environmental impact statement document in Appendix G – Air Quality – 3, are different to those provided in in Table 7-101 of the environmental impact statement.

Response

Figure 7-31 of the environmental impact statement provides a comparison between predicted in-tunnel air quality in the NorthConnex tunnels and measured in-tunnel air quality in the M5 East motorway tunnels. This shows that, using PIARC emissions factors, in-tunnel particulate matter would be higher in the NorthConnex tunnels than the M5 East Motorway tunnels. However, using the more realistic Environment Protection Authority emissions factors which are based on NSW fleet, the in-tunnel particulate matter would be better in the NorthConnex tunnels than the M5 East Motorway tunnels.

Table 7-101 presents the results of in-tunnel air quality for the forecast traffic flow scenarios in 2019 and 2029. Appendix G of the Technical Working Paper: Air Quality provides results for design analysis A and design analysis B. These are fundamentally different traffic scenarios and cannot be compared.

8.11.7 Air quality improvements along Pennant Hills Road

Fifty seven submissions raised issues regarding the air quality improvements along Pennant Hills Road.

Issue description

The reduction in vehicles along Pennant Hills Road will substantially improve air quality for the community living along Pennant Hills Road.

Response

Comments relating to air quality improvements along Pennant Hills Road are noted.

8.11.8 Air quality monitoring

Four hundred and sixty seven submissions raised issues regarding air quality monitoring.

Issue description

Concerns that long-term air quality monitoring will not occur. There is no proposal to monitor $PM_{2.5}$ before, during or after the construction or operation of the tunnel.

All particles up to 0.001 micron in size should be monitored. Ultrafine particles must be monitored.

A comprehensive air quality monitoring program needs to be developed and implemented. Long-term monitoring is required to allow data to be collected to verify the claim that air quality will not be significantly affected. Data needs to be made public to ensure credibility.

Air quality should be monitored independently throughout the life of the project around the tunnel exit portals and a radius of around one kilometre must be undertaken for the life of the tunnels, to ensure that the air quality remains of the highest standard. This will guarantee that the long term health effects of the tunnel can be appropriately assessed.. Otherwise, how will we know if fans are being used properly? They are expensive to run and might be run at low speed or switched off to save money.

The location of the monitoring stations should be provided.

Air Quality should be measured in Lamorna Avenue as this will be one of the most affected areas.

This should also include indoor air quality for those living within 500 metres of the outlet (including schools, day care centres and aged car facilities).

Air quality monitoring would be cheaper if set up on Roads and Maritime land at both interchanges and at the two emergency facilities at Wilson Road and Trelawney Street. The system could be easily automated and therefore ongoing if on Roads and Maritime land.

The NHMRC report is clear that there are serious deficiencies in the sort of monitoring that is carried out around outlets.

No clear evidence exists to show that monitoring to assess compliance, especially for PM_{10} can reliably predict the size, nature and course of adverse health impacts.

Not convinced that long-term monitoring of PM_{10} is useful for the purposes of managing the impact on a community of a road tunnel alone, as opposed to the road network in general.

A cap should be placed on the maximum acceptable level of exposure to all measured pollutants and penalties enforced if they are not met.

Continuous in-tunnel air monitoring is needed.

There needs to be a clear plan of what measures would be implemented if the monitoring indicates that the air quality in the tunnel falls below standards.

The environmental impact statement states that there will be extended periods of monitoring after the construction is completed which would be carried out by an "independent" provider. This needs to be backed up by:

- "Pre-project' monitoring of toxic exhaust gas levels, particulate matter levels, and prevailing weather conditions at many locations particularly those residential areas close to the tunnel portals and ventilation outlets determining the pre-existing conditions 'before the tunnel" as compared to those after the construction period for the local residents.
- The same monitoring should be carried out after the construction completion, again by independent providers
- The results should be made available for review both by the public and also by a range of monitoring companies to enable an unbiased opinion as to the results (ie not NorthConnex appointed).
- There needs to be a better testing regime sourced to enable the testing for the smaller sized particulate matter (those found to be most injurious to health), currently difficult to monitor, to ensure that the true effects from the ventilation outlets is being measured correctly and again relevant to prevailing weather conditions.
- Contractual obligations for NorthConnex to not only find solutions but to implement them to both improve any adverse comparative results but to also improve all of the above-mentioned impacts on local residents. It has been comprehensively proven that no level of diesel fumes is safe for human consumption let alone prolonged exposure, despite what the local air quality standards might state.

Response

Air quality monitoring during operation will be conducted to meet the requirements of the conditions of approval that may be applied to the project by the Minister for Planning. These conditions may specify the timing, duration and extent of the air quality monitoring required for the project.

Air quality monitoring during the initial phase after commencement of operation is intended to verify and validate the air quality modelling conducted for the project. By demonstrating that actual air quality is equal to or better than predicted by the air dispersion modelling, then confidence can be gained that predictions made by the modelling into the future are also robust. A period of twelve months of monitoring is proposed within the environmental impact statement because this would provide a whole year of seasonal variations in weather patterns. For the same reasons, and as the air quality modelling predicts outdoor ground level concentrations, monitoring of indoor air is not considered appropriate.

In-tunnel air quality monitoring would be carried out on a continuous basis during operation.

The form of measures to be implemented in the event that air quality limits are exceeded would be dependent on the nature of the exceedances (eg which pollutants are exceeded and if the exceedance is in-tunnel or ambient air quality). At this stage, it is not possible to speculate what form these measures may take.

Issue description

A local benchmark should be established for appropriate monitoring.

Residents of Wahroonga and Hornsby should be provided with the following information so that they can compare a baseline of current air quality with the project's projected air quality impacts:

- 2012/2013 asthma data.
- 2012/2013 lung cancer register data.
- 2012/2013 COPD data.
- AQI data (including $PM_{2.5}$ and $PM_{0.1}$) collected at the proposed sites for the portals and within one kilometre and two kilometres of the ventilation facility.

Response

Air quality monitoring during operation would be conducted to meet the requirements of the conditions of approval that may be applied to the project by the Minister for Planning. These conditions may specify the timing, duration and extent of the air quality monitoring required for the project.

Where available, relevant health authorities publish information and statistics on important health issues, including relation to asthma and respiratory disease.

Air quality monitoring data collected for the project will be made publicly available.

Issue description

Measurement of particles cannot effectively determine whether ambient air pollution is from surface roads or from a ventilation outlet.

Response

It is correct that ambient air quality monitoring cannot readily differentiate between emissions from the NorthConnex project and from other sources, including surface roads.

Air quality monitoring will be continued prior to and during operation of the NorthConnex project. The air quality monitoring conducted before operation of the project will be used as a baseline, against which to assessment the operational impacts of the project. This will be

achieved by comparing air quality monitoring data before and during operation, to identify any change in air quality.

Issue description

All portals require ongoing continuous monitoring, at exposure-relevant locations to ensure zero portal emissions.

Monitoring should be undertaken within 10 to 30 metres of the portal to ensure no portal emissions. This should take place indefinitely.

Response

Portal emissions are not being sought as part of the current application for approval of the NorthConnex project.

Airflows within in the project tunnels will be monitored to ensure effective management of in-tunnel air quality and efficient operation of the ventilation system. This data would be used to demonstrate that portal emissions are not occurring.

8.11.9 Odour impacts

Ten submissions raised issues regarding odour impacts during operation.

Issue description

The air quality impacts of odours from the water treatment plant have not been assessed. Odour impacts from the water treatment plant need to be clarified.

Response

The potential for odour generation is considered in Section 7.3.4 of the environmental impact statement.

The water treatment plant designed to treat groundwater from the project tunnels is aimed at removing dissolved metals and other anions/ cations dissolved in the groundwater through its exposure to rock. The water treatment plant is not a biological treatment process, such as typically involved in sewage treatment plants.

The nature of any odours would depend on the degree and type of any contamination present in the groundwater. Based on investigation carried out to date, contaminated groundwater is not expected to be encountered. Strong or unpleasant odour is not predicted.

Management measures would be developed to address any odours should contamination be encountered and if odours arise. This would include identification of odours, identification of the extent to which the odours are detectable, and, if necessary, mitigation measures to reduce any odours affecting sensitive receivers. Such mitigation measures could include modifications to the operating process, or the installation of carbon filters to capture odorous compounds before they are emitted.

8.11.10 Impacts from surface roads

Seven submissions raised issues regarding the impacts from surface roads.

Issue description

The motorway will run adjacent to our boundary on Coral Tree Drive with substantial increases to traffic flow, resulting in increased pollution.

Increased pollution due to the loss of trees that currently act as a barrier to the Hills M2 Motorway.

Response

An air quality assessment was carried out as part of the environmental impact statement (refer to Section 7.3 and Appendix G of the environmental impact statement). The assessment included modelling of vehicle emissions along major road corridors, including the Hills M2 Motorway adjacent to Coral Tree Drive. Modelled vehicle emissions along major road corridors has been taken into account when determining background concentrations of pollutants as part of the air quality impact assessment.

The additional westbound lane on the Hills M2 Motorway is required in order for the southbound traffic from the NorthConnex tunnel to safely merge with the westbound Hills M2 Motorway traffic. The provision of this lane is not anticipated to change the origin or destination of traffic travelling on the Hills M2 Motorway. The volumes of heavy vehicles travelling westbound along the Hills M2 Motorway in the AM and PM peak periods with and without the project are predicted to be:

- In the 2019 AM peak 270 heavy vehicles with the project and 260 heavy vehicles without the project.
- In the 2019 PM peak 480 vehicles with the project and 450 vehicles without the project.
- In the 2029 AM peak 340 vehicles with the project and 350 vehicles without the project.
- In the 2029 PM peak 500 vehicles with the project and 490 vehicles without the project.

This is a minor change in the anticipated volume of heavy vehicles using this section of the Hills M2 Motorway.

Vegetation has limited if any effect on the concentration, dispersion and distribution of air pollution from vehicle emissions.

Issue description

Increased traffic on the M1 Pacific Motorway near Hewitt Avenue will result in increased air pollution.

Response

The number of vehicles using the M1 Pacific Motorway near Hewitt Avenue is expected to decrease as a large number of vehicles, especially heavy vehicles, would use the NorthConnex tunnels.

The air quality impact assessment presented in Section 7.3 and Appendix G of the environmental impact statement has included changes in air emissions along major road corridors, including the M1 Pacific Motorway near the project.

Issue description

The northbound tunnel on-ramp from the Hills M2 Motorway would only be separated from houses on Gum Grove Place by a noise wall and would be impacted by pollution emissions from thousands of truck movements that would take place every night.

Response

An air quality assessment was carried out as part of the environmental impact statement (refer to Section 7.3 and Appendix G of the environmental impact statement). The assessment included modelling of vehicle emissions along major road corridors, including the Hills M2 Motorway. Modelled vehicle emissions along major road corridors has been taken into account when determining background concentrations of pollutants as part of the air quality impact assessment.

The volumes of heavy vehicles travelling eastbound along the Hills M2 Motorway in the AM and PM peak periods with and without the project are predicted to be:

- In the 2019 AM peak 460 heavy vehicles with the project and 480 heavy vehicles without the project.
- In the 2019 PM peak 350 vehicles with the project and 290 vehicles without the project.
- In the 2029 AM peak 470 vehicles with the project and 570 vehicles without the project.
- In the 2029 PM peak 470 vehicles with the project and 360 vehicles without the project.

This is a minor change in the anticipated volume of heavy vehicles using this section of the Hills M2 Motorway.

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8.12 Health

8.12.1 Assessment methodology

Four hundred and sixty eight submissions raised issues regarding the health assessment methodology.

Issue description

Significant gaps in this environmental impact statement regarding the health impacts to local residents, particularly regarding Cowie study by the Woolcock Institute showing an increase in respiratory problems of residents near the Lane Cove Tunnel ventilation facilities and the need to measure PM_1.

NorthConnex claims that some ventilation outlets in Australia are very close to residential areas and pose no health risks, however adequate data based on continuous monitoring is not provided to support this. Nor is information regarding the differences in designs and emission volumes of various outlets compared to the proposed design provided.

The community should be provided with the baseline incidence rates for certain health effects.

Response

The human health risk assessment presented in the environmental impact statement has been carried out in accordance with the Director-General's environmental assessment requirements.

It is important that the health outcomes examined as part of the assessment are those where robust correlations exist between the health outcome and the pollutant of concern. The health outcomes examined within the environmental impact statement have been developed based on these robust correlations and in consultation with NSW Health.

When assessing health impacts from fine particulates, the robust associations of effects have been determined on the basis of $PM_{2.5}$, as $PM_{2.5}$ is what is commonly measured in urban air. No robust associations (that can be used in a quantitative assessment) are available for PM_1, although the associations developed for $PM_{2.5}$ will include a significant contribution from PM_1. Hence, health effects observed for PM_1 will be captured in the studies that have been conducted on the basis of $PM_{2.5}$.

The relative incremental increases of the health effects examined are based on the current incidence rates. The baseline incidence rates are documented on Section 7.4 and Appendix H of the environmental impact statement.

The Woolcock Report recently undertaken to investigate the effect of tunnel emissions from the Lane Cove Tunnel on respiratory health found that tunnel emissions had minimal impact on the respiratory heath of residents living near the ventilation outlets and in the surrounding areas. NSW Health's independent Air Pollution Expert Advisory Committee has reviewed the findings of this study and has advised that no changes to the operation or management of the tunnel are needed and no further health studies are required at this time.

Further details regarding the assessment of particulate matter are provided in Section 7.4.3 of the environmental impact statement.

Issue description

The air quality modelling provided particulate matter in µg/m^3 and attempts to compare to health standards quoted in ppm. This is not helpful.

Response

The human health risk assessment generally provides pollutant concentrations in µg/m_3 for comparison against relevant impact assessment criteria. Where ppm units have been used in the air quality assessment or the human health risk assessment the conversion of mg/m^3 or µg/m^3 has been provided.

Issue description

Submissions raised concerns relating to health data, modelling, monitoring and assessment. Key aspects include:

- The health modelling is flawed. Recommendation for the human health impact assessment to be revised and reviewed by an independent body or and independent health study be undertaken.
- As the epidemiological data is complex, and interactions between particulates and other compounds emitted are unknown, it is incorrect to conclude as stated in the environmental impact statement that there are negligible health impacts from such a long tunnel. The problems associated with the exposure to emissions from the placement of outlets and portals in residential areas should be considered now, and rectified to ensure harm minimisation.
- The Federal and State governments must comply with their duty of care and properly investigate the adverse health effects of tunnel emissions.
- No clear evidence exists to show that monitoring such as that carried out to assess compliance with air-quality goals, especially for PM_{10}, can reliably predict the size, nature and course of adverse health impacts."
- It is not explained how $PM_{2.5}$ and smaller particles have been taken into account.
- Birth defects have been shown at level of polycyclic aromatic hydrocarbons at levels much lower than the project, but the environmental impact statement say there is no effect. Additionally, there are no safe levels of benzene.
- There should be due and proper resolution of the expression of concern by medical practitioners and associations.
- Health assessment is based on inadequate and flawed air quality data. Health assessment needs to be re-done in consideration of the polluted air intake from the portals.
- The health assessment should include the worst-case scenario.
- The project should be considered unsafe until proven safe.
- The health assessment should use Australian exposure-response relationships.
- It is impossible to arrive at a hazard index for polycyclic aromatic hydrocarbons without knowing the limits set by the conditions of approval.

Response

The human health risk assessment presented in the environmental impact statement has been carried out in accordance with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012). The human health risk assessment undertaken for the NorthConnex project is the most comprehensive human health risk assessment undertaken for a road tunnel project in Australia.

In accordance with this guideline, the health outcomes examined as part of the assessment are those where robust correlations exist between the health outcome and the pollutant of concern. The health outcomes examined within the environmental impact statement have been developed based on these robust correlations and in consultation with NSW Health. Using studies from other countries such as USA and various countries in Europe provides much more robust understanding of the exposure-response relationships between air pollutants and health effects.

When assessing health impacts from fine particulates, the robust associations of effects have been determined on the basis of $PM_{2.5}$, as $PM_{2.5}$ is what is commonly measured in urban air. No robust associations (that can be used in a quantitative assessment) are available for PM_1, although the associations developed for $PM_{2.5}$ will include a significant contribution from PM_1. Hence, health effects observed for PM_1 will be captured in the studies that have been conducted on the basis of $PM_{2.5}$.

The hazard index for polycyclic aromatic hydrocarbons provided in the environmental impact statement has been determined based on the forecast traffic flows and mix of vehicles. The calculation of this is not dependent on the limits set by the conditions of approval.

Section 2.9 of this report includes an analysis of the potential changes in air quality impacts taking into account pollution levels in air drawn into the tunnel entry portals. This analysis shows that with inclusion of ambient pollution drawn into the main alignment tunnels via the entry portals, the predicted ground level concentrations of relevant pollutants increase by a negligible amount compared with the modelling outcomes presented in the environmental impact statement. When compared with relevant ambient air quality criteria and advisory reporting standards, the predicted impacts of the NorthConnex project remain very low at the most affected locations. As such, this would not affect the findings of the human health risk assessment.

Consideration of worst-case health impacts is provided in the response to the submission by NSW Health in **Section 7.1.2.2** of this report.

Issue description

The proponents don't appear to have made any effort to do a realistic analysis of the possible impacts to the health of residents in the vicinity of the ventilation outlets and portals.

The health risk assessment found "the health risk due to emissions from motorway outlets would be very low" – on what research of 'world best practice' or 'international standard' was this statement based?

Response

The environmental impact statement provides a human health risk assessment in Section 7.4 and Appendix H. This assessment has been undertaken in accordance with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012).

This human health risk assessment focused on the potential impacts around the two ventilation outlets. The project does not propose emissions from the portals. As such, this is not a potential source of air quality impacts and was therefore not required to be considered in the human health risk assessment.

In accordance with this guideline, the health outcomes examined as part of the assessment are those where robust correlations exist between the health outcome and the pollutant of

concern. The health outcomes examined within the environmental impact statement have been developed based on these robust correlations and in consultation with NSW Health.

Issue description

The full impact on human health from all the components of vehicle emissions is not fully understood. We should not assume that the 'known' toxins are the only sources of harm. This should drive a conservative approach.

Response

The environmental impact statement provides a human health risk assessment in Section 7.4 and Appendix H. This assessment has been undertaken in accordance with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012).

In accordance with this guideline, the health outcomes examined as part of the assessment are those where robust correlations exist between the health outcome and the pollutant of concern. The health outcomes examined within the environmental impact statement have been developed based on these robust correlations and in consultation with NSW Health.

Issue description

There is no understanding of the interactions between air pollutants and their compounded effects. Air pollutants are modified by meteorological factors such as temperature and humidity and by the interactions and mix of pollutants. This can lead to formation of particles of different sizes that are more complex to investigate and were not in the original mix of pollutants. The substantive health costs downstream from multi-system health effects needs to be considered.

Response

Oxides of nitrogen undergo reactions with ozone in the atmosphere, through well-understood atmospheric chemistry associated with the formation of photochemical smog. These reactions have been taken into account in the air dispersion modelling and impact assessment presented in the environmental impact statement.

Carbon monoxide can be involved in many different atmospheric reactions, including having a role in ozone and photochemical smog formation. Carbon monoxide typically eventually oxidises to carbon dioxide in the atmosphere. In the context of the air quality impact assessment for the NorthConnex project, carbon monoxide has been assumed to not react in the atmosphere. This is a conservative approach, noting that carbon monoxide is a more significant air quality and potential human health issue than carbon dioxide.

Under normal atmospheric conditions, volatile organic compounds and polycyclic aromatic hydrocarbons may undergo reactions and/ or degrade to form a series of other hydrocarbon compounds. These reactions are typically complex, and in some cases not well understood. This level of atmospheric chemical complexity has not been taken into account in the air quality impact assessment for the project. Instead, volatile organic compounds and polycyclic aromatic hydrocarbons have been considered in two groups (despite both groups containing several different compounds), and conservatively compared with the most stringent ambient air quality criterion from the compounds in each group. These most stringent ambient air quality criteria relate to benzo[a]pyrene and benzene, for polycyclic aromatic hydrocarbons and volatile organic compounds, respectively.

In the case of particulate matter, it is recognised that under some conditions, particles can combine in the atmosphere to generate coarser particulates. This mechanism has not been

taken into account in the air dispersion modelling. This is a conservative approach, because an important focus of the air quality impact assessment and human health risk assessment presented in the environmental impact statement is fine particulates ($PM_{2.5}$). Any reaction, combination or agglomeration of fine particulates to produce larger particulate matter would generally reduce the concentration of fine particulates, and as a corollary, the key air quality and human health risks considered in the environmental impact statement

Issue description

There is no assessment of the potential impacts from the inhalation of silica rich dust generated from construction.

Response

Section 7.3.4 of the environmental impact statement assesses the potential for dust generation during the construction phase. The assessment of dust has been undertaken in accordance with the Director-General's environmental assessment requirements and at a similar level of details for similar projects.

Tunnelling works are confined to underground areas with little or no openings to the surface. Where surface openings are provided, these are generally covered by acoustic sheds during the construction period. Ventilation equipment at these locations would have dust extraction and filtration systems installed to minimise dust impacts. Additionally, as the road headers would use water for dust suppression while cutting rock, dust generation beyond the tunnel from tunnelling activities is expected to be minimal.

Construction air quality management measures are identified in Section 7.3.5 of the environmental impact statement. These include measures such as:

- Water carts, sprinklers, sprays and dust screens to control dust emissions.
- Modifying construction activities during high or unfavourable wind conditions.

These measures would be in place whenever construction works or vehicle movements are occurring to and from the compounds. Additionally, heavy vehicles transporting spoil from the project would be covered at all times on public road and on the project site when there is a risk of dust generation.

A proactive dust observation program involving daily reviews of weather forecasts, observations of meteorological conditions and on site dust generation. This would inform mitigation measures or alterations to construction activities to be implemented during unfavourable weather conditions.

In the context that the potential for dust impacts are effectively managed by standard environmental mitigation and management measures, there is no justification for the consideration of potential health effects from dust during construction.

Issue description

An independent authority should undertake a full cost analysis of the adverse health effects of polluted air from traffic emissions on human health.

A proper long term cost benefit analysis of the real costs and savings of any tunnel ventilation system should include an assessment of the cost of potential health impacts to the community.

Response

The environmental impact statement provides a human health risk assessment in Section 7.4 and Appendix H. This assessment has been undertaken in accordance with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012).

This assessment found that the theoretical health risks from the project are very low

Issue description

The heath assessment should include scenarios:

- Where NorthConnex cannot be used and all traffic is using Pennant Hills Road.
- Where the tunnel ventilation system is not operational which will result in much higher in-tunnel air pollution and consequently higher ambient air pollution.

Response

NorthConnex would only be fully closed to traffic during maintenance activities or in the event of a significant incident in the tunnel. Maintenance activities are planned events and would be scheduled to occur during periods of low traffic volumes. A major incident in the tunnel would be expected to occur very rarely and would be rapidly responded to in order to re-open the tunnels.

The tunnels are provided with two power connections in order to reduce the potential for complete power outages. Additionally a back-up generator would supply essential loads for up to 30 minutes in the event of both power sources failing. This period would be sufficient for all vehicles and people to be evacuated from the tunnel. In the event vehicles cannot be evacuated they would be directed to switch off their engines which would remove the source of air pollution.

As such, none of these scenarios would credibly result in elevated health impacts within the tunnel or to receivers nearby to the ventilation outlets.

Issue description

The health assessment states that PIARC emission factors are expected to result in conservative emission estimates as a safety margin is added to the PIARC factors to "take a certain proportion of high emitting vehicles into account" (PIARC, 2012) however the health assessment does not explain why this proportion of high emitting vehicles does not exist in Australia.

Pacific Environment Limited (PEL) undertook a peer review of the project emission inventory and concluded the emissions inventory for the project was conservative, in particular for PM_{10} and $PM_{2.5}$ which were twice as high as estimated by using Environment Protection Authority emission factors. However, the peer review of the emissions inventory is not provided with the project health assessment or air quality assessment so it is not possible to verify the statements or emission calculations used by PEL to validate the PIARC derived data used.

Response

Further information regarding the development of the emissions inventory for the project is provided in **Section 2.8** of this report.

Issue description

The calculated risks for the project, based on scenarios 2a (2019) and 2b (2029) only, were considered tolerable, which was defined for the project to be between $1x10^{-6}$ and $1x10^{-4}$ (health assessment, Section 5.4.2).

However the discussion of acceptable risk levels does not:

- Discuss that most of the estimated risk levels are above the relevant NSW Planning Guidelines (2011) - the "Hazardous Industry Planning Advisory Papers" (HIPAPs), HIPAP 4, which states the suggested risk criteria developed for land use safety planning in NSW which for schools and child care facilities is $0.5x10^{-6}$ and for residences is $1x10^{-6}$.
- Discuss the implications associated with the use of the NSW risk criteria and the NorthConnex project.

In addition, the older (2006) NSW document Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales stated acceptance criteria for carcinogenic risk:

- Less than $1x10^{-6}$ is acceptable;
- Greater than $1x10^{-4}$ is not acceptable; and
- Between $1x10^{-6}$ to $1x10^{-4}$ requires the implementation of best practice process design and/or emission controls in order to minimise particulate emissions to the maximum extent achievable.

The Project must meet the NSW Planning HIPAP risk criteria of less than $0.5x10^{-6}$. Project air emissions must be minimised to the maximum extent achievable through the application of best-practice process design and/or emission controls.

Response

The human health risk assessment in Section 7.4 and Appendix H of the environmental impact statement provides a discussion on health risk levels. The assessment has shown that the project would result in a very low risk to human health.

Despite this, consideration has been given to additional feasible and reasonable ventilation system design options. This analysis is provided in **Section 3.2** of this report. Based on this balanced consideration of environmental and land use impacts, engineering feasibility and cost, an increase to the ventilation outlets by five metres has been determined to be feasible and reasonable. As such, the project has been amended to include this increase the height of the ventilation outlets. A revised assessment of this increased ventilation outlet height is provided in **Section 9.2** of this report.

Issue description

In-tunnel polycyclic aromatic hydrocarbon speciation has not been provided. Consequently in-tunnel polycyclic aromatic hydrocarbon concentration estimates cannot be verified.

Response

The methodology followed to calculate in-tunnel concentrations of polycyclic aromatic hydrocarbons (PAHs) is summarised in **Section 2.8** of this report. Polycyclic aromatic hydrocarbon emissions within the project tunnels have been calculated on an aggregate basis (ie total contributions from all polycyclic aromatic hydrocarbons), rather than being calculated as the sum of individual, speciated compounds.

Issue description

The human health impact assessment in relation to construction and operational noise is substandard. This is despite there being detailed noise modelling which estimates noise levels that will be experienced by sensitive receivers. It ignores the large number of highly affected sensitive receivers and assumes that the noise mitigation measures will be entirely successful in mitigating impacts. It also ignores the fact that in many locations existing noise walls will be removed for extended periods, exposing sensitive receivers to both unmitigated construction and traffic noise – and it also does not reflect that many sensitive receivers will be exposed to high levels of construction noise for four plus years.

A revised and comprehensive assessment of human health impacts from prolonged and excessive exposure to high levels of noise should be undertaken.

Response

The environmental impact statement provides a human health risk assessment in Section 7.4 and Appendix H. This assessment has been undertaken in accordance with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012).

The heath assessment of noise impacts identifies potential health outcomes for which there is strong evidence. The assessment states that noise levels which do not comply with the criteria could have negative impacts on human health. Therefore, all feasible and reasonable mitigation measures would be implemented in order to reduce noise levels. This is consistent with the approach taken on other infrastructure project of a similar nature and scale.

8.12.2 Impacts around the northern ventilation outlet

Eighty submissions raised issues regarding the health impacts around the northern ventilation outlet.

Issue description

Health risks to residents from ventilation facility in Wahroonga. Over time, the suburb will become known as a black spot for serious health issues.

Specific concerns raised in relation to children and families, the elderly and pregnant women contributing to underweight babies and congenital heart defects. Specific concerns raised regarding diseases including lung cancer, stroke, asthma, heart disease and poor lung growth in children.

Children are more at risk due to:

- Breathing more per unit body weight and having smaller airway and lungs
- Having different rates of toxification and detoxification
- Vulnerability of developing and growing airways and alveoli.
- Time spent outdoors (specifically Abbotsleigh and Waitara Public School and many day care and retirement homes in Wahroonga, Waitara, Hornsby and Turramurra).
- Increased ventilation with play and exercise.
- High rates of acute respiratory infections.
- Two large hospitals, the San Hospital and Hornsby Hospital, are in close proximity to the ventilation facility, where sick and recovering patients will be inhaling pollutants.

Further issues raised include:

- Reference made to the NH&MRC 2008 report in relation to risk to people living near tunnels or their outlets 'if the presence of the tunnel alters the ongoing quality of the neighbourhood ambient air'.
- Provide assurances to people living within 600 metres of the outlet (including Waitara Public School and Abbotsleigh School). What is the plan if health issues arise?
- Specific risks raised include cardiovascular disease, impaired lung development in children and increased lifetime risk of cancer from particulates and volatile organic compounds (VOCs).

Response

A human health risk assessment has been carried out as part of the environmental impact statement. The assessment was carried out in accordance with the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012). The human health risk assessment includes consideration of potential impacts on the general population, as well as more sensitive receivers such as children, the elderly and people with existing respiratory issues.

The assessment initially undertook a screening assessment to determine pollutants which required a quantitative assessment. Based on this screening assessment most pollutants were identified as being below the relevant NSW impact assessment criteria which have been set with consideration of potential health effects. It is recognised that there is no known level of particulate matter below which there are no adverse health effects. As such, particulate matter was subject to a more detailed risk-based assessment.

This assessment considered the potential incremental changes in air quality and subsequent risks to human health around the two ventilation outlets, as well as the potential improvements along Pennant Hills Road from the reduction in traffic volumes.

The assessment of particulate matter considered a range of health outcomes which were developed in consultation with NSW Health. These were based on robust correlations between particulate matter and the health outcome. The assessment considered both the increased annual risk of the health outcome for the population in question and the increased incidence (ie cases per year).

Around the northern ventilation outlet, in Wahroonga, the potential increase in health outcomes has been determined to be very small and undetectable above the normal annual variability in cases per year for all health outcomes assessed.

Issue description

Concerns raised regarding mental health due to lowering property values, health fears for individual and children, neighbours moving away and disruptions to the community

Response

As part of the community consultation during the development of the environmental impact statement and during exhibition of the environmental impact statement, the project team has provided a range of materials and been available to provide the community with relevant factual information regarding the project and potential impacts to allay any fears or concerns which could lead to anxiety or mental health issues. Community consultation will continue through the detailed design and construction phase. Member of the community with ongoing concerns are able to speak with project team members to gain a better understanding of the potential impacts and mitigation measures.

During this period of time, the project also set up a process for the provision of a counselling service on a case by case basis and free of charge. This is an independent service through which an individual would contact the service directly and anonymously. The caller's identity is not provided to the NorthConnex project team or any other third party.

8.12.3 Impacts around the southern ventilation outlet

Fifty nine submissions raised issues regarding the health impacts around the southern ventilation outlet.

Issue description

Health risks to residents from southern ventilation facility. Diesel emissions are a group 1 carcinogen.

Response

A human health risk assessment has been carried out as part of the environmental impact statement (refer to Section 7.4 and Appendix H of the environmental impact statement). The assessment was carried out in accordance with the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012). The human health risk assessment includes consideration of potential impacts on the general population, as well as more sensitive receivers such a children, the elderly and people with existing respiratory issues. The assessment also considered the potential lifetime risk of cancer from potential exposure to diesel particulate matter.

The assessment initially undertook a screening assessment to determine pollutants which required a quantitative assessment. Based on this screening assessment most pollutants were identified as being below the relevant NSW impact assessment criteria which have been set with consideration of potential health effects. It is recognised that there is no known level of particulate matter below which there are no adverse health effects. As such, particulate matter was subject to a more detailed risk-based assessment.

This assessment considered the potential incremental changes in air quality and subsequent risks to human health around the two ventilation outlets, as well as the potential improvements along Pennant Hills Road from the reduction in traffic volumes.

The assessment of particulate matter considered a range of health outcomes which were developed in consultation with NSW Health. These were based on robust correlations between particulate matter and the health outcome. The assessment considered both the increased annual risk of the health outcome for the population in question and the increased incidence (ie cases per year).

Around the southern ventilation outlet the potential increase in health outcomes has been determined to be very small and undetectable above the normal annual variability in cases per year for all health outcomes assessed.

8.12.4 In-tunnel

Ten submissions raised issues regarding the in-tunnel health impacts.

Issue description

In-tunnel issues raised include:

- Health of people using tunnel. Clarification regarding the health of the regular weekday two-way commuter from the Central Coast that will be exposed to hazardous unfiltered vehicle emissions.
- The units for in-tunnel concentrations should be expressed in µg not mg. Thus 0.2 mg = 200 µg. The 24-hour guideline is 25 µg. Therefore, the data is exceeding the NEPM guidelines.
- In peak period the in-tunnel particulate matter concentration will be 500 micrograms per cubic metre when the 24 hour exposure standard is 25 micrograms per cubic metre. This is considered dangerous.
- Visibility levels have nothing to do with health risk.

Response

No criteria or standards are available in relation to short term exposures to pollutants which would be applicable to in-tunnel air quality. Design criteria for in-tunnel air quality have been based on recommendations from international bodies including the World Health Organisation and the Permanent International Association of Road Congress.

It is not possible or appropriate to compare exposures within the tunnel to a 24 hour average exposure standard. In terms of likely exposure times, the average motorist would spend around six to seven minutes in the project tunnels, depending on the direction of travel. The exposure time to the peak levels within the tunnels would be in the order of one minute.

Additionally, the value of around 500 micrograms per cubic metre for in-tunnel $PM_{2.5}$ concentrations is based on the conservative use of PIARC emissions inventory. Using the more realistic Environment Protection Authority emissions inventory, in-tunnel $PM_{2.5}$ concentrations would be less than 300 micrograms per cubic metre in the peak hour.

The environmental impact statement does not suggest that in-tunnel visibility is a measure of health risk. Rather, it identifies, consist with the PIARC guidelines, that visibility can be used as a measure of in-tunnel air quality and as a proxy for particulate matter (based on the conversion factor from PIARC, 2012).

The human health risk assessment provided in Section 7.4 of Appendix H of the environmental impact statement provides an assessment of potential in-tunnel exposures to pollutants by comparing potential exposures to other tunnels around the world and to adopted standards from around the world where they are available. The assessments found that the predicted concentrations are lower than or comparable to other tunnels around the world, and below guidelines available for the United States and parts of Europe.

8.12.5 Asthma

Five hundred and thirty seven submissions raised issues regarding asthma.

Issue description

Health impacts on residents with pre-existing asthma and the fact the environmental impact statement ignores the effect of nitrogen dioxide.

References made to Asthma Australia's concerns around the M5 East Motorway tunnel.

Request that an asthma and allergy management plan is developed.

Response

The human health risk assessment provides in Section 7.4 of Appendix H of the environmental impact statement provides an assessment of the potential increased incidence in asthma symptoms, measured in terms of increased use of bronchodilators. The assessment found that, when considering the impact from the ventilation outlets alone, in the entire community there would an increase in bronchodilator use of:

- 0.07 days per year around the southern interchange.
- 0.10 days per year around the northern interchange.

This increase is very low and would be undetectable in the local community as a whole.

When considering the project as a whole (including the anticipated air quality benefits), there would be an overall decrease in the number of days of bronchodilator use.

On the basis that the potential impacts to asthma are very low and would undetectable in the local community as a whole there is no justification for the preparation of an asthma or allergy management plan.

Issue description

Concerns regarding asthma impacts from heavy vehicle use during construction.

Response

Construction of the project has the potential to generate dust which could aggravate asthma. Section 7.3.4 of the environmental impact statement assesses the potential for dust generation during the construction phase, including from exposed surfaces as a result of vegetation clearing.

Construction air quality management measures are identified in Section 7.3.5 of the environmental impact statement. These include measures such as:

- Water carts, sprinklers, sprays and dust screens to control dust emissions.
- Modifying construction activities during high or unfavourable wind conditions.

A proactive dust observation program involving daily reviews of weather forecasts, observations of meteorological conditions and on site dust generation. This would inform mitigation measures or alterations to construction activities to be implemented during unfavourable weather conditions.

The use of construction equipment and heavy vehicles to deliver and remove material from the construction sites would generate exhaust emissions. These are anticipated to be relatively minor in comparison to the vehicle emissions from the surrounding road network.

Additionally, plant and equipment used during construction would comply with the emissions concentration limits outlined in the *Protection of the Environment Operations (Clean Air) Regulation 2010*.

8.12.6 Benefits along Pennant Hills Road

Four submissions raised issues regarding the health benefits along Pennant Hills Road.

Issue description

The assumption that improved air quality along Pennant Hills Road would lead to improved health is incorrect based on the findings of the Cowie study for Lane Cove Tunnel.

Response

The air quality and health assessments predicted theoretical improvements along Pennant Hills Road (refer to Section 7.3 and 7.4 of the environmental impact statement). These theoretical improvements are order of magnitude larger than the theoretical increases around the ventilation outlets. The environmental impact statement also noted that the anticipated health benefits are very small and would not be measurable above the normal variability in the population. This is consistent with the findings of the Cowie (or Woolcock) study which did not identify any measurable changes in health outcomes along Lane Cove Road.

8.12.7 Noise and vibration

Thirteen submissions raised issues regarding noise and vibration health impacts.

Issue description

Noise impacts from construction traffic will be detrimental to health and well-being (Coral Tree Drive, Northern Ventilation Facility, Junction Road compound, northern interchange compound and Trelawney Street).

Response

The human health risk assessment undertook a qualitative assessment of potential health impacts associated with noise generation during construction.

The potential health outcomes from exposure to noise for which there is strong evidence include:

- Sleep disturbance.
- Annoyance.
- Hearing impairment.
- Children's school performance through effects on memory and concentration.
- Cardiovascular disease.

Other health outcomes, where there is not strong evidence linking noise to the effect, may include increasing difficulty in understanding what others are saying and effects on mental health (usually in the form of exacerbation of issues for vulnerable populations rather than direct effects).

The construction noise guidelines applicable to the project have considered the health effects of noise and the relevant guidance from the World Health Organisation and the Environmental Health Council of Australia in determining appropriate noise criteria.

Noise levels that do not comply with the criteria set out in these policies would have the potential to have negative health outcomes for the community. The worst case assessment predicts that noise criteria would be exceeded at a number of properties in the absence of additional noise mitigation measures. These additional mitigation measures are identified in Section 7.2 of the environmental impact statement and would be further developed prior to construction as part of the Construction Noise and Vibration Management Plan. **Section 4.5** of this report provides further information on proposed construction noise mitigation and management measures.

Issue description

Increased noise levels during construction and operation can be detrimental to people's health and well-being, particularly for children, including disturbing sleep and causing psychological impacts.

Locations include:

- Northbound tunnel on-ramp from the Hills M2 Motorway.
- Hewitt Avenue, Wahroonga.

Response

The human health risk assessment undertook a qualitative assessment of potential health impacts associated with noise generation during construction.

The potential health outcomes from exposure to noise for which there is strong evidence include:

- Sleep disturbance.
- Annoyance.
- Hearing impairment.
- Children's school performance through effects on memory and concentration.
- Cardiovascular disease.

Other health outcomes, where there is not strong evidence linking noise to the effect, may include increasing difficulty in understanding what others are saying and effects on mental health (usually in the form of exacerbation of issues for vulnerable populations rather than direct effects).

The construction and operational noise guidelines applicable to the project have considered the health effects of noise and the relevant guidance from the World Health Organisation and the Environmental Health Council of Australia in determining appropriate noise criteria.

Noise levels that do not comply with the criteria set out in these policies would have the potential to have negative health outcomes for the community. The worst case assessment predicts that noise criteria would be exceeded at a number of properties in the absence of additional noise mitigation measures. These additional mitigation measures are identified in Section 7.2 of the environmental impact statement and would be further developed prior to construction as part of the Construction Noise and Vibration Management Plan. Section 2.6 of this report provides further information on proposed construction noise mitigation and management measures.

The operational noise assessment identifies feasible and reasonable mitigation measures based on exceedances of the guidelines. This includes noise barriers and consideration of at-property acoustic treatment.

8.12.8 General health impacts

Eight hundred and one submissions raised issues regarding general health impacts.

Issue description

Health impacts from pollution from ventilation facilities. Components of vehicular and industrial air pollutants are toxic and cause serious short, medium and long term risks to health.

Concerned about the multiple large scale research studies that suggest that the impact of air pollutants on health are serious.

Specific issues raised include:

- Diesel emissions which are classified as carcinogenic.
- People's health should not be prejudiced because of cost.
- Health of children in schools in the surrounding area.
- Large number of fine particles which penetrate deep into the lung tissue and cause inflammation.
- Increased death from heart disease, increased risk of lung cancer, bladder cancer, heart attacks, high blood pressure, stroke, poor lung growth in children, low birth weight for pregnant women, decreased fertility and increased miscarriage rates, increased autism, accelerated dementia, and congenital heart defects.
- Increased bronchitis, especially in children.
- The intensity of the load from the plume effect is of concern. Even very short term exposure to a dose of these toxins can lead to serious health consequences.
- There is no safe level of exposure for particulate matter. Belief the effect of particulate matter is the same as asbestos and nuclear radiation.
- Ultrafine particles are greatly absorbed into tissues and the circulatory system and are important factors in determining cardiopulmonary toxicity.
- Exposure to traffic related air pollution during pregnancy and the first year of life is associated with autism.
- Higher levels of long-term pollution are associated with significantly faster cognitive decline (development of dementia).

Health should take priority over cost. The cost of healthcare will rise due to issues from the project. A recent OECD study found that the number of deaths from air pollution in Australia has increased in the last five years. Evidence suggests that road transport was probably responsible for about half of all deaths from air pollution. The economic cost to Australia was about $5.8 billion in 2010, up from $2.9 billion five years earlier.

In relation to particulate matter, the NEPM provides a guideline only to assist policymakers, and these guidelines should not be used as an absolute value against which to measure the safety of NorthConnex tunnel emission levels. Rather, the NorthConnex tunnel, ventilation outlets, and portal emissions sites should be designed to ensure there is an overall reduction of population exposures to particulate matter. The pollutant discharge concentrations and

associated outlet air discharge velocities need to be based upon ensuring that there are no human health impacts from the tunnel, rather than achieving guidelines.

The design needs to ensure minimal health impacts. Government is undermining the health of their constituents. The health of the public must be placed above financial gain. There should be community involvement to properly deal with health impacts

What is the purpose of the *Environmental Planning and Assessment Act 1979* if it is not to guide the building of an urban environment that is safe for the users and general community.

Reference to the 2008 NHMRC report on "Air Quality in and around Tunnels".

All outlet dispersal systems have some effects locally. In the past these may have been regarded as negligible but modern knowledge shows that this is probably not the case.

Response

The project does not prejudice the health of the local community because of cost. The project includes a well-designed ventilation system. Considerations during the design of the ventilation system included air quality impacts, human health risks, sustainability and land acquisition.

The impact on health of diesel and petrol emissions are well documented and the use of well-designed ventilation systems used in road tunnels disperses the pollutants far more effectively than on surface roads where the emissions are left to disperse in an uncontrolled manner at ground level.

A human health risk assessment has been carried out as part of the environmental impact statement. This assessment considered the potential incremental changes in air quality and subsequent risks to human health around each of the project ventilation outlets, as well as the potential improvements along Pennant Hills Road from the reduction in traffic volumes. The assessment recognises that there is no threshold below which exposure to particulate matter would not produce a health impact, and therefore a risk-based assessment has been conducted. The risk-based assessment takes into account that any exposure to particulate matter is likely to trigger a health effect.

Further the applicable air quality impact assessment criteria from the Approved Methods and the Air NEPM have not been adopted as absolute values against which to measures the emissions from the project ventilation outlets. They have been adopted as overall airshed goals. The environmental impact statement provides an assessment of the project contribution to these goals and an assessment of the cumulative impacts (ie background plus project contribution). This assessment found that there would not be any increase in the number of exceedances of the goals as a result of the project.

The human health risk assessment considers short duration (acute) and longer duration (chronic) exposures to emissions from the project.

Around the each of the ventilation outlets, the predicted increase in health outcomes (including health outcomes from diesel emissions) has been determined to be very low and undetectable above the normal annual variability in cases per year for all health outcomes assessed.

It is also noted that, when considering the project as whole (that is the incremental increase around the ventilation outlets and the benefits along Pennant Hills Road) the project would provide an overall reduction in particulate matter levels at ground level where it may affect the local community.

Issue description

Air from ventilation outlets will result in health hazards like acid rain and haze banks.

Response

There is no evidence from previous road tunnels in Australia or around the world to suggest that road tunnel ventilation outlets result in acid rain or haze banks.

Acid rain is caused by emissions of sulfur dioxide and nitrogen oxide, which react with the water molecules in the atmosphere to produce acids. The environmental impact statement demonstrates that the NorthConnex project would meet ambient air quality criteria and would pose a very low risk to human health. As such, the project would not result in impacts such as acid rain.

The NorthConnex project would not generate vehicle emissions that do not already exist along the Pennant Hills Road corridor. Its potential implications for acid rain generation would therefore be no different to existing conditions.

Issue description

Long term health effects cannot be accurately forecast for residents in the local area in regards to proposed ventilation outlet locations.

Response

Air within the project tunnels will be maintained at a level which is safe for the users of the tunnel. The ventilation outlets will be used to effectively disperse tunnel air into the atmosphere, so that ground level concentrations of pollutants are very low and well below applicable ambient air quality criteria.

The human health risk assessment focuses on long term (or chronic) potential health outcomes. The assessment has been undertaken in accordance with the Director-General's environmental assessment requirements and the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012). The assessment has calculated the increased risk over a lifetime exposure.

The assessment, presented in Section 7.4 and Appendix H of the environmental impact statement, identified that the potential long term health risks from the ventilation outlets is very low.

When the project as a whole is considered, the assessment found that there would be a theoretical improvement in long term health outcome throughout the project corridor.

This human health risk assessment was undertaken based on robust correlations between health outcomes and pollutants.

Issue description

Particulates larger than PM_{10} are too large to be absorbed directly into the lungs but they can be readily ingested and cause detrimental health affects to those residents living within a 200 metre radius of the ventilation facilities.

Response

The principal health-related exposure pathway for particulate matter emissions from the project is via inhalation. Ingestion of particulate matter is not a significant exposure risk.

Total suspended particulates (with a diameter up to 50 microns) have been considered in the human health risk assessment (refer to Section 4.4.2 of Appendix H to the environmental impact statement).

The environmental impact statement assesses pollutants likely to be generated by the operation of the project and those with the potential to impact on human health. Particulate matter (PM) greater than 10 micrometres in diameter, if inhaled, is generally trapped in the upper respiratory system and does not reach the lungs. The finer particles (PM_{10} and less) tend to be transported further from the source and are of more concern with respect to human health as these particles can penetrate into the lungs. Hence not all of the dust characterised as total suspended particulates is relevant for the assessment of health impacts, and total suspended particulates as a measure of impact, has not been evaluated in detail within the assessment. The assessment has only focused on particulates of a size where significant associations have been identified between exposure and adverse health effects.

Issue description

Recommendation for a long term health study on children and residents in areas impacted by outlet discharges to be included as part of the conditions of approval.

Long term health issues should be considered before the financial gain of the developer.

Response

A human health risk assessment has been carried out as part of the environmental impact statement (refer to Section 7.4 and Appendix F). The assessment was carried out in accordance with the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012). The human health risk assessment includes consideration of potential impacts on the general population, as well as more sensitive receivers such as children, the elderly and people with existing respiratory issues.

The results of this assessment identify that the potential increase in health outcomes has been determined to be very small and undetectable above the normal annual variability in cases per year for all health outcomes assessed.

Issue description

Concerns regarding health impacts for residents near the Wilson Road tunnel support facility and the Trelawney Street tunnel support facility.

Response

The environmental impact statement assesses the potential impacts of the NorthConnex project for a series of credible construction and operational scenarios. A reasonable level of conservatism has been applied to these scenarios to allow for flexibility in the implementation of the project, and to give regulatory authorities, the community and other stakeholders' confidence in the veracity and robustness of the relevant environmental impact assessments.

Section 2.7.2 of this report provides further discussion of tunnel incidents that may lead to emergency emissions from the project tunnels (principally fire related incidents). The discussion demonstrates that a combination of a very low probability of such events, and the design of the project to minimise potential consequences, would result in a very low risk of significant impacts to the surrounding environment and communities in the unlikely event of a tunnel incident.

The environmental impact statement does not present a detailed, quantitative assessment of scenarios including force majeure events, very low risk (ie very low likelihood and/ or very low consequence) incidents or other outcomes that are either not realistically or credibly foreseeable during the normal operation of the project. This is consistent with the approach take for the assessment of other major infrastructure and developments in New South Wales, including major surface road and tunnel projects, rail infrastructure, ports and airports. These types of developments consider the risk of an emergency or unexpected event occurring (such as a major road crash, a train derailment, or an aircraft crash), but do not provide a detailed, quantified assessment of the potential environmental impacts of such an event occurring. Instead, the focus in these cases is ensuring that feasible and reasonable measures are applied to the particular development to minimise the likelihood and the consequence of emergency events.

Issue description

Concerns regarding health impacts for increased air pollution around Hewitt Avenue.

Response

The number of vehicles using the M1 Pacific Motorway in the vicinity of Hewitt Avenue would be expected to decrease as a large number of vehicles, especially heavy vehicles, would be using the NorthConnex tunnels. As identified in Section 7.4 of the environmental impact statement, the reduction in heavy vehicle use on surface road is expected to result in overall health benefits in the area.

Issue description

Adverse impact on wellbeing from knowing that tunnelling would be undertaken beneath homes.

Response

As part of the community and stakeholder consultation during the exhibition of the environmental impact statement, the project team developed a fact sheet titled 'tunnelling near your home'. This fact sheet is aimed at providing the community with relevant factual information regarding the tunnelling process and potential impact in order to allay any fears and reassure them of tunnelling safety. Community and stakeholder consultation will continue through the detailed design and construction phase. Members of the community with ongoing concerns regarding tunnelling are able to speak with project team members to gain a better understanding of the tunnelling process, potential impacts and methods to ensure the structural integrity of the tunnels.

Tunnelling works have the potential to result in impacts including vibration and ground-borne noise, and settlement. These potential impacts are identified and assessed in Section 7.2.4 and Section 7.8.3 of the environmental impact statement, respectively.

In relation to vibration, the assessment identifies that up to 64 receivers would exceed the preferred criteria for human comfort during the night-time period. No receivers are predicted to exceed the maximum value for human comfort. Additionally, no receivers would exceed the structural damage criteria during any tunnelling activities. The potential exceedances would be felt for a relatively short period of time only while tunnelling activities are directly underneath or on close proximity to these receivers.

In relation to ground-borne noise, the assessment identifies that exceedances would occur at around 28 receivers during the evening period and around 90 receivers during the night-time period. Similar to vibration impacts, the potential exceedances would be limited for a relatively short period of time only while tunnelling activities are directly underneath or in proximity to these receivers.

In relation to settlement, preliminary ground movement investigations indicate that there may be potential settlement of up to a maximum of 20 millimetres in areas where the main alignment tunnels and the on and off-ramp tunnels are approaching the surface. The remainder of the tunnel alignment would be expected to experience settlement impacts of less than five millimetres. Movement of up to 20 millimetres would be expected to result in cosmetic damage only (ranging from hairline cracking to cracking of up to five millimetres). Further assessments would be undertaken during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable mitigation and management measures required to minimise potential ground movement impacts.

Prior to the commencement of tunnelling works, existing condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. Any damage attributed to the project would be rectified by the contractor at no cost to the property owner.

Issue description

Concerns regarding ill-health and stress from living next to construction sites. Concerns include:

- Dust from construction activities.
- Exhaust emissions from plant and equipment, and heavy vehicles along access routes.
- Asbestos from demolition.
- Fungus from vegetation removal.

Response

Construction works would result in impacts to the local community. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures. Construction works would be limited in duration and any construction-related impacts on surrounding receivers would be temporary.

The use of construction equipment and heavy vehicles to deliver and remove material from the construction sites would generate exhaust emissions. These are anticipated to be relatively minor in comparison to the vehicle emissions from the surrounding road network. As such, the use of heavy vehicles on construction access routes is not expected to result in human health impacts.

Based on feedback in submissions and through other consultation with the community and other stakeholders, the proposed construction traffic routes for the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9) have been altered to avoid impacts on local residential streets. Updated construction traffic and construction noise assessments for these amended haulage routes are provided in **Section 9.4** of this report.

Construction air quality management measures are identified in Section 7.3.5 of the environmental impact statement. These include measures such as:

- Water carts, sprinklers, sprays and dust screens to control dust emissions.
- Modifying construction activities during high or unfavourable wind conditions.

The removal of asbestos during demolition activities would be undertaken in accordance with relevant legislation and guidelines to avoid the potential for exposure.

Fungus issues during the removal of vegetation is not anticipated to be an issue, however if discovered during construction would be effectively managed by wetting down the fungus during vegetation removal.

As part of the community consultation during the development of the environmental impact statement and during exhibition of the environmental impact statement, the project team has provided a range of materials and been available to provide the community with relevant factual information regarding the project and potential impacts to allay any fears or concerns which could lead to stress. Community consultation will continue through the detailed design and construction phase. Member of the community with ongoing concerns are able to speak with project team members to gain a better understanding of the potential impacts and mitigation measures.

Issue description

Adverse psychosocial health impact from stress caused by the project.

Response

As part of the community consultation during the development of the environmental impact statement and during exhibition of the environmental impact statement, the project team has provided a range of materials and been available to provide the community with relevant factual information regarding the project and potential impacts to allay any fears or concerns which could lead to stress. Community consultation will continue through the detailed design and construction phase. Member of the community with ongoing concerns are able to speak with project team members to gain a better understanding of the potential impacts and mitigation measures.

The project also set up a process for the provision of a counselling service on a case by case basis and free of charge. This is an independent service through which an individual would contact the service directly and anonymously. The caller's identity is not provided to the NorthConnex project team or any other third party.

Issue description

Lowering of property values will result in emotional and psychological states that may eventually cause a series of diseases such as heart disease, hypertension, cancer and psychological disorders. Belief that the health risks of lowering property values are the same as air pollution.

Response

In Sydney and elsewhere around Australia large infrastructure projects have been shown to add value and better amenity to the area in which they are built and as such property prices have increased accordingly.

The belief that home values around the ventilation outlet and portals may drop up to 25 per cent or more and that it will be difficult to sell houses near the outlets appears to have no credible supporting evidence.

For example the property at Gum Grove Place, West Pennant Hills (adjacent to the southern ventilation outlet) was put on the market on 22 May 2014 with a guide price of over $980,000. The property sold by mid June 2014, less than four weeks later, at a price of $1,370,000 (around 40 per cent over price guide). In the north there has been four properties sold in Woonona Avenue since the end of May with the recent sale of a property in Woonona

Avenue, which sold on 30 July 2014 eight days after being put on the market and another property in Woonona Avenue sold on 14 July 2014 only five days after being put on the market and both higher than the price guide provided.

Additionally, there is no evidence from previous road tunnel projects suggesting these projects result in a decrease in property values.

With respect to the M5 East Motorway ventilation outlet in Turrella; research indicates in the last 10 years the average median price in Turrella has increased 4.6 per cent per year in line with neighbouring suburbs of Earlwood (4.3 per cent) and Arncliffe (4.5 per cent) and in excess of Wolli Creek (3.6 per cent). Further, in the last five years the median price has increased almost 70 per cent which is 20 per cent more than Earlwood and Arncliffe.

With respect to the Lane Cove Tunnel ventilation outlet, research indicates that, in the last 10 years, the average annual increase in median property in Lane Cove (the suburb adjacent to the Lane Cove Tunnel ventilation outlet) was 4.7 per cent. This is similar to nearby suburbs of Chatswood (five per cent) and Artarmon (four per cent) over the same period.

On this basis, there is no cause for health concerns due to the potential lowering of property values.

There is also the potential for positive impacts on property values, particularly along the Pennant Hills Road corridor. This is likely to result from improvements in amenity, including improved air quality, reduced traffic noise and improved road safety along that corridor.

Issue description

Increased headlight glare at Hewitt Avenue will lead to loss of sleep and health impacts.

Response

The proposed noise wall between the Hewitt Avenue residences and the M1 Pacific Motorway would prove a barrier to head light glare.

Motorists turning around in Hewitt Avenue would be expected to be relatively minor and would not result in a significant change to residences in relation to head light glare.

8.13 Urban design, landscape character and visual amenity

8.13.1 Construction light spill

Four submissions raised issues regarding construction light spill.

Issue description

Concerned regarding construction light intrusion along the Hills M2 Motorway integration works.

Response

Construction lighting is likely to be required in order to facilitate night works along the Hills M2 Motorway. Table 7-136 of the environmental impact statement provides consideration of the potential impacts from night lighting. Residential areas along the Hills M2 Motorway would generally be screened from the lighting by existing vegetation or noise barriers.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts including construction lighting impacts. Cut-off and directed lighting would be used and lighting location considered to ensure that glare and light spill are minimised.

Issue description

Concerned regarding construction light intrusion in Wahroonga during construction.

Response

Construction lighting is likely to be required in order to facilitate night works within Wahroonga. Table 7-136 of the environmental impact statement provides consideration of the potential impacts from night lighting. Residential areas along the M1 Pacific Motorway would generally be screened from the lighting by existing vegetation or noise barriers.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts including construction lighting impacts. Cut-off and directed lighting would be used and lighting location considered to ensure that glare and light spill are minimised.

Issue description

Concerned regarding construction light intrusion from the southern interchange compound during construction.

Discussions on this subject within the environmental impact statement are irrelevant and ridiculous given that it admits that there has been no existing light measurement, so there is no bench mark to compare data with, and there is no lighting plan, for either the construction or operation phase, in existence. This means that there is no scrutiny of the proposed lighting and no opportunity for those most affected by it to comment.

Impact of vehicle lights entering and exiting the site.

Response

Construction lighting is likely to be required in order to facilitate night works around the southern interchange compound. Table 7-136 of the environmental impact statement provides consideration of the potential impacts from night lighting. Residential areas along the Hills M2 Motorway would generally be screened from the lighting by existing vegetation or noise barriers.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts including construction lighting impacts. Cut-off and directed lighting would be used and lighting location considered to ensure that glare and light spill are minimised.

8.13.2 Construction visual impact

Fifty four submissions raised issues regarding construction visual impacts.

Issue description

Boundary and compound walls and the acoustic shed will have an impact on residents who will no longer overlook gardens and / or parkland areas, particularly those along Gum Grove Place.

Request to mitigate the visual impact around the southern interchange during construction.

Response

Potential visual impacts from the construction of the project are assessed in Section 7.5.5 of the environmental impact assessment. In relation to Gum Grove Place located adjacent to the southern interchange compound, the potential visual impact was assessed as being high to moderate.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts. This includes investigating option to retain the existing vegetation around the perimeter of construction site where feasible and reasonable.

Issue description

Concerns regarding visual impacts at the Trelawney Street site including a 15 metre high shed. Request to mitigate the visual impact around the Trelawney Street site during construction.

Response

Potential visual impacts from the construction of the project are assessed in Section 7.5.5 of the environmental impact assessment. In relation to the Trelawney Street compound, the potential visual impact was assessed as being high to moderate for receivers on Loch Maree Avenue and Trelawney Street, and high for receivers immediately to the east of the site.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts. This includes, among other measures, investigating options to retain the existing vegetation around the perimeter of construction sites where feasible and reasonable.

Issue description

Concerns regarding visual impacts at the Wilson Road compound (C6).

Response

Potential visual impacts from the construction of the project are assessed in Section 7.5.5 of the environmental impact assessment. In relation to the Wilson Road compound, the potential visual impact was assessed as being high for receivers immediately to the west of the site, and high to moderate for receivers on Killaloe Avenue and Wilson Road.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts. This includes, among other measures, investigating options to

retain the existing vegetation around the perimeter of construction sites where feasible and reasonable.

Issue description

The unused parts of the Lisle Court reserve should not be used as a storage area for goods and materials.

Response

Works in the vicinity of Lisle Court are required to facilitate the construction of the new on-ramp connecting the Hills M2 Motorway to the northbound main alignment tunnel, and potentially for the augmentation of an existing surface water detention basin. There are no plans to use this area as a storage area during construction.

Issue description

Concerns regarding visual impacts at the northern interchange compound. There does not appear to be any plans for visual barriers.

Response

Potential visual impacts from the construction of the project are assessed in Section 7.5.5 of the environmental impact assessment. In relation to the northern compound, the potential visual impact was assessed as being high to moderate for adjacent residential receivers.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts. This includes, among other measures, investigating options to retain the existing vegetation around the perimeter of construction sites and provision of hoarding around construction sites where feasible and reasonable.

Issue description

Shadow diagrams provided in the environmental impact statement are incorrect.

Shadow diagrams for 21 December and 21 June for the construction buildings should be provided.

Response

The shadow diagrams provided in the Technical Working Paper: Urban design are accurate for the dates they are portraying. These shadow diagrams provide an indication of the shadow effects on a typical day in summer and the typical day in winter. There is no requirement to provide shadow diagrams for set dates of the year

8.13.3 Operational landscape character impact

Sixty four submissions raised issues regarding operational landscape character impacts.

Issue description

The project will ruin the suburb of Wahroonga which is known for its beauty and tree lined outlooks.

The northern ventilation facility is an ugly, featureless, industrial style stack and not consistent with the adjacent residential area.

Response

A set of urban design objectives have been developed specific to the project. Of relevance to the northern ventilation facility and potential impacts to the surrounding area, these objectives include:

- Aesthetically enhance the road facility and associated works and structures.
- Integrate new elements with existing work in as seamless a way as possible to meet the urban design requirements.
- Enhance existing landscape and integrate new landscape both across and into the corridor.

The full list of urban design objectives is provided in Table 7-121 of the environmental impact statement. These objectives would continue to be considered and would guide the detailed design of the operational ancillary facilities.

Operational infrastructure at the northern end of the project has been located to be within and immediately adjacent to the M1 Pacific Motorway corridor. This will avoid or minimise direct and indirect impacts on surrounding residential areas.

The façade of the northern ventilation facility has been designed to provide a series of smaller elements to present a more domestic and small scaled appearance reflective of existing development in the area. This would be achieved through the combination of glass fibre reinforced concrete panels, sandstone, 'timber-look' battens and glazed openings to reflect the adjacent heritage residential area. This strategy is repeated in the design of the noise barriers which features sandstone planter boxes and 'timber-look' battens.

Additionally, the landscaping around the ventilation facility is proposed to reflect the adjacent streetscape and heritage listed street trees.

Further information regarding the proposed urban design of the facility and landscaping is provided in Section 7.5 and Appendix I of the environmental impact statement.

Issue description

Vegetation in areas affected by the project in the southern interchange and along the Hills M2 Motorway should be maintained as much as possible. A more detailed and comprehensive plan of landscaping post construction, detailing plans to soften the visual impact of industrial buildings, needs to be provided. Community consultation post 12 September 2014 (the close of the public exhibition period) regarding landscaping plans is desirable.

Response

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts. This includes investigating option to retain the existing vegetation around the perimeter of construction site where feasible and reasonable.

The Technical Working Paper: Urban Design in Volume 4 of the environmental impact statement provides landscape plans for the concept design. These will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Issue description

Disagree with the description of the Trelawney street landscape character zone. It fails to recognise the residential area it will displace and references commercial and retail areas. The only residential area referenced is 'adjacent' to the site. A reader not familiar with the area could interpret that the facility is in an area currently solely occupied by commercial and retail facilities however this is not the case.

Response

The landscape character zone provides a description of the area as a whole. This description (in Table 7-119 of the environmental impact statement) recognises the presence of low density residential development. The presence of commercial areas and the Pennant Hills Road corridor are also important features of this landscape character zone.

8.13.4 Operational visual impact

One hundred and three submissions raised issues regarding operational visual impacts.

Motorway operations complex

Issue description

Concerns regarding the visual impact of the motorway control centre and the southern ventilation facility within motorway operations complex.

There is no attempt to design either the building or the landscape to represent anything other than a dominant, industrial building. With architecture that is purely industrial, comprising a metal and glass monolith without character or soul, and a generic landscape, which fails to address any sense of genius loci, the end result is not only boring but offensive to those that will have to suffer it looming over them in years to come.

Suggestions include:

- Redesign of the façades of the Southern Control Centre building to be more sympathetic to the residential nature of the surrounding environment – perhaps locating the 'basement car parking' below ground to reduce the bulk and scale of the building, articulate the façades, use alternative materials to industrial glass and steel.
- Relocating the southern ventilation outlet, which would allow more land to be used for the Motorway Control Centre, allowing a lower height to be designed for this building.

Shadow diagrams provided in the environmental impact statement are incorrect.

Shadow diagrams for 21 December and 21 June for the construction buildings should be provided.

Response

Section 7.5.5 of the environmental impact statement provides an assessment of potential visual impacts from the introduction of operational ancillary facilities, including the motorway control centre as part of the motorway operations complex.

Based on submissions received from the Environment Protection Authority, NSW Health and the general community, consideration has been given to additional feasible and reasonable ventilation system design options. This analysis is provided in **Section 3.2** of this report. Based on this balanced consideration of environmental and land use impacts, engineering feasibility and cost, an increase to the ventilation outlets by five metres has been determined

to be feasible and reasonable. As such, the project has been amended to include this increase the height of the ventilation outlets. A revised assessment of visual impacts associated with this increased ventilation outlet height is provided in **Section 9.2** of this report.

If the southern ventilation outlet was to be considered in Pennant Hills Golf Course or on the southern side of the Hills M2 Motorway, no appreciable improvement has been demonstrated or identified. These locations would:

- Relocate negligible air quality and human health impacts to other residential receivers, with no significant reduction in the magnitudes of those impacts.
- Likely require a net increase in property acquisition requirements.
- Significantly add to the cost of the project, with no confirmed, viable additional financing and no measurable associated benefits.

The rationale for the location of the ventilation facilities is provided in Section 4.4.1 of the environmental impact statement.

A ventilation facility on the Pennant Hills Golf Course would not eliminate potential visual impacts. This location is likely to increase the visual catchment of the surface infrastructure around the southern interchange.

The motorway operations complex has been located adjacent to and facing Pennant Hills Road in order for the facility to be seen as an integrated part of the transport corridor.

The motorway operations complex would comprise a grouping of buildings that would flank the on and off-ramp portals, and provide a relatively long and narrow architectural buffer between the road infrastructure and the existing residential area.

Notwithstanding, it is acknowledged that the motorway operations complex would comprise new elements located immediately adjacent to existing low density residential areas. The scale, form and fabric of these buildings would be in contrast to the adjacent residential development. However, the buildings represent architecturally well considered and articulated structures, exhibiting a visibly integrated family of forms and fabric, and a visually recessive colour scheme that would blend with the proposed landscaping. Landscaping would include tall native tree plantings, and the addition of exotic feature tree plantings to the motorway operations complex road perimeter.

The visual impact assessment has considered the potential views to the facility from two residential receiver locations (Gum Grove Place, and the corner of Karloon Road and Eaton Road) and two motorist receiver locations. In relation to the residential receivers, the overall visual impact has been assessed as moderate to high. Over time, this visual impact would reduce as landscaping around the facility matures and provides a more effective visual buffer.

The shadow diagrams provided in the Technical Working Paper: Urban design are accurate for the dates they are portraying. These shadow diagrams provide an indication of the shadow effects on a typical day in summer and the typical day in winter. There is no requirement to provide shadow diagrams for set dates of the year

Vegetation clearing

Issue description

Vegetation should be encouraged to screen the high wall of the Hills M2 Motorway on the northern side near Lisle Court.

Response

In the vicinity of Lisle Court, clearing of vegetation is required to facilitate the construction of the new on-ramp connecting the Hills M2 Motorway to the northbound main alignment tunnel, and potentially for the augmentation of an existing surface water detention basin.

Opportunities to limit the extent of clearing would be investigated during the detailed design stage. Any residual land between operational infrastructure and adjoining properties would be landscaped to provide a visual buffer.

Issue description

Impact on backyard views from Gum Grove Place. Do not wish to have a view of a wall from the backyard, ruining the natural scenery.

Response

Vegetation clearing in the vicinity of Gum Grove Place would be required in order to facilitate construction of the northbound connection to the NorthConnex tunnel.

Opportunities to limit the extent of clearing would be investigated during the detailed design stage. Any residual land between operational infrastructure and adjoining properties would be landscaped to provide a visual buffer.

Issue description

Concerns around visual impacts from the removal of bushland between homes and the Hills M2 Motorway. This bush strip has taken 17 years to grow and will need another 15-20 years to return to its current state.

Loss of bush outlooks resulting from the proposed Hills M2 integration works.

Response

The environmental impact statement has undertaken a conservative assessment of vegetation clearing by assuming that all vegetation within the construction footprint will be cleared. In relation to the section along the Hills M2 Motorway, the construction footprint, as shown in Figure 5-25 to 5-27 of the environmental impact statement, encompasses the majority of the area between the adjoining property boundary and the motorway. Opportunities to reduce the area of clearing would be investigated during the detailed design stage.

Trelawney Street tunnel support facility

Issue description

Concerns regarding the visual impact of the Trelawney Street tunnel support facility, especially when viewed from lower parts of Trelawney Street and Loch Maree Avenue. The eastern side of the site will be seven to ten metres above the current level. A building above that will make it considerably higher than the current landscape. Submissions suggest that:

- The facility should be improved to moderate its appearance from Pennant Hills Road.
- The facility should not result in shadowing to adjacent properties.
- The facility to put the whole building underground with a park provided on top.

Response

In response to community feedback received during the development of the environmental impact statement, the design of the Trelawney Street tunnel support facility was refined in order to lower the overall height and bulk of the proposed building.

Parts of the proposed building, such as the emergency smoke extraction point, are required to be above ground for operational reasons. Additionally, the building includes large elements such as axial fans which need to be periodically serviced and replaced. Placing this facility entirely underground would result in significant operational and maintenance complexities. Greater impacts during periodic maintenance activities would also be likely. For these reasons it is not practical to locate the Trelawney Street tunnel support facility entirely below ground.

Section 7.5 of the environmental impact statement provides an assessment of the visual impacts of the Trelawney Street tunnel support facility. The visual impact has been assessed to be moderate from Loch Maree Avenue and high to moderate from Trelawney Street. Over time, this impact would be gradually reduced as landscaping plantings proposed around the perimeter of the site mature and provide a visual screen. This includes a significant landscaped section on the eastern side of the facility.

The Technical Working Paper: Urban Design (Volume 4 of the environmental impact statement) provides shadow diagrams for the Trelawney Street site. These show that the facility would not result in any significant shadowing impacts to adjacent receivers.

As identified in Appendix D of the environmental impact statement, the Urban Design and Landscape Plan would be developed in consultation with the community and relevant local council(s).

Wilson Road tunnel support facility

Issue description

Concerns regarding the visual impact of the Wilson Road tunnel support facility. The artist's impression from the corner of Wilson Road and Killaloe Avenue shows an unpleasant site and loss of neighbourhood.

Response

In response to community feedback received during the development of the environmental impact statement, the design of the Wilson Road tunnel support facility was refined in order to lower the overall height and bulk of the proposed building.

Section 7.5 of the environmental impact statement provides an assessment of the visual impacts of the Wilson Road tunnel support facility. The visual impact has been assessed to be high from receivers adjoining the site to the west, and high to moderate from the Wilson

Road/ Killaloe Avenue intersection. Over time, this impact would be gradually reduced as landscaping plantings proposed around the perimeter of the site mature and provide a visual screen.

Urban design and landscaping plans would be developed during the detailed design phase. These plans would be developed taking into account the outcomes of consultation with the surrounding community and the relevant local council.

Cycleways

Issue description

The eastbound cycleway at Pennant Hills Road on the Hills M2 Motorway seems to be on the northern side of the noise wall. What provisions will be provided to reduce the visual impact of this cycle way on adjoining properties?

Response

The edge of the cycleway would incorporate a throw screen or a privacy screen of around three metres in height (refer to Section 12.0 of the Urban Design Technical Working Paper). The locations of privacy screens would be determined during detailed design based on the proximity and nature of adjacent receivers.

Noise barriers

Issue description

Request for a new noise barrier along the Hills M2 Motorway to the west of Barclay Road should be built high enough to block views to the orange noise walls on the other side of the motorway.

Response

Table 7-86 of the environmental impact statement provides the recommended heights of noise barriers. Based on this assessment, it has been recommended that the barrier to the west of Barclay Road along the Hills M2 Motorway be increased in height to five metres high.

Barrier heights would be confirmed at the detailed design stage.

Barrier heights are determined by optimal noise attenuation and not to block views from other buildings.

Issue description

Concerns regarding blocking of sunlight from proposed noise barriers and boundary fences.

Locations include Hewitt Avenue and the motorway operations complex.

Response

Based on the current design of the project, the operational noise barrier in the vicinity of Hewitt Avenue would be increased in height. Noise mitigation measures would be reviewed during detailed design to ensure that reasonable and feasible noise mitigation measures are provided, including noise barriers where appropriate, to meet the requirements of the Road Noise Policy and the Environmental Noise Management Manual. This would include consideration of potential impacts such as overshadowing and the input from the local community.

As identified in Appendix D of the environmental impact statement, the Urban Design and Landscape Plan would be developed in consultation with the community and relevant local council(s). This would include consultation regarding the height of boundary fences to provide the appropriate balance between an adequate fence height to not blocking sunlight.

Northern ventilation facility

Issue description

Visual impact of the northern ventilation facility. The removal of the vegetation means that much of the M1 Pacific Motorway corridor and the new ventilation facility will be visible.
The heritage, garden suburb of Wahroonga is being turned into an industrial area.

Response

The potential visual and landscape character impacts from the introduction of the northern ventilation facility are identified and assessed in Section 7.5.5 of the environmental impact statement. Within this section it is identified that the facility would be visually contrasting with the adjacent area. The overall visual impact of the facility from the surrounding residential receivers has been assessed to be high to moderate.

Views of the M1 Pacific Motorway are likely until landscaping is established. Landscaping of the site will reduce these views and potential visual impacts as vegetation grows over time.

In order to reduce the potential impact of the northern ventilation facility, its façade has been designed to provide a series of smaller elements to present a more domestic and small scaled appearance reflective of existing development in the area. This would be achieved through the combination of glass fibre reinforced concrete panels, sandstone, 'timber-look' battens and glazed openings to reflect the adjacent heritage residential area. This strategy is repeated in the design of the noise barrier which features sandstone planter boxes and 'timber-look' battens.

Additionally, the landscaping around the ventilation facility is proposed to reflect the adjacent streetscape and heritage listed street trees.

Coral Tree Drive

Issue description

The road moving closer to properties and the removal of the vegetation will result in visual impacts.

Response

The environmental impact statement has undertaken a conservative assessment by assuming that all vegetation within the construction footprint will be cleared. In relation to the section along the Hills M2 Motorway near Coral Tree Drive, the construction footprint, as shown in Figure 5-27 of the environmental impact statement, encompasses the majority of the area between the adjoining property boundary and the motorway. Opportunities to reduce the area of clearing would be investigated during the detailed design stage.

As identified in Appendix D of the environmental impact statement, the Urban Design and Landscape Plan would be developed in consultation with the community and relevant local council(s).

Signage

Issue description

Concerns regarding the location of road signage being visible from residential receivers.

Response

The location of road signage would consider design and operational requirements as well as potential impacts to residential areas.

As identified in Appendix D of the environmental impact statement, a signage strategy would be developed during the detailed design phase of the project. Targeted community and stakeholder consultation would be carried out during the development of the signage strategy in relation to the location and associated impacts.

8.13.5 Operational urban design and landscaping

Eighty four submissions raised issues regarding operational urban design and landscaping.

Issue description

The northern ventilation facility looks like a container terminal in the artist's impression in the environmental impact statement. This does not suit the heritage and interwar houses and is not an improvement on what is there now. It should be built of brick to fit in with the surrounding homes. There should be input into the design from qualified heritage consultant.

The argument that motorists are the most important receivers in viewing the ventilation building and therefore this has been the basis of its design, is insulting to local residents. Motorists would only view the ventilation for seconds as they drive past at 80 kilometres per hour – while many residents will have views of the ventilation outlet 24 hours a day and seven days a week.

It appears that the landscape planting will occur on the street frontage which would be Council owned land. It is unclear if agreement has been reached to do this with Council and who would be responsible for maintenance. Landscaping will take 10-20 years to mature, meaning there is a considerable amount of time with no screening.

The community should have been provided with multiple designs. There has been no opportunity for community involvement in the urban design of the facility. Alternative designs should be provided to allow the community to provide opinions.

Suggestions to reduce the visual impact of the facility include:

- Minimising the bulk and height of the building as much as possible.
- Using material and a building design which is in keeping with the heritage area.
- Relocating the deluge tanks so both are as close to the motorway as possible, enabling greater landscaping to be provided.

Response

The potential visual and landscape character impacts from the introduction of the northern ventilation facility are identified and assessed in Section 7.5.5 of the environmental impact statement. Within this section it is identified that the facility would be visually contrasting with the adjacent area. The overall visual impact of the facility from the surrounding residential receivers has been assessed to be high to moderate. This rating is based on landscape plantings around 12-18 months after project opening. As such, this impact would decrease over time as the landscape matures.

The environmental impact statement does not argue or state that motorists are the most important receivers in viewing the ventilation facility. The environmental impact statement identifies that the most affected receivers are likely to be motorists and nearby residences in Woonona Avenue, Bareena Avenue and potentially Benson Close. As identified in Table 1-139 of the environmental impact statement, the overall operational visual impact rating for residential receivers for this facility is high to moderate, whilst for motorists it is moderate to low.

In order to reduce this potential impact, the façade of the northern ventilation facility has been designed to provide a series of smaller elements to present a more domestic and small scaled appearance reflective of existing development in the area. This would be achieved through the combination of glass fibre reinforced concrete panels, sandstone, 'timber-look' battens and glazed openings to reflect the adjacent heritage residential area. This strategy is repeated in the design of the noise barrier which features sandstone planter boxes and 'timber-look' battens.

Additionally, the landscaping around the ventilation facility is proposed to reflect the adjacent streetscape and heritage listed street trees. All landscaping would be maintained by the motorway operator, unless alternative arrangements are agreed with the local Council.

As identified in Appendix D of the environmental impact statement, the Urban Design and Landscape Plan would be developed in consultation with the community and relevant local council/s.

Issue description

Existing trees, planting and tree maintenance issues were raised in submissions. Specific requests include:

- Planting and maintenance of trees and bushes against boundary and compound walls in residential areas affected by the project, such as Gum Grove Place and Hillside Place, is extremely important.
- The leafy aspect must be maintained by appropriate landscaping. The maturity of planting is unclear.
- Existing trees on western side of motorway operations complex (between the complex and Gum Grove Place) should be retained. Need to use 45 litre pots where the complex is adjacent to residential areas, not 300 mm pots as indicated in the Landscape Design report.
- Suggestion for mass tree plantings around the southern ventilation facility.

Response

The environmental impact assumes that this vegetation would be removed to facilitate construction works. Notwithstanding, opportunities to retain vegetation along the perimeter of construction sites would be investigated during the detailed design stage.

The Technical Working Paper: Urban Design in Volume 4 of the environmental impact statement provides landscape plans for the concept design. These concept design plans identify that the area along the western side of the motorway operations complex would be landscaped. These plans will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council(s).

Issue description

Vegetation in areas affected by the project around the southern interchange and motorway operations complex should be maintained as much as possible. A more detailed and comprehensive plan of landscaping post construction, detailing plans to soften the visual impact of industrial buildings, needs to be provided. Community consultation post 12 September 2014 (the close of the public exhibition period) regarding landscaping plans is desirable. Details regarding proposed maintenance of landscaping is required.

Section 7.5 of the environmental impact statement (page 707) states that 'opportunities would be investigated to flatten landscape batters at the operational ancillary facilities to maximise plant response and maintainability.' The use of earth mounds is an efficient and cost effective way to deal with traffic noise. Whilst flattening of the site during construction may be appropriate, it would seem more logical and reasonable to use earth mounding along the Eaton Road frontages to reduce the visual impact of the site whilst simultaneously addressing some of the noise and light pollution issues that will be created at the operational phase.

Redesign the landscaping to better integrate with the local environment, provide a visual buffer between the residential properties and the industrial site and to address some of the negative impacts on the local residents (ie. earth mounding, multi-layered plantings etc). Prepare and implement a maintenance program for the landscaping including requirements for appropriately qualified personnel to carry out such maintenance (ie. horticulturalist for gardens, Arborist for trees) and detailing a minimum period (recommended to be not less than 10 years) for maintenance to be continued to allow plants and trees to attain maximum potential.

The open plan look of the reserve behind Lisle Court should be retained (ie no brick walls of significant metal fences), as well as many of the trees and as much of the current grassed area as possible.

Retain as many trees as possible along the Hills M2 Motorway and revegetate the area after construction.

A dedicated plan is required to maintain the unused part of the Lisle Court Reserve.

Response

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts. This includes investigating options to retain the existing vegetation around the perimeter of construction site where feasible and reasonable.

Earth mounds can be an effective method of reducing noise levels from infrastructure projects, however they require more space to effectively implement than a noise wall. The mitigation measure in question does not preclude the use of earth mounds, it is aimed at reducing the steepness of batters in order to allow for better plant growth.

The Technical Working Paper: Urban Design in Volume 4 of the environmental impact statement provides landscape plans for the concept design. These will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Issue description

The plant selection identified in the landscape plan is highly generic and pays little heed to what is appropriate for the climatic or environmental conditions of the site and almost none to the genius loci. Although Sydney Blue Gums (*Eucalytpus saligna*), a locally indigenous species, have been selected as the primary screening tree, their proposed planting arrangement is unsuitable for the species or the location. Given the exposed nature of the site and the extreme winds that occur periodically, planting of isolated specimens of this tree is a recipe for failure. The species is a forest tree and is most suited to be grown in groupings. Isolated specimens are prone to branch failures and even whole tree failure, particularly when exposed to the winds which occasion this area.

Response

The Technical Working Paper: Urban Design in Volume 4 of the environmental impact statement provides landscape plans for the concept design. This document identifies that there would be a native plantings around the facility.

Urban design and landscape plans will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Issue description

Request for detailed plans and guarantees of minimum standards to ensure mature trees are replaced with suitably aged trees and not bushes and saplings.

Response

The Technical Working Paper: Urban Design in Volume 4 of the environmental impact statement provides landscape plans for the concept design. This document also identifies a number of urban design and landscape objectives which would guide the detailed design of this element of the project.

Urban design and landscape plans will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Issue description

The loss of vegetation around Hewitt Avenue will result in visual impacts. There is no mention of the re-vegetation in front of the wall at the end of Hewitt Avenue, clarification required in terms of what will be planted and whether it will provide screen to cover the wall.

It has been suggested that landscaping should be undertaken to mitigate some of the visual impacts. This could also help anti-graffiti and vandalism. Landscaping should range from basic tree plantings to frames for climbing plants.

Response

The Technical Working Paper: Urban Design in Volume 4 of the environmental impact statement provides landscape plans for the concept design. This document identifies that there would be native mass planting in front of the proposed noise wall.

Urban design and landscape plans will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the

Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Issue description

Request for decent landscaping to replace the bushland that was destroyed for the Hills M2 Motorway Upgrade project, and the rest of the bushland that will be lost with this round of widening.

Effort is required on the destruction of weeds and weed seeds before rehabilitation commences. Five years of genuine maintenance weeding should be undertaken.

Response

The Technical Working Paper: Urban Design in Volume 4 of the environmental impact statement provides landscape plans for the concept design. This document identifies that there would be a native mass planting in front of the proposed noise wall.

Urban design and landscape plans will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Ongoing maintenance would be undertaken by the motorway operator.

Issue description

Community and local council involvement in the urban design of the project is required due to its significant visual impacts in some locations.

An Urban Design and Landscaping Plan for surface and landscaped elements of the project should be prepared in consultation with the community and local government.

Response

Urban design and landscape plans will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Issue description

There is little information on the design and visual appearance of noise walls.

Response

Section 10 of the Technical Working Paper: Urban Design (Volume 4 of the environmental impact statement) provides principles for the design of noise barriers.

Urban design and landscape plans will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Issue description

Revegetation around the Trelawney Street facility should be done with a range of plants native to the region and include large trees, an intermediate understorey and ground cover. There also needs to be a long term maintenance plan in place.

Response

The Technical Working Paper: Urban Design in Volume 4 of the environmental impact statement provides landscape plans for the concept design. This document identifies that there would be native plantings around the facility.

Urban design and landscape plans will be further developed as part of the detailed design phase and documented in the Urban Design and Landscape Plan. As identified in the Community Communication Framework (Appendix D of the environmental impact statement), the Urban Design and Landscape Plan would be developed in consultation with the community and the relevant local council/s.

Ongoing maintenance would be undertaken by the motorway operator.

8.13.6 Operational light spill

Eight submissions raised issues regarding operational light spill.

Issue description

Concern about increased light spill over noise walls due to street lighting or tolling installations at the southern interchange, clarification requested to ensure that light spill will not increase.

Response

Table 7-144 of the environmental impact statement provides a summary of the operational night lighting impacts. The potential impacts to sensitive residential receivers around the southern interchange would be moderate.

As detailed in Table 7-145 of the environmental impact statement, additional light would be introduced to this area during operation associated with the on and off-ramp tunnel portals and the main alignment tunnel portals. Additionally, the toll gantries would require specific illumination. The motorway operations complex would have feature lighting and up lighting to the building elevations facing Pennant Hills Road. Safety and security lighting around the car park and access paths to buildings would also be required. The extent of glare emanating from the new lighting towards adjacent residential development is likely to be relatively low, given the design of the lighting and screening between project infrastructure and residential receivers.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts including operational lighting impacts. Cut-off and directed lighting would be used and lighting location considered to ensure glare and light spill are minimised.

Issue description

The properties at 16-24 Pennant Hills Road are directly across from the proposed new right hand turn lane from the M1 Pacific Motorway to Pennant Hills Road. These houses will have direct headlight pollution into their homes from this new right turn lane.

Response

The detailed design of the new right turn lane would aim to reduce any potential impacts associated with headlight glare to residential receivers. This location is currently lit at night from street lights and is already somewhat affected by headlights from vehicles on the existing roads.

Issue description

Fences should be built for properties on Hewitt Avenue to prevent head light glare from vehicles.

Response

The proposed noise wall between the Hewitt Avenue residences and the M1 Pacific Motorway would prove a barrier to head light glare.

Motorists turning around in Hewitt Avenue would be expected to relatively minor and would not result in a significant change to residences in relation to head light glare.

Issue description

Concerned regarding light intrusion from the southern interchange compound during operation.

Discussions on this subject within the environmental impact statement are irrelevant and ridiculous given that it admits that there has been no existing light measurement, so there is no bench mark to compare data with, and there is no lighting plan, for either the construction or operation phase, in existence. This means that there is no scrutiny of the proposed lighting and no opportunity for those most affected by it to comment.
Impact of vehicle lights entering and exiting the site.

Response

Table 7-136 of the environmental impact statement provides consideration of the potential impacts from night lighting at the motorway operations complex. Residential areas along the Hills M2 Motorway would generally be screened from the lighting by existing vegetation or noise barriers.

Table 7-146 of the environmental impact statement identifies mitigation measures to reduce the potential visual impacts including operational lighting impacts.

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8.14 Biodiversity

8.14.1 Vegetation clearing

Seventy three submissions raised issues regarding vegetation clearing.

Issue description

Concern regarding the clearing of vegetation between the residential property boundary and the Hills M2 Motorway. Clearance of vegetation will destroy flora and fauna. Specific areas of concern include:

- Between the residential property boundary and the Hills M2 Motorway. (Coral Tree Drive).
- On the northern side of the Hills M2 Motorway near Lisle Court. Vegetation provides a screen to the high wall on the Hills M2 Motorway.
- Along the southern side of the Hills M2 Motorway.

Response

Section 7.6 of the environmental impact statement provides a biodiversity impact assessment. For the purposes of the assessment a worst-case area of vegetation clearing was assumed.

In the vicinity of Coral Tree Drive, clearing of vegetation is required to facilitate the construction of the new off-ramp connecting the southbound main alignment tunnel to the Hills M2 Motorway.

In the vicinity of Lisle Court, clearing of vegetation is required to facilitate the construction of the new on-ramp connecting the Hills M2 Motorway to the northbound main alignment tunnel, and potentially for the augmentation of an existing surface water detention basin.

Opportunities to limit the extent of clearing would be investigated during the detailed design stage. Any residual land between operational infrastructure and adjoining properties would be landscaped to provide a visual buffer.

Issue description

The amount vegetation will be removed around the southern interchange has not been made clear.

Response

The environmental impact statement has undertaken a conservative assessment of vegetation clearing by assuming that all vegetation within the construction footprint will be cleared. The construction footprint in the area is provided in Figure 5-27 of the environmental impact statement. Notwithstanding, opportunities to limit the clearing of vegetation will be investigated during the detailed design stage.

Issue description

Bushland behind homes along the Hills M2 Motorway to the west of Barclay Road will be lost.

Response

The environmental impact statement has undertaken a conservative assessment of vegetation clearing by assuming that all vegetation within the construction footprint will be cleared. In relation to the section along the Hills M2 Motorway to the west of Barclay Road,

the construction footprint, as shown in Figure 5-25 of the environmental impact statement, encompasses the majority of the area between the adjoining property boundary and the motorway. Opportunities to limit the clearing of vegetation will be investigated during the detailed design stage.

Issue description

The removal of vegetation around Hewitt Avenue will remove the habitat of birds.

Response

The vegetation clearing in this location is relatively minor in nature. Whilst it may result in some loss of habitat for birds, there is sufficient alternative habitat in the vicinity.

Appropriate native vegetation species would be used for landscaping, and consideration would be given to the potential habitat value of landscaping for native birds and other fauna.

Issue description

The Junction Road compound will also have a major impact on the local ecology.

Response

The clearing of vegetation for the Junction Road compound has been considered and assessed in Section 7.6 of the environmental impact statement. The use of this compound is temporary for the construction period only. This area would be rehabilitated with native vegetation following construction.

Issue description

The construction and operation of the tunnel should not risk any damage to vegetation and native fauna.

Response

Section 7.6 an Appendix J of the of the environmental impact statement provide an assessment of the potential biodiversity impacts.

The project has been designed to avoid and minimise impacts on native vegetation, particularly critically endangered ecological communities such as Blue Gum High Forest.

The assessment recommends mitigation measures to limit impacts to vegetation and provides an offset calculation for impacts which cannot be avoided. Further opportunities to limit the clearing of vegetation will be investigated during the detailed design stage. At this stage, biodiversity offset requirements would be recalculated.

Issue description

The Trelawney Street compound would require the removal of two large Blue Gum trees. The assessment of these trees as part of the environmental impact statement was cursory.

These trees should be retained.

Response

The environmental impact statement has undertaken a conservative assessment of vegetation clearing by assuming that all vegetation within the construction footprint will be cleared. In some areas during the assessment there were limitations to site access. Assessments were therefore undertaken based on what could be determined from roadside assessment and aerial photography. These areas would be considered in more detail prior to construction.

Opportunities to the retention of existing large tress would be considered during the detailed design and construction planning stages,

8.14.2 Impacts to endangered ecological species

Sixty four submissions raised issues regarding impacts to endangered ecological communities.

Issue description

Extension of the existing detention basin on the northern side of the Hills M2 Motorway behind the residences in Lisle Court should be minimised as far as possible so that it does not encroach on the Council Reserve, which contains Sydney Blue Gums.

Response

As identified in Section 7.9.3 of the environmental impact statement, existing surface water detention basins along the Hills M2 Motorway would be augmented in order to ensure that the drainage system continues to operate the with the same design capacity as the current situation.

In the case of Lisle Court, the environmental impact statement has undertaken a worst-case assessment in assuming that the entire area would be required in order to provide a larger detention basin in the location. The exact capacity requirements would be subject to the detailed design stage (subject to the project being approved). During the detailed design stage, options would also be investigated to achieve the necessary capacity with minimal impacts to Lisle Court. This would include consideration of options such as deepening the existing basin where feasible and reasonable.

Issue description

Concerns regarding the destruction of Blue Gums behind properties for the relocation of the noise barrier.

Response

A biodiversity impact assessment is provided in Section 7.6 and Appendix J of the environmental impact statement. This includes an assessment of potential impact to Blue Gum individuals and Blue Gum High Forest.

The assessment recommends mitigation measures to limit impacts to vegetation and provides an offset calculation for impacts which cannot be avoided. Further opportunities to limit the clearing of vegetation will be investigated during the detailed design stage. At this stage, biodiversity offset requirements would be recalculated.

Issue description

The northern interchange compound (C9) will result in the removal of 1.14 ha of critically endangered Blue Gum High Forest. The project would require 10 per cent or 17.52 hectares of all remaining Blue Gum High Forest to the protected and conserved.

Belief the impact is unnecessary and could be avoided.

Response

The project has been designed to avoid and minimise impacts on native vegetation, particularly Blue Gum High Forest. The potential impacts and removal of Blue Gum High Forest is considered and assessed in Section 7.6 and Appendix J of the environmental impact statement.

The assessment recommends mitigation measures to limit impacts to vegetation and provides an offset calculation for impacts which cannot be avoided. Further opportunities to limit the clearing of vegetation will be investigated during the detailed design stage. At this stage, biodiversity offset requirements would be recalculated.

Issue description

Object to the removal of endangered flora and fauna, especially Blue Gum High Forest at:

- The southern interchange compound / motorway operations complex.
- On Trelawney Street, Nelson Street, and Loch Maree Avenue around the Trelawney Street site.

Response

The location of the proposed southern ventilation outlet and motorway operations complex does not contain Blue Gum High Forest, threatened flora species or habitat for threatened fauna species.

There are some Blue Gum individuals in the vicinity of the Trelawney Street site which may need to be removed. Opportunities to retain these trees would be considered during the detailed design stage.

The project has been designed to avoid and minimise impacts on native vegetation, particularly Blue Gum High Forest. The potential impacts and removal of Blue Gum High Forest is considered and assessed in Section 7.6 and Appendix J of the environmental impact statement.

Issue description

Concerns regarding impacts to Blue Gum High Forest from groundwater drawdown.

Response

The project has been designed to avoid and minimise impacts on native vegetation, particularly Blue Gum High Forest. The potential impacts on Blue Gum High Forest is considered and assessed in Section 7.6 and Appendix J of the environmental impact statement.

The Blue Gum High Forest and Blue Gum individuals in the vicinity of the project have not been identified as being dependent on groundwater.

The assessment recommends mitigation measures to limit impacts to vegetation and provides an offset calculation for impacts which cannot be avoided.

8.14.3 Aquatic environment and changes to hydrology

Fifty five submissions raised issues regarding the aquatic environment and changes to hydrology.

Issue description

The creek running through the reserve at Lisle Court provides for a considerable population of birds, frogs, ducks, eels and water monitors. The creek should not be piped.

Response

As identified in Section 7.9.3 of the environmental impact statement, existing surface water detention basins along the Hills M2 Motorway would be augmented in order to ensure that the drainage system continues to operate with the same design capacity as the current situation.

In the case of the environment around Lisle Court, the environmental impact statement has undertaken a worst-case assessment which assumes that the entire area would be required to be cleared of vegetation in order to provide a larger detention basin in the location. The exact capacity requirements would be subject to the detailed design stage. During the detailed design stage, options would also be investigated to achieve the necessary capacity with minimal impacts to Lisle Court. This would include consideration of options such as deepening the existing basin where feasible and reasonable. The aim of these considerations during detailed design will be to minimise the extent of vegetation clearing required, where feasible and reasonable. Disturbed areas will be rehabilitated and landscaped consistent with the landscaping measures outlined in the environmental impact statement.

As identified in Section 7.6.4 of the environmental impact statement, pre-clearing surveys would be undertaken prior to works commencing by a suitably qualified ecologist. As part of this process, immobile native fauna would be relocated to appropriate alternative habitat.

Issue description

The Spring Gully Creek (Cockle Creek) riparian zone would be destroyed. The environmental impact statement identifies this location as ‘weeds’. This statement is incorrect as there are many mature eucalypts, western red cedar trees and ferns as well as local micro-environment fauna such as a colony of water dragons, green tree frogs, wallaby, blue tongue lizard and ducks.

Response

A biodiversity impact assessment has been carried out and is provided in Section 7.6 and Appendix J of the environmental impact statement. The assessment considers clearing of native vegetation, potential impacts to threatened flora and fauna, and potential indirect impacts such as the spread of weeds, and the potential impacts to Cockle Creek.

As the project would only involve minor additions to existing infrastructure within the Cockle Creek riparian corridor, it is unlikely that significant impacts on the riparian corridor would result from the project.

In addition, potential impacts to aquatic fauna in the upper reaches of Cockle Creek in proximity to construction areas are likely to be limited given the already degraded condition of the environment and the lack of habitat. The section of the creek within the worst case M1 Pacific Highway tie-in works disturbance footprint contains no aquatic assemblages (macrophytes or fringing aquatic vegetation), is in poor condition and unable to support fish life. Impacts to the higher quality environment further downstream would be avoided through the use of erosion and sedimentation controls and the stabilisation of banks where

necessary. Mitigation measures identified in Section 7.6.4 of the environmental impact statement would be implemented to further reduce potential impacts on the Cockle Creek riparian corridor.

The mapping of this area as 'weeds' refer to the fact this it does not comprise a cohesive native vegetation community. It is acknowledged that this area does provide habitat value for a range of fauna. This does not affect the results of the biodiversity assessment.

8.14.4 Indirect and other impacts

Seven submissions raised issues regarding indirect and other biodiversity impacts.

Issue description

Flora and fauna in the area will disappear (Gum Grove Place). Impacts to flora and fauna must be taken seriously and must be mitigated.

Response

The environmental impact statement provides an assessment of potential biodiversity impacts in Section 7.6. Vegetation within the vicinity of Gum Grove Place has generally been identified as 'urban native' with some exotics, which has re-grown following the construction of the Hills M2 Motorway. The assessment identifies that this vegetation would be cleared in order to facilitate construction of the northbound connection to the NorthConnex tunnel.

Although this vegetation is likely to be utilised by a range of fauna species, it has not been identified as key habitat. Alternative habitat would be available for fauna in the nearby Bidjigal Reserve. The potential for habitat rehabilitation and reinstatement would be considered as part of the development and implementation of landscaping across areas disturbed during construction of the project.

The project has aimed to avoid impacts to significant ecological areas as far as feasible and reasonable. For example, the project has avoided impacts to a significant section of Blue Gum High Forest in the vicinity of Brickpit Park and Kenley Park.

Where impacts could not be avoided, biodiversity mitigation measures and offset requirements have been provided in Section 7.6.4 of the environmental impact statement. These are consistent with the Principles for the use of Biodiversity Offsets in NSW (DECCW, 2008) and the NSW Offset Principles for Major Projects (state significant development and state significant infrastructure) (OEH, 2013).

Issue description

Exhaust gases and heat from the ventilation facilities will have a detrimental effect on flora and fauna, potentially damaging the local ecosystem.

Response

The environmental impact statement provides a human health risk assessment in Section 7.4 and Appendix H. The human health risk assessment found that the emissions from the ventilation outlet would have a very low impact on human health. Based on these findings, it can be extrapolated that the emissions from the project ventilation outlets would have a similar, negligible impact on nearby flora and fauna.

Issue description

Properties along Nelson Street, Trelawney Street and Loch Maree Avenue contain very large Sydney Blue Gum trees (some of these are protected and have a historical connection to the original indigenous communities). The construction of the current tunnel alignment would have unsafe environmental impacts including the possibility of these trees falling onto residential homes and properties.

Response

The tunnel alignment in the vicinity of Nelson Street, Trelawney Street and Loch Maree Avenue is around 20 to 50 metres below ground level. A tunnel at this depth would not have any impacts on the viability or structural integrity of the trees above.

Issue description

Questions raised regarding the biodiversity assessment. Considering the proposed location for the northern portal and the outlet has only recently been changed how can the area have been appropriately surveyed? Frogs and all of the native flora and fauna in the area need to be accurately recorded and monitored over the course of a year to create an accurate baseline.

Response

The biodiversity assessment has been undertaken in accordance with the Director-General's environmental assessment requirements and the relevant government guidance documents.

Surveys were completed across the project area including the locations around the northern portals and ventilation outlet. Baseline data over a year is not required in order to identify potential habitat value and adequately assess the potential impacts.

8.14.5 Biodiversity management and offsets

Four submissions raised issues regarding biodiversity management and offsets.

Issue description

The environmental impact statement does not identify Blue Gum High Forest biodiversity offsets and therefore does not comply with the Director-General's requirements.

The project should consider acquiring properties along Pennant Hills Road to extend the park and plantings to compensate for the loss of vegetation in the area, including a significant Blue gum tree on Pennant Hills Road.

Response

The clearing of vegetation has been assessed in Section 7.6 of the environmental impact statement. Biodiversity mitigation measures and offset requirements, consistent with the Principles for the use of Biodiversity Offsets in NSW (DECCW, 2008) and the NSW Offset Principles for Major Projects (state significant development and state significant infrastructure) (OEH, 2013) are provided in Section 7.6.4 of the environmental impact statement.

The environmental impact statement identifies that the offset calculation would be reviewed and refined in consultation with the Office of Environment and Heritage and the Department of Planning and Environment as part of the Biodiversity Offset Strategy. Previously unsurveyed areas would be surveyed, then offset calculations would be refined based on that additional information, plus potential reduction in vegetation disturbance due to a refinement of the detailed design and construction methodologies.

On completion of the project, Roads and Maritime would investigate options for the use of residual land. This may include returning land to the community in the form of parks or recreational areas or selling land for redevelopment in accordance with the relevant existing land use zonings.

Issue description

A plan should be developed as to how the vegetated area would be cleared of hosted species. Relocation plans must be prepared and implemented. The management of venomous species needs special care.

Response

A flora and fauna management plant would be developed prior to the commencement of construction. This would include pre-clearing surveys and any necessary relocation of wildlife.

8.15 Social and economic

8.15.1 Social and community impacts

Ninety four submissions raised issues regarding social and community impacts.

Issue description

The northern ventilation outlet will disrupt the Wahroonga community by:

- Impacting quality of life, especially for the young and elderly
- Affecting community cohesion, with potential of community fragmentation. Long term residents have already moved away.
- Impacting local school enrolments (adverse result of air quality impacts)
- Having a long term negative impact on an established suburb.

Response

It is acknowledged that the construction of the northern ventilation facility would result in some disruption to the community in the vicinity of the works. This would include potential for noise, traffic, dust and visual impacts. These impacts have been assessed, and feasible and reasonable mitigation measures identified in the relevant sections of the environmental impact statement.

The potential for ongoing community fragmentation or severance in Wahroonga is limited considering the M1 Pacific Motorway currently forms a barrier between communities. The project would not result in a new barrier or changes to accessibility across this motorway corridor.

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrates that the NorthConnex project in its current form would meet ambient air quality criteria and would pose a very low risk to human health. In this context, there is not anticipated to be any impact to the enrolment of children in schools in Wahroonga.

Construction planning would be further developed during the detailed design of the project. This would include prioritising construction staging from the M1 Pacific Motorway corridor, where feasible and reasonable, rather than from surrounding local streets.

Issue description

Roads and Maritime is acquiring the public reserve at the rear of Lisle Court, West Pennant Hills. This is a well-used public community area. Local residents and children use this area to ride bikes and play ball games and walk dogs. It has value for being separated from local roads with access only via two pedestrian laneways and therefore provides a safe area, particularly for small children.

Any extension to the existing detention basin must be minimised as far as possible to ensure that it does not unduly encroach on this reserve. After completion of works, any residual land should not be denied to the local community.

Response

Works in the vicinity of Lisle Court are required to facilitate the construction of the new on-ramp connecting the Hills M2 Motorway to the northbound main alignment tunnel, and potentially for the augmentation of an existing surface water detention basin.

Opportunities to limit the extent of works and the impact on the public reserve would be investigated during the detailed design stage. Roads and Maritime would consider minimising the acquisition to only the land required for the NorthConnex project. This would leave land not required for the NorthConnex project for community use.

Issue description

The project has not considered the well-being and quality of life of local residents, future health costs and school enrolments.

The route of the tunnels will have a negative effect on more residents and properties.

Response

It is acknowledged that the introduction of the project has the potential to result in impacts to the local community. These impacts, potentially including noise and vibration; air quality and visual impacts are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement has considered these potential impacts and demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

Issue description

The residents who live adjacent to the Hills M2 Motorway have to bear the consequences of this project – again, after already suffering through the Hills M2 Motorway, Westlink M7 Motorway and the Hills M2 Motorway Upgrade projects. The road moving closer to their homes, no increase in noise barrier heights, no reduction in speed limits, no measures to enforce speed limits. Extra traffic, extra noise, extra pollution– 24 hours a day, 7 days a week.

Response

It is acknowledged that the project has the potential to result in impacts to the local community. These impacts, potentially including noise and vibration; air quality and visual impacts are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement has considered these potential impacts and demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

Issue description

Concerns there will be added pressure on local hospitals and GP surgeries due to health impacts from the project.

Response

The air quality impact assessment and the human health risk assessment included in the environmental impact statement demonstrate that the NorthConnex project in its current form would meet ambient air quality criteria and would pose a very low risk to human health. In this context, it is not anticipated that there would any increase in pressure on local health services.

Issue description

Large public parks in the area are now surrounded by major roads and are isolated from communities.

Response

The NorthConnex project would improve traffic conditions on surface roads, especially through the removal of heavy vehicles. This would result in potential benefits along Pennant Hills Road, including improvements to accessibility to local public parks and amenities in general.

8.15.2 Construction amenity and traffic

One hundred and one submissions raised issues regarding construction amenity and traffic.

Issue description

Community will experience discomfort during construction

Response

It is acknowledged that construction works would result in impacts to the local community. These impacts, potentially including noise and vibration; air quality (particularly dust); visual impacts; and construction traffic are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

The environmental impact statement identifies feasible and reasonable management and mitigation measures in order to avoid or minimise these potential impacts.

Issue description

Concerns regarding disturbance during construction and turning leafy suburbs into giant construction zones. Specific areas include:

- Wahroonga.
- Northern interchange compound.
- Wilshire Avenue, Carlingford.
- Around the southern interchange.

Seeking assurance that there will be no adverse impacts as a result of construction works in the vicinity of Wilshire Avenue, Carlingford.

Response

Construction works would result in impacts to the local community. These impacts, potentially including noise and vibration; air quality (particularly dust); visual impacts; and construction traffic, are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures. Construction works would be limited in duration and any construction-related impacts on surrounding receivers would be temporary.

The environmental impact statement identifies feasible and reasonable management and mitigation measures in order to avoid or minimise these potential impacts.

Issue description

Removing large volumes of spoil will disrupt many people in their daily life, including as a result of heavy vehicles. This will also impact businesses as staff and deliveries will be delayed due to increased travel times.

Response

The environmental impact statement identifies that the project would generate large volumes of spoil. In order to reduce these impacts from any one location, the project propose to remove this spoil from four construction sites being:

- Southern interchange compound.
- Wilson road compound.
- Trelawney Street compound.
- Northern interchange compound.

The environmental impact statement includes an assessment of the identified impacts from removing this spoil. Further, the environmental impact statement identified feasible and reasonable mitigation measures to manage the identified impacts.

In some cases, such as traffic and construction traffic noise, the environmental impact statement has provided a worst-case assessment by providing an assessment of all spoil being transported in a northerly direction and all spoil being transported in a southerly direction. It is feasible that multiple spoil disposal sites may be utilised which would reduce the impact as described in the environmental impact statement.

Issue description

There will be significant disruption and diminished quality of life around the Trelawney Street compound.

Response

Construction works would result in impacts to the local community. These impacts, potentially including noise and vibration; air quality (particularly dust); visual impacts; and construction traffic, are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures. Construction works would be limited in duration and any construction-related impacts on surrounding receivers would be temporary.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the Trelawney Street compound (C7). As a result, heavy vehicle use of residential streets around the Trelawney Street compound has been avoided with reductions in potential traffic noise impacts as a result.

Changes made to access arrangements at the Trelawney Street compound are detailed and assessed in **Section 9.4** of this report.

Issue description

Issues related to parking on residential streets and construction worksites include:

- Clarification of project plan preventing construction workers parking on residential streets.
- Concern about limited on-street parking available on Loch Maree Avenue. Parking on the street already poses a safety risk to exiting driveways. Request that construction vehicles will not be allowed to park on the street on Loch Maree Avenue, Trelawney Street, Nelson Street, Greenhill Avenue, Stuart Street and Campbell Street. Suggestion to use existing car parks in Phyllis Avenue.
- All vehicles associated with the Trelawney Street site are to be completely banned from using Nelson Street, Trelawney Street or Lock Maree Avenue for access or parking.
- No parking spaces to be allowed on the site. The only parking should be at the Pioneer Avenue site.
- Other locations include Hewitt Avenue, around the southern interchange and around the Pioneer Avenue compound during the demolition stage and around the Bareena Avenue compound.

Response

The project includes the provision of a construction worker parking facility at Pioneer Avenue. This facility would provide a centralised parking area for the construction workers who would then be transferred to construction sites by bus. In the case of Trelawney Street, workers could also walk the short distance between the two sites.

In addition to this site, each construction site provides limited vehicle parking, off the local streets within the site compound.

These measures are intended to reduce the potential for construction workers to park on local residential streets.

The demolition phase for the Pioneer Avenue compound would be relatively short duration compared to the overall construction timeframe. Opportunities to avoid the parking of worker vehicles on the street during this period would be investigation as part of detailed construction planning. This potential minor impact should be considered against the significant benefits of providing this facility as opposed to worker parking on the streets around each of the construction facilities.

Issue description

Construction works will result in safety and privacy impacts. Residents will feel they cannot leave their windows open, will have to limit family time outside and limit children and pets playing outside.

Locations include along the Hills M2 Motorway, around the northern interchange compound and Hewitt Avenue

Response

Construction works would result in impacts to the local community. These impacts, potentially including noise and vibration; air quality (particularly dust); visual impacts; and construction traffic, are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures. Construction works would be limited in duration and any construction-related impacts on surrounding receivers would be temporary.

With respect to potential privacy impacts, all construction works would be planned and executed to minimise potential privacy issues with adjacent and surrounding receivers where feasible and reasonable.

Issue description

The Wilson Road compound (C6) would severely affect normal living at Killaloe Avenue and the ability to retire in the near future. This includes the use of heavy vehicles 24 hour per day and seven days per week.

Response

Construction works would result in impacts to the local community. These impacts, potentially including noise and vibration; air quality (particularly dust); visual impacts; and construction traffic, are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures. Construction works would be limited in duration and any construction-related impacts on surrounding receivers would be temporary.

Issue description

The proposed northern interchange will adversely affect the residents of local streets (Lucinda, Eastbourne, Exeter, Seton, Hewitt, Havilah, Hinemoa) by restricting access the shopping and medical facilities.

Response

Construction works would result in impacts to the local community. These impacts, potentially including noise and vibration; air quality (particularly dust); visual impacts; and construction traffic, are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures. Construction works would be limited in duration and any construction-related impacts on surrounding receivers would be temporary.

8.15.3 Operational amenity and traffic

Fifty nine submissions raised issues regarding operational amenity and traffic.

Issue description

Proposal in its current form will lead to a considerable loss of amenity in Wahroonga.

Response

Operational infrastructure at the northern end of the project has been located to be within and immediately adjacent to the M1 Pacific Motorway corridor. This will avoid or minimise direct and indirect impacts on surrounding residential areas.

The façade of the northern ventilation facility has been designed to provide a series of smaller elements to present a more domestic and small scaled appearance. This would be achieved through the combination of glass fibre reinforced concrete panels, sandstone, ‘timber-look’ battens and glazed openings to reflect the adjacent heritage residential area. This strategy is repeated in the design of the noise barrier which features sandstone planter boxes and ‘timber-look’ battens. Additionally, the landscaping around the facility is proposed to reflect the adjacent streetscape and heritage listed street trees.

Areas adjacent to the widened motorway to the east would be landscaped with native trees, shrubs and grasses to provide a visual screen between the residential area and the adjacent motorway.

Further information regarding the proposed urban design of the facility and landscaping is provided in Section 7.5 and Appendix I of the environmental impact statement.

Other changes in amenity during operation of the project may arise from traffic and noise. These potential impacts are assessed within Section 7.1 and 7.2 of the environmental impact statement respectively. Appropriate feasible and reasonable mitigation strategies including noise barriers and consideration of at-property treatment are proposed within the environmental impact statement.

Issue description

Quality of life around the southern ventilation outlet will deteriorate. It will affect all those living in the area, even down to the cleanliness of washing on the clothes line.

Response

Operational infrastructure in the vicinity of the southern interchange has been located within or immediately adjacent to the existing road reserves. Operational ancillary facilities have been co-located within the motorway operations complex adjacent to the major transport corridor of Pennant Hills Road and the Hills M2 Motorway in order to reduce the potential impacts to the local area.

It is acknowledged that the introduction of new infrastructure has the potential to result in impacts to the local community. These impacts, potentially including noise and vibration; air quality and visual impacts are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

Issue description

Do not feel comfortable living at such close proximity to the Wilson Road facility or the Trelawney Street facility. The safety of properties adjacent would be compromised as there would be no dwelling on one side. It would be open to intrusions, thefts and other anti-social activities. Security measures must be in place.

The facility will also be a target for graffiti.

Response

It is acknowledged that the introduction of new infrastructure has the potential to result in impacts to the local community. These impacts, potentially including noise and vibration; air quality and visual impacts are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

Operational ancillary facilities would be designed to meet the requirements of crime prevention through environmental design. This is likely to include appropriate low level lighting around the site and CCTV to monitor the site at all times. The facilities house plant and equipment vital to the safe operation of the tunnel infrastructure and accordingly a high level of security would be maintained.

Any graffiti on the facilities will be removed as soon as practical.

Issue description

The proposed new right hand turn lane from the M1 Pacific Motorway to Pennant Hills Road will impact the enjoyment of home across the road on Pennant Hills Road.

Response

It is acknowledged that the introduction of new infrastructure has the potential to result in impacts to the local community. These impacts, potentially including noise and vibration; air quality and visual impacts are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures.

Issue description

Impacts to parking and local roads along Aiken Road during operation.

Response

The motorway operations complex provides sufficient car parking for the workers who would be based at this site, and for any visitors. The project would not impact current car parking on Aiken Road or other roads in the area.

8.15.4 Impacts to economic output

One respondent raised issues regarding impacts to economic output.

Issue description

The proposed use of Phyllis Avenue for spoil trucks from the Trelawney Street compound may threaten the long term viability of maintaining current employment numbers at Bunnings.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the Trelawney Street compound (C7). Changes made to access arrangements at the Trelawney Street compound are detailed and assessed in **Section 9.4** of this report.

8.16 Hydrogeology and soils

8.16.1 Construction erosion and sedimentation

One respondent raised issues regarding construction erosion and sedimentation.

Issue description

The steep decline from Pennant Hills Road to residential properties has caused heavy runoff, erosion and damage to properties during severe storm events in the past. It is unclear how these issues will be managed during construction.

Response

Mitigation measures relating to erosion and sedimentation are provided in Table 7-179 of the environmental impact statement. This would include implementation of erosion and sediment control measures in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Volume 2D (DECC, 2008).

Measures would be put in place to ensure the existing situation is not made worse by the construction site.

8.16.2 Construction groundwater impacts

Seven submissions raised issues regarding construction groundwater impacts.

Issue description

Concerned about the depth of the tunnels under Eastbourne Avenue and the impact this will have on an underground spring in the area and the houses above. Clarification requested regarding the design in this location.

Placing large tunnels only relatively few metres below this water course risks damage to several properties.

Response

The groundwater impact assessment in Section 7.8 of the environmental impact statement provides consideration of potential impacts to groundwater and settlement related to groundwater drawdown which has the potential to result in property damage.

The assessment found that, in all cases, settlement due to groundwater drawdown would be less than three millimetres which is considered negligible and would only result in minor cosmetic damage.

The alignment of the tunnels in this location is provided on Figure 5-8 of the environmental impact statement. The depth of the tunnel is available from the geological long section in Appendix C of the environmental impact statement, or through the tunnel viewer on the NorthConnex website, Further details regarding the design would be available following the detailed design stage.

Issue description

The groundwater assessment is substandard and does not meet the Director-General's Requirements. It also does not provide sufficient assurance that significant groundwater settlement impacts and groundwater drawdown will not result from the construction of the tunnel.

Response

The groundwater impact assessment has been undertaken in accordance with the Director-General's environmental assessment requirements and considers potential groundwater drawdown during construction of the tunnels. This is provided in Section 7.8.3 of the environmental impact statement.

8.16.3 Settlement

Twenty one submissions raised issues regarding settlement.

Issue description

Various settlement instability and damage related issues including:

- The likelihood and magnitude of subsidence has not been addressed, including as a result of groundwater drawdown.
- Impacts to house foundations during tunnelling.
- Construction vibration and resulting localised instability unless rock bolting is carried out.
- Guarantee that there will be no damage to property.
- Potential damages to property as a result of tunnelling beneath houses.
- Individual property features have not been considered as part of the environmental impact statement.
- The information on geology is simplistic. The geology in the area has jointing and fractures which could cause problems.

Response

Prior to the commencement of tunnelling works, existing condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. In the unlikely event of damage caused by the construction of the NorthConnex project, it would be rectified by the contractor at no cost to the property owner.

In addition, the structural integrity of the tunnel would be assured during construction through the implementation of an appropriate construction methodology for the tunnelling conditions and ongoing tunnel support by way of techniques such as rockbolts and / or shotcrete lining as needed.

The geology of the area was influential in determining the tunnel vertical alignment. Hawkesbury Sandstone is considered an excellent tunnelling and excavation medium as it is high strength with relatively widely spaced defects. As a result, the tunnel has been designed to maximise the length of tunnel within Hawkesbury Sandstone. This has reduced the potential for ground movement and the associated impacts.

Despite this, some level of ground movement may still occur as a result of:

- Tunnel induced movement caused by the relief of stress from tunnelling through intact rock.
- Settlement induced from groundwater drawdown.

Consideration of these potential impacts in provided in Section 7.8 of the environmental impact statement. Preliminary ground movement investigations indicate that there may be

potential settlement of up to a maximum of 20 millimetres in areas where the main alignment tunnels and the on and off-ramp tunnels are shallower where they are approaching the surface. The remainder of the tunnel alignment would be expected to experience settlement impacts of less than five millimetres.

Settlement resulting from groundwater drawdown would be less than three millimetres in all cases.

Based on previous experience and research, this indicates that, in all cases, ground movement is likely to result in cosmetic damage only. For the majority of properties the anticipated impacts would be negligible, typically resulting in hairline cracking only.

It is acknowledged, however, that the risk to individual structures would be dependent on the geotechnical conditions, the depth of the tunnel, the number of storeys of the building, and the position, condition, and masonry of the structure itself. A such, the results presented are preliminary and do not take into account the specifics of each individual structure. Further assessments would be undertaken during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable mitigation and management measures required to minimise potential ground movement impacts.

Issue description

Requesting map of road alignment and affected properties (including construction phase).

Response

Properties which may be affected by vibration during construction are identified in Appendix F of the environmental impact statement. These vibration levels are predicted to be at a level which may be felt by receivers but would be below the level at which any building damage would be expected to occur.

As identified in Section 7.8 of the environmental impact statement preliminary ground movement investigations indicate that there may be potential settlement of up to a maximum of 20 millimetres in areas where the main alignment tunnels and the on and off-ramp tunnels are approaching the surface. The remainder of the tunnel alignment would be expected to experience settlement impacts of less than five millimetres.

Based on these predictions, ground movement is unlikely to result in any damage, but if it does occur it would be cosmetic damage only. For the majority of properties, the anticipated impacts are negligible. For a limited number of properties, ground movement may result in fine cracking.

These results are preliminary and do not take into account the specifics of the property itself. Further assessments would be undertaken during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable mitigation and management measures required to minimise potential ground movement impacts.

Issue description

Concerned regarding settlement and property impacts during construction along the Hills M2 Motorway.

Response

Surface construction works along the Hills M2 Motorway are not anticipated to result in any settlement impacts to adjacent properties.

Prior to the commencement of tunnelling works, existing condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. In the unlikely event of damage caused by the construction of the NorthConnex project, it would be rectified by the contractor at no cost to the property owner.

Issue description

The environmental impact statement should detail the effects on infrastructure out to 1,000 metres and until the impacts are negligible.

Response

The environmental impact statement provides an assessment of potential impacts to properties. As identified in Section 7.8 of the environmental impact statement preliminary ground movement investigations indicate that there may be potential settlement of up to a maximum of 20 millimetres in areas where the main alignment tunnels and the on and off-ramp tunnels are approaching the surface. The remainder of the tunnel alignment would be expected to experience settlement impacts of less than five millimetres.

Based on these predictions, ground movement is unlikely to result in any damage, but if it does occur it would be cosmetic damage only. For the majority of properties, the anticipated impacts are negligible. For a limited number of properties, ground movement may result in fine cracking.

Prior to the commencement of works, existing condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. In the unlikely event of damage caused by the construction of the NorthConnex project, it would be rectified by the contractor at no cost to the property owner.

Issue description

Settlement of the ground resulting in damage to buildings, public infrastructure (such as sewers, water reticulation networks, roads) and other structures. In some cases this settlement can result in the catastrophic failure of the ground causing sink holes to develop, similar the Lane Cove Tunnel collapse. This is particularly a risk for NorthConnex as the tunnels are predominately underneath houses and other built infrastructure.

Even some of the preliminary estimates of settlement due to groundwater drawdown of about 20 millimetres are extremely concerning especially for heritage items that will be impacted by vibration from tunnelling activities and surface works.

Response

The environmental impact statement provides an assessment of potential impacts to properties. As identified in Section 7.8 of the environmental impact statement preliminary ground movement investigations indicate that there may be potential settlement of up to a maximum of 20 millimetres in areas where the main alignment tunnels and the on and off-ramp tunnels are approaching the surface. The remainder of the tunnel alignment would be expected to experience settlement impacts of less than five millimetres.

Based on these predictions, ground movement is unlikely to result in any damage, but if it does occur it would be cosmetic damage only. For the majority of properties, the anticipated impacts are negligible. For a limited number of properties, ground movement may result in fine cracking.

Prior to the commencement of works, existing condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. In the unlikely event of damage caused by the construction of the NorthConnex project, it would be rectified by the contractor at no cost to the property owner.

Section 8.2 of the environmental impact statement considers the potential for tunnel collapse during construction and identifies appropriate construction methods to manage this potential impact.

8.16.4 Operational groundwater impacts

Nine submissions raised issues regarding operational groundwater impacts.

Issue description

Given that NorthConnex will be one of largest tunnels in the world (in terms of length and cross-sectional area) and will be unlined, the potential for significant inflow of groundwater and the lowering of the groundwater table is extremely high. Impacts from significant inflow and drawdown can include:

- Loss of access to water for existing groundwater users – if the drawdown of the groundwater table results in water levels decreasing to below the bottom of existing bores.
- Loss of flow in surface waterways – if there are flow connections between surface waterways and the groundwater, the drawdown of the groundwater table can result in an equivalent decrease in flow in surface waterways.

For NorthConnex a substantially more comprehensive groundwater assessment would be expected including

- Development of models of regional and local groundwater aquifers.
- Modelling of the impacts of both construction and operation on groundwater levels.
- A more detailed assessment of impacts on surface waterways flows and groundwater dependent ecosystems.
- An assessment on potential impacts to Blue Gum High Forest.
- Hydrogeological impacts on water flows to the Lane Cove National Park should be monitored and remedial action taken if required.
- Cumulative assessment of North West Rail Link and NorthConnex.

Response

The level of assessment of groundwater impacts was undertaken in accordance with the NSW Office of Water Aquifer Interference Policy. An empirical assessment of the lateral extent of potential groundwater drawdown in the Hawkesbury Sandstone as a result of groundwater into the project tunnels has been conducted using the Perrochet and Musy (1992) empirical method. The assessment shows a long-term quasi steady state drawdown scenario. Based on this model, the environmental impact statement considers the potential impacts of potential groundwater drawdown in Section 7.8.

The lateral extent of drawdown in the north is lower than in the south due to the shallower level tunnel and deeper incised watercourses, compared to the south with a deeper tunnel and shallower incised watercourses. Groundwater outflow to creeks through springs (if they are present), would not be affected outside the lateral extent of drawdown.

The lateral extent of groundwater drawdown intersects a number of surface watercourses in their headwaters. These include:

- Three un-named creeks around Normanhurst.
- Tedbury Creek.
- Berowra Creek.
- Devlins Creek.

With the exception of Devlins Creek, these surface watercourses are all concrete lined, or concrete piped systems where the lateral extent of groundwater drawdown intersects the watercourse. As such, drawdown impacts on these watercourses would not be anticipated.

Devlins Creek retains somewhat of a natural channel where the lateral extent of groundwater drawdown intersects the watercourse. Due to the relatively low hydraulic conductivity within the Hawkesbury Sandstone, the base flow in Devlins Creek would not be reliant on the surface expression of groundwater. Any baseflow within Devlins Creek fed by groundwater flows is anticipated to be negligible.

Additionally, as identified in the Technical Working Paper: Biodiversity (Appendix J to the environmental impact statement), there are no groundwater dependent ecosystems within this section of Devlins Creek, and there are no ecosystems along downstream sections of Devlins Creek which are reliant on the surface expression of groundwater. This suggests that the vast majority of water flow within Devlins Creek is from overland flow paths. As the NorthConnex project is located predominantly underground, there would be no change to overland flow paths.

The Groundwater Dependent Ecosystem Atlas identifies some areas of vegetation within the Berowra Valley Regional/ National Park and the Lane Cove National Park which are reliant on groundwater to various degrees. The Atlas does not identify any vegetation which is reliant on the surface expression of groundwater (ie baseflows of watercourses fed by groundwater). There is no direct connection between potential impacts on baseflows and these groundwater dependent ecosystems.

It is also relevant to note that the principal regulatory instrument – the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources prepared and published by the NSW Office of Water – does not identify any groundwater dependent ecosystems in either the Berowra Valley Regional/ National Park or the Lane Cove National Park. The closest groundwater dependent ecosystems to the project that are identified in the Water Sharing Plan are at Windsor (around 20 to 30 kilometres from the project at the closest point) and within the Botany Sands Aquifer (around 25 kilometres from the project and separated by Sydney Harbour). Both of these areas of groundwater dependent ecosystems mapped in the Water Sharing Plan are well beyond the area potentially affected by the project.

A cumulative impact assessment taking into consideration North West Rail Link is provided in Section 7.8 3 of the environmental impact statement.

The North West Rail Link is proposing to construct undrained tunnels (ie tunnels which are lined and minimise the ongoing inflow of water). The North West Rail Link construction methodology involved the erection of tunnel lining segments immediately following tunnel boring. As such, the potential for cumulative impacts would be limited to the concurrent construction phase of the project and the short period between North West Rail Link tunnel boring and tunnel lining.

8.17 Surface water

8.17.1 Construction water quality, treatment and discharge

Three submissions raised issues regarding construction water quality, treatment and discharge.

Issue description

Concerns regarding potential impacts to Cockle Creek during construction, including:

- The widening of the M1 Pacific Motorway will cause the destruction of the adjacent Cockle Creek and riparian area. This is a local landmark and should be preserved.
- The placement of the Junction Road compound increases the risk of a chemical spill going directly into the creek.

Response

Section 7.9.3 of the environmental impact statement identifies that there would be direct disturbance to Cockle Creek during construction. Where required, Cockle Creek would be realigned around permanent infrastructure. The creek would be rehabilitated to meet its existing or an improved quality.

As identified in Section 8.2 of the environmental impact statement, dangerous goods and hazardous substances would be appropriately stored on site in bunded areas to prevent the potential for a spill to the environment. Mitigation measure SW16 in Table 7-179 of the environmental impact statement also identified that spill kits would be kept readily available in the event of a spill.

Issue description

The environmental impact statement does not address water emitted through shafts and pumped drainage during construction.

Response

Section 7.9 of the environmental impact statement provides an assessment of potential surface water impacts during construction. This sections identifies that water captured in the tunnel (including shafts) would be pumped to four water treatment plants for treatment prior to disposal of the local watercourse system. Water would be discharged in accordance with the requirements of an environment protection licence.

8.17.2 Construction hydrology and flooding

Four submissions raised issues regarding construction hydrology and flooding.

Issue description

Concerns raised regarding the possibility of flash floods around Hewitt Avenue during the construction phase.

Response

The potential for flooding during construction is assessed in Section 7.9.3 of the environmental impact statement.

The project is not located in flood prone areas and would not be expected to significantly change the existing flood characteristics of the area. Appropriate erosion and sediment control measures would be implemented during the construction phase in order to manage the potential for erosion during rain events.

8.17.3 Operational drainage infrastructure

Two submissions raised issues regarding operational drainage infrastructure.

Issue description

The section of Pennant Hills Road between Russell Avenue and the Pacific Highway does not have any drainage pits and the runoff drains to Russell Avenue. This is ineffective and water ponds and runs across the road. The catchment of the additional lanes should not be directed into Russell Avenue and should be captured along Pennant Hills Road.

Response

The widening of Pennant Hills Road in this section would be designed in accordance with the Austroads and Roads and Maritime design standards to ensure a safe environment. This includes consideration of necessary drainage infrastructure.

Austroads is the association of Australasian road transport and traffic agencies. One of the functions of Austroads is to publish Guides to promote a nationally consistent approach to the design, maintenance and operation of road networks.

Details of the existing drainage infrastructure would be investigated during detailed design. Any necessary improvements or augmentation would be considered at this time.

Issue description

Submissions query as to what the capacity of the current detention basin adjacent to the reserve at Lisle Court is, whether it can cope with the 25 per cent extra run off and whether the size of the current detention basin can be increased to prevent the need for an additional pond?

Response

Works in the vicinity of Lisle Court are required to facilitate the construction of the new on-ramp connecting the Hills M2 Motorway to the northbound main alignment tunnel, and potentially for the augmentation of an existing surface water detention basin.

Opportunities to limit the extent of works and the impact on the public reserve would be investigated during the detailed design stage. Roads and Maritime would consider minimising the acquisition to only the land required for the NorthConnex project. This would leave land not required for the NorthConnex project for community use.

8.17.4 Operational water quality, treatment and discharge

Sixty two submissions raised issues regarding operational water quality, treatment and discharge.

Issue description

Disposal of the polluted water from the tunnels should be via sedimentation tanks.

Response

Water collected within the project tunnels during the operational stage would be captured and treated in the operational water treatment plant located within the motorway operations complex near the southern interchange. Water would be treated to an appropriate standard prior to discharge to a local watercourse. The project has been designed to achieve an operational water discharge quality up to the equivalent of the 95 per cent protection levels

specified for freshwater eco-systems in accordance with ANZECC guidelines (ANZECC & ARMCANZ, 2000). The discharge water quality level would be determined in consultation with the NSW Environment Protection Authority during the detailed design phase taking into consideration the current water quality of the receiving watercourses.

Further information regarding operational water treatment is provided within Section 7.9 3 of the environmental impact statement.

Issue description

Submissions raised issues regarding Blue Gum Creek and include:

- The project will exacerbate existing issues in Blue Gum Creek from the operational groundwater discharge (up to 40 litres per second) and the increase in stormwater flows.
- It is essential that an ongoing monitoring and maintenance program is implemented to ensure the long term creek health and prevent further damage.
- Clarification needs to be provided regarding the volume of water that will flow into Blue Gum Creek from the water treatment plant adjacent to the southern ventilation outlet.
- Will the water leaving the tunnel storage plants be absolutely pollutant free? What guarantees are there? Who will be responsible for monitoring the purity of the water discharged from the storage treatment facility downstream?
- That an independent organization should monitor the toxicity of the water and the rate at which it is released into Blue Gum Creek.

Response

Section 7.9.3 of the environmental impact statement identifies the potential impacts to Blue Gum Creek from the discharge of water from the operational water treatment plant. The potential impacts identified include potential increased erosion, increased localised flooding and increased damage to public and private assets.

As identified in Section 7.9.3 of the environmental impact statement, discharge to the Blue Gum Creek could be up to 40 litres per second. The operational water treatment plant has been designed to achieve a maximum water discharge quality equivalent to the 95 per cent protection level specified for freshwater ecosystems in accordance with ANZECC guidelines (ANZECC and ARMCANZ, 2000). The discharge water quality level would be determined in consultation with the NSW Environment Protection Authority during the detailed design phase taking into consideration the current water quality of the receiving watercourses.

The environmental impact statement commits to further investigation in relation to the exact location of the operational water discharge location. At this stage, additional mitigation measures such as stream bed and bank stabilisation, or re-sizing of existing drainage infrastructure would be determined based on the location of discharge and a more detailed examination of any potential impacts. Detailed design of the discharge and identification of an appropriate location for the discharge would take into account potential geomorphic, property and ecological impacts.

Existing detention basins on the Hills M2 Motorway would be augmented is necessary to ensure that the Hills M2 Motorway drainage system continues to operate at the same design capacity as the current situation.

Additionally, the quality of the water discharged from the water treatment plant is likely to be significantly better than the water currently in Blue Gum Creek. This has the potential to result in improved ecological conditions within this stretch of the watercourse.

Issue description

Surface water flow from a roadway is unlikely to improve the quality of water in the stream. The surface water impacts will most likely degrade the health of Darling Mills Creek.

Response

Section 7.9.3 of the environmental impact statement identifies the potential impacts to Blue Gum Creek and Darling Mills Creek as a result of the project. This assessment identifies that the residual impact to Blue Gum Creek and Darling Mills Creek would include:

- Increased flows resulting from increased sizes of detention basins.
- Potential for localised flooding during high rainfall events.
- Potential for bed and bank instability.
- Discharge of water from the operational water treatment plant.

These impacts are assessment in the surface water impact assessment provided in Section 7.9 of the environmental impact statement. This assessment has been undertaken consistent with the requirements of the Director-General's environmental assessment requirements.

The operational water treatment plant has been designed to achieve a maximum water discharge quality equivalent to the 95 per cent protection level specified for freshwater ecosystems in accordance with ANZECC guidelines (ANZECC and ARMCANZ, 2000). The discharge water quality level would be determined in consultation with the NSW Environment Protection Authority during the detailed design phase taking into consideration the current water quality of the receiving watercourses.

8.17.5 Operational hydrology and flooding

Fifty seven submissions raised issues regarding operational hydrology and flooding.

Issue description

The project will exacerbate existing flooding conditions on Blue Gum Creek. Every care should be taken to avoid flooding the homes located close to the creek. Clarification needed on procedures and checks have been put in place to ensure that properties near the Blue Gum Creek are not flooded as a result of water released by the storage treatment plant.

Response

As identified in Section 7.9.3 of the environmental impact statement, the anticipated flows from the water treatment plant would be negligible compared to the peak flows in Blue Gum Creek.

Notwithstanding, the environmental impact statement identifies and assesses the potential impact associated with this discharge. The environmental impact statement commits to further investigation in relation to the exact location of the operational water discharge location. At this stage, additional mitigation measures such as stream bed and bank stabilisation, or re-sizing of existing drainage infrastructure would be determined based on the location of discharge. Detailed design of the discharge and identification of an appropriate location for the discharge would take into account potential geomorphic, property and ecological impacts.

8.18 Non-Aboriginal heritage

8.18.1 Direct impacts to heritage items

Fifteen submissions raised issues regarding direct impacts to non-Aboriginal heritage items.

Issue description

The heritage chapter of the environmental impact statement is inconsistent and in many cases uses outdated assessment as the foundation of investigation for impacts which have not been adequately addressed. Some statements of significance have focussed on unsympathetic aspects rather than the excellent condition of properties.

Future panning has been left to detailed design. Clarification on the future processes needs to be provided.

Response

The assessment undertaken has appropriately used the current (at time of preparation) statement of significance contained within the statutory listing for each of the non-Aboriginal heritage items and heritage conservation areas. As identified by Ku-ring-gai Council in their submission, any discrepancies between the statements of significance do not affect the outcomes of the assessment.

Issue description

The construction and operation of the tunnel should not risk any damage to local heritage items.

Response

Section 7.10 and Appendix L of the environmental impact statement provide an assessment of potential impacts to non-Aboriginal heritage items. The tunnel and the location of surface infrastructure has been design to avoid and minimise direct and potentially indirect impact to local heritage as far as feasible and reasonable. Where this was not possible, appropriate mitigation and management measures have been recommended as part of the assessment.

Issue description

The environmental impact statement does not identify all heritage listed properties.

Response

Figure 7-82 of the environmental impact statement identifies all heritage items in the vicinity of the project. Heritage items assessed in more detail are those where there is potential for direct or indirect impacts to occur.

Issue description

The Pioneer Avenue compound will result in the loss of a significant industrial heritage item. Another less sensitive site within the industrial area should be used.

Response

Section 7.10.3 of the environmental impact statement provides an assessment of the potential impacts to the Thornleigh Maltworks. It is acknowledged in Table 7-85 that the project has the potential to result in significant impacts to the heritage value of this site.

As such, mitigation measures are proposed including the retention of the germination building, an archival recording of the industrial site to record the connection of the original

structures with the modern structures, and an archaeological test excavation program (refer to mitigation measure NAH8 in Table 7-186 of the environmental impact statement.

Issue description

Given the range of profiles the tunnel will pass through it is highly probable that fossils will be exposed. This needs to be considered in work procedures. A plan that considers fossil finds needs to be developed.

Response

Mitigation measure NAH1 identifies the standard procedure to follow in the event of unexpected heritage finds. This includes stop work procedures and notification to the NSW Heritage Branch.

8.18.2 Impacts to heritage conservation areas

Twenty nine submissions raised issues regarding impacts to heritage conservation areas.

Issue description

Concerns regarding the introduction of a ventilation outlet in the middle of the North Wahroonga Heritage Conservation Area. Specific concerns include:

- The design of an ugly, bulky, featureless, industrial style ventilation outlet. It is not consistent with the adjacent heritage conservation area. The heritage conservation area is a symbol of Sydney and Australian history
- The adjacent properties that are all less than six metres in height. A 15 to 30 metre tall ventilation outlet is not consistent with the adjacent area.
- The integrity and quality of development pattern, the built form and the landscapes exhibit a rich combination of heritage value. Acquired properties in the heritage conservation area will destroy the heritage conservation area.
- The impact on heritage values needs to be re-assessed in consideration of the visual impact.
- The ventilation outlet which will be highly visible from both sides of the M1 Pacific Motorway.
- That the impacts to the heritage conservation area from the ventilation outlet are significant and will destroy the heritage values and styles in the area. Alternative options are available which would preserve and maintain the heritage conservation area.

Response

The northern ventilation facility has not been located in the middle of the heritage conservation area. The facility is located adjacent to an existing infrastructure corridor on the edge of the heritage conservation area. Once complete, this facility would form part of the infrastructure corridor. A total of three properties are being acquired within this heritage conservation area, all of which are located on the edge of the conservation area, adjacent to the existing M1 Pacific Motorway corridor.

The ventilation facility design within the environmental impact statement would generally be around 13 metres high above the existing ground level on the site. The ventilation outlet would form a discrete raised section above the rest of the facility. The outlet as described in the environmental impact statement would be around 15 metres above the surrounding residential land, and around 23 metres above the M1 Pacific Motorway road level. As the landform drops towards the M1 Pacific Motorway from the residential area, the main part of

the facility would not be viewed as being significantly higher than the adjacent two storey residential developments.

Based on this balanced consideration of environmental and land use impacts, engineering feasibility and cost (refer to **Section 3.2** of this report) the height of the ventilation outlets has been increased by five metres. A revised assessment of this increased ventilation outlet height is provided in **Section 9.2** of this report. This only affects the height of the discrete raised section of the facility and not the remainder of the building.

Section 7.5.5 of the environmental impact statement identifies that the facility would be visually contrasting with the adjacent area. The overall visual impact of the facility from the surrounding residential receivers has been assessed to be high to moderate.

In order to reduce this potential impact, the façade of the northern ventilation facility has been designed to provide a series of smaller elements to present a more domestic and small scaled appearance reflective of existing development in the area. This would be achieved through the combination of glass fibre reinforced concrete panels, sandstone, 'timber-look' battens and glazed openings to reflect the adjacent heritage residential area. This strategy is repeated in the design of the noise barrier which features sandstone planter boxes and 'timber-look' battens. Additionally, the landscaping around the ventilation facility is proposed to reflect the adjacent streetscape and heritage listed street trees.

Section 7.10.3 of the environmental impact statement provides an assessment of the potential impacts to this heritage conservation area which includes consideration of visual impacts. The Wahroonga North heritage conservation area is part of a larger landscape of existing roads, houses and vegetation. It is important as a reference site for Hornsby, particularly in relation to the early development of the area. The area has potential to reveal its pre-Victorian development and use through research. The heritage conservation area demonstrates the post 1892 residential development of the area, exhibiting built and landscape qualities that are becoming rare within Hornsby.

Impacts to heritage values within the conservation area would be localised to specific areas on the edge of the conservation area and already associated with major transport network infrastructure. The northern ventilation facility would not impact on the existing streetscape or development pattern of the heritage conservation area. The overall heritage value of the heritage conservation area would not be significantly impacted by the proposed works.

8.18.3 Potential indirect impacts

Fourteen submissions raised issues regarding potential impacts and indirect impacts to non-Aboriginal heritage items.

Issue description

The northern ventilation facility is very close to heritage listed properties in the area including:

- "Neringla" built in 1895 is only six to eight metres away.
- "Cherrygarth" built in 1897 is less than 30 metres away.
- "Highlands House" built in 1892 is around 300 to 400 metres away and is a State significant heritage property.

Concerns raised regarding the impact of vibration to these properties. The heritage impact is significant.

Response

Section 7.10.3 of the environmental impact statement provides an assessment of the potential impacts to non-Aboriginal heritage items.

“Highlands House” is located around 350 metres from any proposed works. This heritage property does not have views to any element of the project. There is no potential for impacts to this property from the project.

“Neringla” and “Cherrygarth” are located opposite the northern ventilation facility. Impacts to these properties may include vibration and settlement from surface works or tunnelling, and visual impacts. These impacts are assessed in Table 7-185 of the environmental impact statement. Impacts to these properties from settlement and vibration would be negligible. An existing condition survey would be undertaken prior to construction works in the vicinity of the two heritage items and a program of monitoring would be implemented to identify early potential risks to each site.

Noise barriers and landscaping would provide some visual screening between the project and the heritage items, once established. However, the taller components of the northern ventilation facility would be located further north and may be visible above the noise barriers. Existing vistas and view lines from the property would be considered during detailed design, including rehabilitation strategies that are sympathetic to the heritage items.

Overall, it is concluded that the heritage value of the listed items would not be significantly affected by the project and associated works.

Issue description

The vibration monitoring scope in relation to heritage properties is not defined. Furthermore the mitigation measures for construction vibration do not specifically mention heritage items and the assessment, while mention of heritage structures in the noise assessment report is rudimentary.

Response

The vibration assessment concludes that the structural damage levels would not be exceeded from tunnelling works and provides safe working distances for surface plant and equipment. This inherently includes consideration of heritage items.

The non-Aboriginal heritage assessment within Section 7.10 of the environmental impact statement also considers the potential for vibration impacts to heritage items.

Mitigation measure NAH5 identifies mitigation measures in relation to vibration and heritage items, including existing condition surveys and vibration monitoring during construction as required. The exact nature of the vibration monitoring would depend on the anticipated impact to each of the heritage items.

Issue description

Acoustic mitigation works on heritage properties should be excluded from the project as they are not defined and their significance have not been assessed. Therefore it is impossible to assess their impacts.

Response

Section 7.10.3 of the environmental impact statement provides consideration of potential acoustic treatment and heritage items. This section identifies that the need for acoustic treatment at each property would be confirmed during detailed design, in consultation with landowners, and with consideration of potential impacts to heritage values.

Should at-property acoustic treatment be required for listed heritage items, this may result in impacts to the fabric of these items. Treatment would be sympathetic to the heritage values of each item and would be undertaken in accordance with the Burra Charter, which stipulates that changes which reduce cultural significance should be reversible.

Issue description

The assessment of visual impacts on heritage values is cursory and does not cross-reference the visual impact assessment.

In relation to 4 Burns Road the potential visual impact described in the environmental impact statement will not be screened by neighbouring properties, as these properties are marked for acquisition and demolition. The environmental impact statement should be amended to address this potential impact.

Response

Section 7.10.3 of the environmental impact statement provides consideration of potential visual impacts to heritage items.

Existing vistas and view lines from the property would be considered during detailed design, including rehabilitation strategies that are sympathetic to the heritage items.

Table 7-185 of the environmental impact statement identifies that there would be potential visual impacts to 4 Burns Road (LEP ID I855). Potential for visual impacts would be re-considered during the detailed stage of the project.

In this location, proposed landscaping treatments would minimise the potential for visual impact to and from this property.

Issue description

Concern about potential impacts to heritage items including:

- Vibration impacts.
- Settlement impacts.
- Social impacts.

The heritage chapter of the environmental impact statement has inconsistencies and out of date significance assessments.

Response

Section 7.10.3 and Appendix L of the environmental impact statement provide an assessment of the potential impacts to non-Aboriginal heritage items. The tunnel and the location of surface infrastructure has been designed to avoid and minimise direct and potentially indirect impact to local heritage as far as feasible and reasonable. Where this was not possible, appropriate mitigation and management measures have been recommended as part of the assessment.

Overall, it is concluded that the heritage value of the listed items and of the heritage conservation areas would not be significantly affected by the project and associated works.

The non-Aboriginal heritage assessment within section 7.10 of the environmental impact statement also considers the potential for vibration impacts to heritage items. Mitigation measure NAH5 identifies mitigation measures in relation to vibration and heritage items,

including existing condition surveys and vibration monitoring during construction as required. The exact nature of the vibration monitoring would depend on the anticipated impact to each of the heritage items.

8.19 Aboriginal heritage

8.19.1 Potential impacts to Aboriginal heritage items

Seven submissions raised issues regarding potential impacts to Aboriginal heritage items.

Issue description

Provision of critical State significant infrastructure status may in some instances impact on Australian Aboriginal Cultural Heritage. All Aboriginal Heritage must be protected and if impacted, relevant mitigation measures should be put in place.

The construction and operation of the tunnel should not risk any damage to Aboriginal artefacts.

Response

Section 7.11 provides an assessment of Aboriginal heritage. The assessment found that there would be no direct impacts to any known Aboriginal heritage items. Appropriate mitigation measures are identified for the potential indirect impacts such as vibration to rock shelters.

The declaration of the project as State significant infrastructure does not affect the veracity of the Aboriginal heritage assessment or the requirement to develop appropriate mitigation measures.

Issue description

The Aboriginal heritage assessment was a cursory approach to a very important issue that does not comply with the relevant guidelines and standards, including the excellent Roads and Maritime PACHCI procedures. The issues with the Aboriginal heritage assessment include:

- As described in the Aboriginal heritage assessment report, inspections of potentially impacted areas were undertaken in September, October and December 2013. This was significantly before the preferred option was released in March 2014 – and also before the additional works along the Hills M2 Motorway were identified in the additional April State significant infrastructure application report. Also the inspections in September and October 2013 were before the Director-General's requirements for the project were issued. Clearly this timing indicates that the full scale and extent of the project could not have assessed during the site inspections with the Aboriginal representatives.
- It appears that no advertising for the registration of potential Aboriginal knowledge holders has been undertaken. This directly disenfranchises Aboriginal people that have a spiritual connection to areas potentially impacted by the project and is likely to result in important cultural and archaeological resources not being identified and therefore impacted during construction.
- There was no consultation with Aboriginal representatives after the site inspections and the Aboriginal stakeholders had no opportunity to comment on the final report.
- The Aboriginal consultation and heritage assessment process has not strictly complied with Roads and Maritime's PACHCI process and OEH Code of Practice and Aboriginal Cultural Heritage Consultation requirements.
- The Aboriginal heritage assessment report claims that the project is permissible without development consent (Section 2.2.1) due to the ISEPP. This is clearly incorrect as the Minister for Planning is the consent authority for the project. The lack of understanding of the development approval pathway may have affected the impact assessment.

- The transects did not cover all potential impacted areas where Aboriginal sites may occur.
- It is surprising no Aboriginal heritage was identified around Cockle Creek.
- The Aboriginal heritage assessment report does not clearly identify the potential direct and indirect impacts associated with the project – without doing this it is impossible to comprehensively assess the impacts of the project and determine whether the proposed mitigation measures are appropriate.
- As required by the DGRs the assessment was to be undertaken in compliance with Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, July 2005). This clearly has not been undertaken.

A thorough and compliant re-investigation of the site should be undertaken based on the current design prior to work commencing.

It should be a condition of approval that a responsible and competent heritage officer be present or at least on call (requiring works to halt pending review).

Response

The NorthConnex Aboriginal heritage assessment has been undertaken in accordance with the Director-General's environmental assessment requirements, the Roads and Maritime PACHCI and relevant Office of Environment and Heritage guidelines. Responses to each issue raised are provided below:

- Inspections undertaken in September, October and December 2013 undertook a conservative approach and surveyed a larger area within the preferred project corridor identified in the State significant infrastructure application report. This included inspections of areas along the Hills M2 Motorway. The preferred tender design and the Director-General's requirements were not required to be identified in order to undertake these inspections.
- Identification of Aboriginal heritage stakeholders was undertaken in accordance with Stage 2 of the Roads and Maritime PACHCI. As no direct impacts to Aboriginal heritage were identified, there was no requirement to proceed to Stage 3.
- Aboriginal heritage representatives were consulted following the site inspections and invited to provide a report or comments detailing their findings from the inspections for consideration in the assessment of the potential impacts of the project.
- The Aboriginal heritage assessment was carried out generally in accordance with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, July 2005) and the Director-General's environmental assessment requirements.
- Consultation with Aboriginal stakeholders is described in Section 3.1 of the Technical Working Paper: Aboriginal Heritage (Appendix M of the environmental impact statement).
- Consultation with Aboriginal stakeholder has been undertaken in accordance with Stage 2 of the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (RTA, 2011) which aligns with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW, 2010).
- The Aboriginal heritage assessment report correctly identifies the planning approval pathway for the project. The project is permissible without development consent by virtue of clause 94 of *State Environmental Planning Policy (Infrastructure) 2007*. The Aboriginal heritage assessment was carried out generally in accordance with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community

Consultation (DEC, July 2005) and the Director-General's environmental assessment requirements.

- The location of transects and site inspections area was determined based on predictive mapping of where Aboriginal heritage items are likely to occur.
- The Aboriginal heritage assessment clearly identifies that there are no direct impacts to Aboriginal heritage items. The assessment also identifies the potential for indirect impacts to items such as potential for vibration impacts to nearby rock shelters, and recommends appropriate mitigation and monitoring measures to manage these potential indirect impacts.
- The Aboriginal heritage assessment was carried out generally in accordance with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, July 2005) and the Director-General's environmental assessment requirements.

Mitigation measure AH5 in Table 7-190 of the environmental impact statement provides a procedure in the event of an unexpected find of an Aboriginal object. This includes engagement of a qualified archaeologist, and consultation with the Office of Environment and Heritage and relevant Aboriginal parties.

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8.20 Land use and property

8.20.1 Property acquisition

Eighty three submissions raised issues regarding property acquisition.

Issue description

Request for property acquisition or compensation for impacts by Roads and Maritime Services. Property should be acquired at market value.

Response

All properties directly affected by the project would be subject to acquisition with compensation paid in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991*. Compensation or acquisition of other properties is not proposed, based on the demonstration in the environmental impact statement that the potential impacts of the project would be within acceptable limits.

Issue description

Roads and Maritime should acquire the property whose access is within the Pearces Corner intersection. This access is unsafe. The park adjoining this property could be extended. This could also be used to compensate for the loss of vegetation in the area.

Response

This property is being acquired by Roads and Maritime in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991*. On completion of the project, Roads and Maritime would investigate options for the use of residual land. The preference is for the land to be sold for future use in accordance with the relevant existing land use zonings.

Issue description

Concerns regarding acquisition of houses for widening of the M1 Pacific Motorway, this has caused disruption to the community.

Response

The project requires some property acquisition adjacent to the existing M1 Pacific Motorway to facilitate the tie in of the NorthConnex project. The project has been designed to minimise the need for property acquisition as much as practical.

Affected property owners have been individually consulted. All property is being acquired by Roads and Maritime with compensation paid in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991*.

Issue description

Object to the compulsory acquisition of the council reserve at Lisle Court, which is a public community facility and is well used by local residents and their children. No need to acquire the whole reserve as the land available within the existing detention basin area should be sufficient to accommodate the runoff (additional runoff of 25 per cent from road). The drainage capacity design should be completed first so that the minimum area needed is acquired rather than the whole reserve, leaving the significant majority of the reserve to be maintained by Hills Shire Council as current.

Response

Acquisition of part of the Lisle Court reserve is required in order to facilitate the augmentation of an existing surface water detention basin.

The potential increase in impervious surfaces draining to this basin and the extent of augmentation works required would be determined during the detailed design phase. Opportunities to limit the extent of works and the impact on the public reserve would be investigated during this stage of the project.

Roads and Maritime is currently discussing the acquisition of this property with The Hills Shire Council. Roads and Maritime would consider minimising the acquisition to only the land required for the NorthConnex project. This would leave land not required for the NorthConnex project for potential community use.

Issue description

Requests not to acquire and demolish a particular house in Wahroonga.

Response

The need for land acquisition has been minimised through the design of the project. Despite this, there will remain a need for some land acquisition and removal of existing developments in order to construct and operate the project.

Affected property owners have been individually consulted. All property is being acquired by Roads and Maritime with compensation paid in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991*.

Issue description

Roads and Maritime is using taxpayers money to purchase properties when project has not been approved.

Response

Roads and Maritime do not require planning approval in order to acquire properties.

Roads and Maritime has commenced property acquisition in order to not delay the commencement of the project if project approval is granted. This also gives owners of properties to be acquired some certainty, rather than leaving them not knowing what will happen to their property for many months.

All property is being acquired by Roads and Maritime with compensation paid in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991*.

Issue description

The NorthConnex team showed a lack of effort to do any site inspections regarding property acquisition, Houses were missed due to inadequate investigations and even after they were identified, the levels of acquisition required kept changing. This shows a lack of planning.

Response

Property acquisition requirements based on the concept design at the time of developing the environmental impact statement are detailed in Section 8.1.2 of the environmental impact statement.

Additional property acquisition may be required for the project in order to provide safe access and egress arrangements, to mitigate potential impacts or in response to design refinements. It is noted that Roads and Maritime do not require properties to be identifies in planning document in order to undertake acquisition.

Issue description

Lack of notification of proposed subterranean acquisition beneath property. Request for details on how the project will impact on development potential of property.

Response

All properties directly affected by the project would be subject to acquisition in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. Compensation or acquisition of other properties is not proposed, based on the demonstration in the environmental impact statement that the potential impacts of the project would be within acceptable limits.

8.20.2 Utility and local road impacts

Sixty six submissions raised issues regarding utility and local road impacts.

Issue description

Local roads used to access the southern interchange compound will require expensive widening, upgrading and significant ongoing maintenance due to road damage. This includes where trucks would need to turn a (90 degree) angle from Oakes Road into Eaton Road.

Potential utility impacts, including overhead power lines along Eaton Road, telecommunications infrastructure on the west side of Pennant Hills Road and traffic lights at the Pennant Hills Road / Copeland Road intersection.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). As a result, heavy vehicle use of residential streets including Oakes Road and Eaton Road has been avoided.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

Issue description

Increased costs of maintaining residential roads affected by construction vehicle route should be financed by NorthConnex.

There is a potential damage in the suburban streets by the (1,480 per day) tunnel heavy trucks. The cost of fixing all damaged suburban streets will be paid by Roads and Maritime or Government.

Specific area of concern include the use of Aiken Road, Oakes Road, Eaton Road and Karloon Road at the southern interchange compound, Eastbourne Avenue at the northern interchange compound, around the Junction Road compound and Hewitt Avenue.

Response

Any damage to local roads caused by construction traffic would be repaired at the project's expense.

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9).

Changes made to access arrangements at these compounds are detailed and assessed in **Section 9.4** of this report.

Issue description

The main sewer line for the area runs through the centre of the Lisle Court Reserve. The construction of the detention basin in this area will not be viable without completely removing and redesigning / relocating the sewer.

Response

The project is likely to impact on a number of utilities. The exact location of utilities would be investigated prior to construction works through Dial Before You Dig searches and on-site investigations. Utilities would be either protected in their current location or relocated at the commencement of construction works.

Issue description

Concerns regarding impacts to sewer line and drainage under house from the construction of the tunnel (tunnel is only 17 metres under property).

Response

The project is likely to impact on a number of utilities. The exact location of utilities would be investigated prior to construction works through Dial Before You Dig searches and on-site investigations. Utilities would be either protected in their current location or relocated at the commencement of construction works.

Issue description

Concerns regarding the relocation of the electrical pole in Hewitt Avenue.

Response

The project is likely to impact on a number of utilities. The exact location of utilities would be investigated prior to construction works through Dial Before You Dig searches and on-site investigations. Utilities would be either protected in their current location or relocated at the commencement of construction works.

Issue description

There is no information on scale and impact of service relocations. Major service relocations and additional new services need to be detailed and the impact of their construction and operation assessed.

Response

Potential impacts to utilities are described in Section 8.1 of the environmental impact statement. The exact nature of these impacts would be dependent on further surveys work and detailed design, however, utilities would either be protected in their current location or

relocated at the commencement of construction works. This approach is consistent with infrastructure projects of a similar nature and scale.

Issue description

Potential utility impacts, including overhead power lines along Eaton Road, telecommunications infrastructure on the west side of Pennant Hills Road and traffic lights at the Pennant Hills Road / Copeland Road intersection.

Response

Based on concerns raised in public submissions and through other community and stakeholder engagement mechanisms (refer to **Chapter 5** of this report), access arrangements to several construction compounds have been reviewed. This has included a review of heavy vehicle access arrangements to the southern interchange compound (C5). As a result, heavy vehicle use of residential streets including Oakes Road and Eaton Road has been avoided.

Changes made to access arrangements at the southern interchange compound are detailed and assessed in **Section 9.4** of this report.

8.20.3 Future development impacts and opportunities

Eleven submissions raised issues regarding future development impacts and opportunities.

Issue description

Potential future high rise development could impact the effectiveness of the outlet. Any future high rise development within 800 metres of the outlet needs to be limited to less than 13 metres.

There doesn't appear to be any clear restrictions on future building heights, even very close to the outlet. For the Lane Cove Tunnel there are significant restrictions in building heights near the outlets, whereas this issue is not mentioned in the NorthConnex environmental impact statement. The outlet may require changes to the permitted land uses in the vicinity and should therefore not be allowed.

Response

The issue of air quality impact for elevated receivers has been considered in detail in response to the submission received from Ku-ring-gai Council (refer to **Section 7.2.3.1** of this report).

Issue description

The current design and location of the northern portals prevents future possibility of increasing the capacity of the M1 Pacific Motorway without significant property acquisition. Relocating the portals further north would allow greater traffic capacity now and greater capacity for future widening,

Response

The potential acquisition requirements from a potential need to widen the M1 Pacific Motorway in the future are beyond the scope of the NorthConnex project. Based on the predicted future traffic volumes, there is not anticipated to be a need to widen the M1 Pacific Motorway in the foreseeable future.

8.20.4 Property values

Eighty four submissions raised issues regarding property values.

Issue description

Negative impact on property prices directly above the tunnel. Suggestion of a loss of 30 per cent in value.

Response

The environmental impact statement demonstrates that potential impacts associated with the construction and operation of the NorthConnex project are within acceptable limits. On this basis, there is no basis for negative changes in property values as a result of the project.

In Sydney and elsewhere around Australia large infrastructure projects have been shown to add value and better amenity to the area in which they are built and as such property prices have increased accordingly.

There is potential for positive impacts on property values, particularly along the Pennant Hills Road corridor. This is likely to result from improvements in amenity, including improved air quality, reduced traffic noise and improved road safety along that corridor.

Issue description

Loss of property value as a result of Hills M2 Motorway integration work.

Response

The environmental impact statement demonstrates that potential impacts associated with the construction and operation of the NorthConnex project are within acceptable limits. On this basis, there is no technical basis for negative changes in property values as a result of the project.

Issue description

Submissions raised concerns regarding property values, issues include:

- The environmental impact statement does not address property prices, rents and the ability to sell a property during the construction or operational phases.
- Suggestion of a loss of 30-50% in value, depending on proximity to and visibility of facilities.
- Lowering property values around the northern ventilation outlet. Decrease will be due to additional noise, toxic air pollution, view of the outlet and increase risk of tunnel accidents and outlet explosions.
- Many houses in the area have already been sold below and market value.
- Lowering property values around the southern ventilation outlet and interchange
- The Sydney Morning Herald property growth chart for 2014 indicates that Wahroonga has fallen into one of the 10 lowest growth suburbs with only 3.9 per cent growth. Information from Your Investment Property shows that house growth in Wahroonga was 10.9 per cent in the last 12 months and zero per cent in the last quarter. The timing corresponds to the release of the location of the outlet and portal.
- The claim that transport projects have a positive impact on property values due to improved amenity, connectivity, savings in travel costs and attractiveness to investors only refer to properties along Pennant Hills Road. It does not fit the case for properties around the outlet and portal.

- Request for guarantee that property prices around the outlet will not be affected.
- An independent study by the Valuer-General should be undertaken to assess the impact on property values of the NorthConnex project.
- A full study on the impact of the project on the value of properties located within two kilometres of the project.

Response

The environmental impact statement demonstrates that potential impacts associated with the construction and operation of the NorthConnex project are within acceptable limits. On this basis, there is no technical basis for negative changes in property values as a result of the project.

In Sydney and elsewhere around Australia large infrastructure projects have been shown to add value and better amenity to the area in which they are built and as such property prices have increased accordingly.

The belief that home values around the ventilation outlet and portals may drop up to 25 per cent or more and that it will be difficult to sell houses near the outlets appears to have no credible supporting evidence.

For example the property at Gum Grove Place, West Pennant Hills (adjacent to the southern ventilation outlet) was put on the market on 22 May 2014 with a guide price of over $980,000. The property sold by mid June 2014, less than four weeks later, at a price of $1,370,000 (around 40 per cent over price guide). In the north there has been four properties sold in Woonona Avenue since the end of May with the recent sale of a property in Woonona Avenue, which sold on 30 July 2014 eight days after being put on the market and another property in Woonona Avenue sold on 14 July 2014 only five days after being put on the market and both higher than the price guide provided.

Additionally, there is no evidence from previous road tunnel projects suggesting these projects result in a decrease in property values.

With respect to the M5 East Motorway ventilation outlet in Turrella, research indicates in the last 10 years the average median price in Turrella has increased 4.6 per cent per year in line with neighbouring suburbs of Earlwood (4.3 per cent) and Arncliffe (4.5 per cent) and in excess of Wolli Creek (3.6 per cent). Further, in the last five years the median price has increased almost 70 per cent which is 20 per cent more than Earlwood and Arncliffe.

With respect to the Lane Cove Tunnel ventilation outlet, research indicates that, in the last 10 years, the average annual increase in median property in Lane Cove (the suburb adjacent to the Lane Cove Tunnel ventilation outlet) was 4.7 per cent. This is similar to nearby suburbs of Chatswood (five per cent) and Artarmon (four percent) over the same period.

Issue description

Lowering property values around the Trelawney Street site and the Wilson Road site.

Response

The environmental impact statement demonstrates that potential impacts associated with the construction and operation of the NorthConnex project are within acceptable limits. On this basis, there is no technical basis for negative changes in property values as a result of the project.

In Sydney and elsewhere around Australia large infrastructure projects have been shown to add value and better amenity to the area in which they are built and as such property prices have increased accordingly.

There is potential for positive impacts on property values, particularly along the Pennant Hills Road corridor. This is likely to result from improvements in amenity, including improved air quality, reduced traffic noise and improved road safety along that corridor.

Issue description

Lowering of property values around surface works during construction and operation. It will be difficult to sell homes during construction.

Response

The environmental impact statement demonstrates that potential impacts associated with the construction and operation of the NorthConnex project are within acceptable limits. On this basis, there is no technical basis for negative changes in property values as a result of the project.

In Sydney and elsewhere around Australia large infrastructure projects have been shown to add value and better amenity to the area in which they are built and as such property prices have increased accordingly.

There is potential for positive impacts on property values, particularly along the Pennant Hills Road corridor. This is likely to result from improvements in amenity, including improved air quality, reduced traffic noise and improved road safety along that corridor.

8.20.5 Compensation

One hundred and eight submissions raised issues regarding compensation.

Issue description

Request for compensation to property owners affected. Specific requests include:

- Questions regarding who is liable for health impacts. Compensation for compromising health and disregarding health concerns.
- Who is accountable / liable when it is proven that the modelling is incorrect?
- Compensation for long term health impacts from construction and operation.
- Insurance policy established to insure against any long term health impact.
- Warranty that there will be no adverse health impacts during the life of the tunnel on nearby residents.
- Compensation for increase traffic congestion during construction affecting ability to get to work and losing jobs.
- Compensation for loss in property value.
- Provide stamp duty refunds for the sale of impacted properties and the purchase of new properties for affected owners.
- Compensation for decrease in quality of life during construction.
- Compensation to be able to move out and rent for the period of construction.
- Stamp duty of future house purchases be waived for residents within 500 metres of the proposed ventilation outlet for the period of construction.

- Free medical treatment, exams and ongoing tests for the period of five years post construction.
- Request for compensation to property owners within two kilometres of the ventilation facilities if there are reductions in the air quality.
- Compensation for the removal of Sydney Blue Gum trees that may fall on residential homes or properties on Nelson Street, Trelawney Street and Loch Maree Avenue as a result of the project.
- Reduced local government rates payable for impacted properties.
- Compensation for stress caused by the project.
- Replacement of good that are damaged by release of pollutants from the ventilation outlets.

Compensation for any damage done to properties as a result of the project.

Response

All properties directly affected by the project would be subject to acquisition in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. Compensation for other perceived impacts or acquisition of other properties is not proposed, based on the demonstration in the environmental impact statement that the potential impacts of the project would be within acceptable limits.

Prior to the commencement of construction works, existing condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. Copies of these reports will be provided to the property owner. In the unlikely event of damage caused by the construction of the NorthConnex project, this would be rectified by the contractor at no cost to the property owner.

Issue description

We should be compensated through the provision of access through the Wilson Road tunnel support facility to build a granny flat at the back of our place, and an easement through the facility to access property.

Response

The project would not impact the existing access arrangements to properties around the Wilson Road tunnel support facility. As such, there is no justification for providing access through the NorthConnex site.

8.20.6 Property damage

Two submissions raised issues regarding property damage.

Issue description

Vegetation disturbance around West Pennant Hills may lead to termite nests being disturbed which are then likely to attack properties in the vicinity causing damage.

Response

Vegetation clearing would be required in the vicinity of West Pennant Hills to facilitate the motorway operations complex and the connection of the project to the Hills M2 Motorway. This vegetation clearing would not be anticipated to result in significant impacts to adjacent properties from termites. Additionally, large areas of existing vegetation in the vicinity would be retained.

Issue description

The project will exacerbate existing issues in Blue Gum Creek from the operational groundwater discharge (up to 40 litres per second) and the increase in stormwater flows, resulting in property damage.

Response

Section 7.9.3 of the environmental impact statement identifies the potential impacts to Blue Gum Creek from the discharge of water from the operational water treatment plant. The potential impacts identified include potential increased erosion, increased localised flooding and increased damage to public and private assets.

The environmental impact statement commits to further investigation in relation to the exact location of the operational water discharge location. At this stage, additional mitigation measures such as stream bed and bank stabilisation, or re-sizing of existing drainage infrastructure would be determined based on the location of discharge and a more detailed examination of any potential impacts. Detailed design of the discharge and identification of an appropriate location for the discharge would take into account potential geomorphic, property and ecological impacts.

8.21 Hazards and risk

8.21.1 Construction tunnelling risks

Four submissions raised issues regarding construction tunnelling risks.

Issue description

Submissions raised concerns over construction difficulties including:

- Risk of collapse and sink holes.
- Risk of trees falling on to residential properties on Nelson Street, Trelawney Street and Loch Maree Street as a result of tunnelling.
- Risk of encountering relic root system during tunnelling which may result in instability of the ground above. A strategy needs to be developed.

Response

Tunnelling works would be undertaken in accordance with the requirements of the Work Cover Code of Practice for Tunnels. Primary support for the project tunnels would be installed as the excavation progresses, as recommended by an appropriately qualified geotechnical or tunnel engineer. A 'Permit to Tunnel' system would also be developed and implemented to ensure that design, construction and survey are taken into consideration and ground support conditions modified if required before the excavation advances. This system requires the methodology and approach for any proposed tunnelling works to be reviewed and approved before the proposed work stage to proceed. These practices are regularly reviewed and updated based on among other things lessons learned on other projects locally and internationally.

The structural integrity of the tunnel would be assured during construction through the implementation of appropriate construction methodology for the tunnelling conditions and ongoing tunnel support by way of rockbolts and / or shotcrete lining. The majority of the main alignment tunnels would be constructed at significant depth within Hawkesbury Sandstone with minimal risk of surface effects. For on and off-ramps, and where the main alignment tunnels come to the surface, tunnel components would be progressively constructed and stabilised to ensure that surface deformations do not occur.

The tunnel depth, generally around 20 metres to 60 metres below ground level with shallower sections approaching the portals and deeper sections under the North West Rail Link tunnels, also enhances the structural integrity of the tunnel. The geology of the area was influential in determining the tunnel vertical alignment. Hawkesbury Sandstone is considered an excellent tunnelling and excavation medium as it is high strength with infrequent and relatively widely spaced defects. In comparison, Ashfield Shale is also of high strength but has a deeper soil profile, closer spaced defects (commonly affected by faulting) and the fresh shale can readily deteriorate on exposure. As a result, the tunnel has been designed to maximise the length of tunnel within Hawkesbury Sandstone and minimise the length within Ashfield Shale.

The tunnel alignment in the vicinity of Nelson Street, Trelawney Street and Loch Maree Avenue is around 20 to 50 metres below ground level. A tunnel at this depth is not anticipated to have any impacts on the viability or structural integrity of the trees above.

The interception of relic root systems is not expected to result in any instability issues.

8.21.2 Electric and magnetic fields

Three submissions raised issues regarding electric and magnetic fields.

Issue description

The health assessment excludes the proven adverse health effects of electric and magnetic fields from mobile phone base stations / towers within 300 metres.

The substation at the Wilson Road site will have a direct impact on our health in the short and long term.

Response

Consideration of the potential impacts from electric and magnetic fields is provided in Section 8.2.1 of the environmental impact statement.

The detailed design of the project substations would ensure that the exposure limits for the general public suggested by the Draft Radiation Standard (Australian Radiation Protection and Nuclear Safety Agency, December 2006) would not be exceeded at the boundary of the substation sites.

The project does not involve the development of a mobile phone base station or tower. As such, it is not required to assess the impact of these.

8.21.3 Incidents in the tunnel

Thirty seven submissions raised issues regarding incidents in the tunnel.

Issue description

Submissions regarding tunnel related incidents include:

- Impacts to properties above the tunnel in the case of a tunnel incident during operation
- The increased risk of tunnel incidents and ventilation outlet explosions around Wahroonga.
- Impacts from explosions as a result of truck collisions carrying highly flammable petroleum, LPG or chemicals.
- Questions regarding existing plans and designs to avoid accidents in the tunnel.

Response

Incidents within the tunnel during construction would not be expected to result in any impact to properties above the tunnel. The tunnel would be constructed in accordance with appropriate standards such as fire rating to ensure the structural integrity of the tunnel in the event of an incident.

Vehicles carrying dangerous goods would not be permitted to use the tunnels. These trucks would continue to use Pennant Hills Road, which is consistent with the existing situation.

The environmental impact statement assesses the potential impacts of the NorthConnex project for a series of credible construction and operational scenarios. A reasonable level of conservatism has been applied to these scenarios to allow for flexibility in the implementation of the project, and to give regulatory authorities, the community and other stakeholders confidence in the veracity and robustness of the relevant environmental impact assessments.

Section 2.7.2 of this report provides further discussion of tunnel incidents that may lead to emergency emissions from the project tunnels (principally fire related incidents). The discussion demonstrates that a combination of a very low probability of such events, and the design of the project to minimise potential consequences, would result in a very low risk of significant impacts to the surrounding environment and communities in the unlikely event of a tunnel incident.

The environmental impact statement does not present a detailed, quantitative assessment of scenarios including force majeure events, very low risk (ie very low likelihood and/ or very low consequence) incidents or other outcomes that are either not realistically or credibly foreseeable during the normal operation of the project. This is consistent with the approach take for the assessment of other major infrastructure and developments in New South Wales, including major surface road and tunnel projects, rail infrastructure, ports and airports. These types of developments consider the risk of an emergency or unexpected event occurring (such as a major road crash, a train derailment, or an aircraft crash), but do not provide a detailed, quantified assessment of the potential environmental impacts of such an event occurring. Instead, the focus in these cases is ensuring that feasible and reasonable measures are applied to the particular development to minimise the likelihood and the consequence of emergency events.

Issue description

Submissions raised concerns over tunnel fires and the likelihood of a catastrophic disaster including:

- That based on experience from the fire emergency in the English Channel tunnel, evacuation via the neighbouring tunnel does not work and it is suggested that long tunnels should have vertical evacuation exits to the surface.
- Questions over the emergency measures for exiting the tunnels in case of fire.
- How people with severe intolerance to diesel fumes or disabled persons will be removed.
- The adequacy of local emergency services in managing an incident in the tunnels.

Response

The project has been designed to provide for efficient, free flowing traffic with physical capacity to accommodate predicted traffic volume. The preferred design has incorporated all feasible and reasonable design measures including in relation to geometry, pavement, lighting and signage, consistent with current Australian Standards, road design guidelines and industry best practice. In doing so, the design of the project has been developed to inherently minimise the likelihood of incidents and accidents. These measures are described in Section 8.2 of the environmental impact statement.

In the event of incidents and accidents, the project has been designed to meet appropriate fire and life safety requirements. Among other measures, this would include:

- Pedestrian cross passages between the two tunnels every 120 metres.
- Two emergency vehicle cross passages between the two tunnels at around third points.
- Emergency pedestrian exits from the main alignment tunnels and on and off-ramp tunnels.
- Automatic fire and smoke detection and suppression systems within the tunnels.

These measures have been developed in consultation with Fire and Rescue NSW, and taking into account applicable standards and guidelines.

The Channel Tunnel is a rail tunnel around 50 kilometres in length. The fire and life safety design of that tunnel is not directly comparable to the nine kilometre NorthConnex road tunnels.

Occupants involved in the fire event, or upstream of the fire source, would be instructed to stop their vehicles, and exit in the opposite direction along the carriageway (as this region would be protected by the smoke management system), or through an exit door to a cross passage leading to the non-incident main alignment tunnel. Access to the pedestrian cross passages have been appropriately designed to allow use by disabled persons.

Occupants downstream of the fire source would be encouraged to continue driving out of the tunnel. If this is not possible and they are directed to evacuate on foot, egress would be provided via an exit door to a cross passage leading to the non-incident carriageway.

Emergency services would be able to reach the fire source via the non-incident tunnel and cross passages (by vehicle or foot), or from the upstream direction in the incident tunnel (by foot).

Issue description

Water for firefighting should be provided.

Response

The NorthConnex project has been designed to include advanced fire and life safety systems, a key component of which would be a deluge system which would be automatically operated in the event that a fire is detected in the project tunnels. Water for the deluge system would be stored in tanks, two at the northern ventilation facility and one at the motorway operations complex. The rapid response to a fire incident in the project tunnels would limit the potential escalation of a fire within the project, and would significantly reduce the potential generation of smoke.

The design and operation of advanced fire and life safety systems, coupled with a prohibition on the transport of dangerous goods through the project tunnels would reduce the risk of a fire – and particularly a major fire – to very low levels.

Issue description

No coherent plan has been explained to prevent trucks and other vehicles carrying dangerous goods from entering the tunnel. If a plan exists and can be made effective then that traffic will continue to use Pennant Hills Road.

Response

As with other road tunnels in Sydney, vehicles carrying dangerous goods and hazardous substances would be prohibited from using the NorthConnex tunnels. These vehicles are required by law to carry identification markers. Cameras are used to identify these vehicles prior to the tunnel portals and direct them to use an alternative route. The prohibition of these vehicles from the tunnels would reduce the risk of very large fires or the release of toxic materials.

These vehicles would be required to continue to use Pennant Hills Road or other surface roads, as they currently do.

Issue description

Management of trucks getting stuck in tunnel for being too high.

Response

Design features and operational measures to reduce the likelihood of an incident involved over height vehicles in the tunnel are described in Section 8.2.1 of the environmental impact statement.

The project would be the highest of any road tunnel in Sydney (at 5.3 metres high) which would minimise the likelihood of an incident involving over height vehicles.

The project also includes an over height detection system to further minimise the likelihood of an incident associated with over height vehicles within the tunnel. This over height detection system comprises:

- Electronic over height detectors prior to the tunnel portals.
- Vehicle presence detectors.
- Warning signs with lanterns installed that would light up upon detection of an over height vehicle.

Detectors would be installed prior to divergence points to the tunnels to allow over height vehicles to divert to an alternative route. Secondary detectors would also be installed after the divergence point to detect over height vehicles that have not diverted. The detection of over height vehicles would be alarmed to the motorway operator and the nearest camera switched on to the incident monitors so that the operator can control traffic management devices such as moveable physical barriers and portal variable message signs to stop the vehicle from entering the tunnel.

Notwithstanding, human factors in particular cannot be entirely removed during operation of the project and there would remain a residual risk of incidents and accidents, albeit the likelihood of such events would be low.

Issue description

The tunnels fail international safety standards by converting the breakdown lane into a traffic lane.

Response

The provision of a breakdown lane is not required by international road design standards.

At project opening, the NorthConnex tunnels would provide two traffic lanes in each direction and a breakdown lane. The tunnels are being built wide enough to be able to retro-fit to three lanes in each direction in the future if required. Under this scenario, there would not be a continuous breakdown lane, however there would be two breakdown bays in each direction. The project would also incorporate CCTV in order to provide a rapid response to an incident or breakdown within the tunnels. This is consistent with other tunnels throughout Sydney. In addition, two emergency vehicle crossover facilities would be provided at around the third points of the tunnels to provide flexibility for emergency services vehicle access.

As detailed in Section 8.2.1 of the environmental impact statement, the project has been designed to provide for efficient, free flowing traffic with physical capacity to accommodate predicted traffic volume. The preferred design has incorporated all feasible and reasonable design measures including in relation to geometry, pavement, lighting and signage,

consistent with current Australian Standards, road design guidelines and industry best practice. In doing so, the design of the project has been developed to inherently minimise the likelihood of incidents

In addition, the project has been designed in accordance with the following standards:

- Australian Standard AS4825 – Tunnel fire safety.
- National Fire Protection Association (NFPA) 502 - Standard for Road Tunnels, Bridges and Other Limited Access Highways.
- Permanent International Association of Road Congress (PIARC) including:
  - Systems and equipment for fire and smoke control in road tunnels, 2007.
  - Road tunnels: Vehicle emissions and air demand for ventilation, 2012.
  - Fire and Smoke Control in Road Tunnels, 1999.
  - Operational Strategies for Emergency Ventilation, 2008.

Issue description

Tunnels are inherently more hazardous in the event of accidents. Emergency services are more easily delivered to the site of an accident on a surface road.

The lack of provision for contraflow between the tunnels will hinder rescue attempts.

Response

As detailed in Section 8.2.1 of the environmental impact statement, the project has been designed to provide for efficient, free flowing traffic with physical capacity to accommodate predicted traffic volume. The preferred design has incorporated all feasible and reasonable design measures including in relation to geometry, pavement, lighting and signage, consistent with current Australian Standards, road design guidelines and industry best practice. In doing so, the design of the project has been developed to inherently minimise the likelihood of incidents

In addition, the project has been designed in accordance with the following standards:

- Australian Standard AS4825 – Tunnel fire safety.
- National Fire Protection Association (NFPA) 502 - Standard for Road Tunnels, Bridges and Other Limited Access Highways.
- Permanent International Association of Road Congress (PIARC) including:
  - Systems and equipment for fire and smoke control in road tunnels, 2007.
  - Road tunnels: Vehicle emissions and air demand for ventilation, 2012.
  - Fire and Smoke Control in Road Tunnels, 1999.
  - Operational Strategies for Emergency Ventilation, 2008.

Tunnels actually offer the opportunity to more effectively manage an accident or incident. For example:

- Tunnels are continuously monitored which allows much faster response times for emergency services.
- In the event of an accident involving a fire, the tunnels provide a deluge system to quickly put the fire, rather than needing to wait for emergency services to arrive to the scene.

The tunnels also provide two vehicle cross-overs and pedestrian cross-passages every 120 metres to allow for efficient evacuation of pedestrians from the incident tunnel to the non-incident tunnel. This also allows emergency services to easily reach the scene of an accident through the non-incident tunnel if required.

8.21.4 Bushfires

One respondent raised issues regarding bushfires.

Issue description

People who live within bushfire prone lane will be more at risk.

Response

Consideration of bushfires is provided in Section 8.2.1 of the environmental impact statement. The project would not increase the risk to surrounding bushfire prone land.

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8.22 Resources and waste

8.22.1 Construction spoil management and management

Nineteen submissions raised issues regarding construction spoil generation and management.

Issue description

Hornsby Quarry makes sense as the soil disposal site as it is the shortest possible distance from the construction sites and would impact the least amount of people. However, transporting spoil to the quarry through the streets of Hornsby is a significant problem.

An alternative would be to develop a route up the western side of the M1 Pacific Motorway to King Street, then along King Street to Bridge Street and straight into the quarry. This route would disrupt the least amount of people. Ideally this route would use a conveyor belt system which would be quiet and produce no exhaust fumes, although trucks could also be used along this route.

Spoil could be easily transported to Hornsby Quarry via a spoil tunnel from the northern end of the project or from Pioneer Avenue to the quarry. This would be easier if the northern portals were further north.

Response

Section 5.3.18 of the environmental impact statement identifies potential sites with the necessary capacity to receive the spoil generated by the project. These include:

- The ADI site, St Marys with a capacity for between two and 2.5 million cubic metres.
- Gosford Quarry with a capacity of around 2.5 million cubic metres.
- Hornsby Quarry with a capacity of around 3.3 million cubic metres.
- The CSR Quarry with a capacity of around 1.16 million cubic metres.
- The Defence precinct Schofields (HMAS Nirimba) with a capacity of 500,000 cubic metres.
- The Great Southern Rock Quarry Sandy Point with an anticipated capacity of around five million cubic metres.

Other disposal / re-use sites may be used depending on need at the time spoil is generated.

Further consideration of spoil disposal sites would be undertaken during the detailed design phase. This consideration would include factors such as the distance from the construction sites, minimising traffic and noise impacts to the local community, the cost of disposing of the spoil, and the relevant location's ability to receive the spoil in the necessary timeframes.

The provision of a 'spoil tunnel' to Hornsby Quarry is outside the scope of the NorthConnex project.

Issue description

Concern regarding the amount of spoil being removed from the project. Questions whether this is achievable considering the current congestion on Pennant Hills Road and the amount of trucks required. The impacts from the removal and transportation of spoil have not been addressed.

Suggestions include:

- Only remove spoil from the two ends of the project to avoid using Pennant Hills Road for any trucks movements. This would shorten the construction time and result in financial savings.
- Spoil from Trelawney Street to be transported south only and spoil from Wilson Road to be transported north only to eliminate the need for trucks to cross Pennant Hills Road. A circuit could be established between the two sites.

Response

Spoil removal from tunnelling works has been planned to occur from four sites being the southern interchange compound (C5), Wilson Road compound (C6), Trelawney Street compound (C7) and northern interchange compound (C9) in order to limit the potential impacts from any one site.

Removing spoil from the two ends of the project is likely to result in significantly increased impacts in those two locations due to the increased trucks movements required. This would also be likely to increase the construction duration as space to store spoil is limited.

It is not possible at this stage to restrict spoil disposal locations from individual construction sites. To this end, the assessment undertaken presents two worst-case scenarios with all spoil being transported north and all spoil being transported south. In reality, it is reasonably feasible that spoil sites in each direction would be used which would reduce these potential impacts.

The impacts associated with the removal of spoil, potentially including noise and vibration; air quality (particularly dust); and construction traffic, are identified and assessed within the relevant sections of the environmental impact statement. The environmental impact statement demonstrates that these impacts can be managed within acceptable limits with the application of a suite of mitigation and management measures. Construction works would be limited in duration and any construction-related impacts on surrounding receivers would be temporary.

The environmental impact statement identifies feasible and reasonable management and mitigation measures in order to avoid or minimise these potential impacts.

Access and egress routes for spoil trucks would continue to be examined in consultation with Roads and Maritime and the Traffic Management Centre during the development of Traffic Management Plan and Traffic Control Plans to ensure that potential impacts on the surrounding road network and the local community are minimised where feasible and reasonable.

Issue description

Confirmation of the soil disposal sites is required before the project is approved. The location of the CSR Quarry is not provided

Response

Section 5.3.18 of the environmental impact statement identifies potential sites with the necessary capacity to receive the spoil generated by the project. These include:

- The ADI site, St Marys with a capacity for between two and 2.5 million cubic metres.
- Gosford Quarry with a capacity of around 2.5 million cubic metres.
- Hornsby Quarry with a capacity of around 3.3 million cubic metres.

- The CSR Quarry with a capacity of around 1.16 million cubic metres. This quarry is located at Schofields.
- The Defence precinct Schofields (HMAS Nirimba) with a capacity of 500,000 cubic metres.
- The Great Southern Rock Quarry Sandy Point with an anticipated capacity of around five million cubic metres.

Other disposal / re-use sites may be used depending on need at the time spoil is generated.

Further consideration of spoil disposal sites would be undertaken during the detailed design phase. This consideration would include factors such as the distance from the construction sites, minimising traffic and noise impacts to the local community, the cost of disposing of the spoil, and the relevant location's ability to receive the spoil in the necessary timeframes.

Spoil disposal sites would need to have an appropriate planning approval in place to lawfully receive the material from the NorthConnex project.

8.22.2 Other construction waste

Two submissions raised issues regarding other construction waste.

Issue description

Concerns regarding spillage of waste from construction trucks.

Response

As required by law, the load on trucks would be covered to prevent the spillage of waste onto the road. In the event that material is spilt, it would be removed as soon as practical.

8.22.3 Construction resource use

Three submissions raised issues regarding construction resource use.

Issue description

Proposed construction route to the southern interchange compound will cause fuel wastage and is a waste of money.

Response

Based on feedback in submissions and through other consultation with the community and other stakeholders, the proposed construction traffic routes for the southern interchange compound (C5), the Trelawney Street compound (C7) and the northern interchange compound (C9) have been altered to avoid impacts on local residential streets. Updated construction traffic and construction noise assessments for these amended haulage routes are provided in **Section 9.4** of this report. The proposed routes provide more direct access to the site.

Issue description

The project has been designed without significant use of renewable energy.

Will power used during construction be from renewable sources. If not, what is the amount of pollution that will come from fossil fuel generated power? Would radiation be part of the emission?

Response

The power requirements for the project are detailed in Table 8-26 of the environmental impact statement. This power would mainly be sourced from the mains power supply.

Emissions from the generation of this power is a matter for the power supply authority and the relevant power generator.

8.22.4 Operational resource use

Three submissions raised issues regarding operational resource use.

Issue description

The project has been designed without significant use of renewable energy. There would be a high energy consumption to provide ventilation.

Response

The project has reduced its energy consumption by placing the ventilation outlets in the most efficient location, being as close as practicable to the main alignment tunnel exit portals. This is because vehicles travelling through the tunnels create a piston effect, which draws air into the tunnel and pushes it forward in the direction of traffic flow. Locating the ventilation outlets near the main alignment tunnel exit portals maximises the benefit of the piston effect and minimises the need for additional energy consumption to operate tunnel jet fans and to transport the exhaust air from the tunnel to the outlet. This approach provides environmental benefits through the reduction in energy consumption and greenhouse gas emissions from the project.

The locations of ventilation outlets for the project have been determined based on proximity to the main alignment tunnel exit portals, as well as consideration of other factors including land access and acquisition requirements, geology, engineering and construction constraints, potential landscape and visual impacts, and the location of other major infrastructure.

As shown in Table 8-30 of the environmental impact statement, the predicted energy consumption for the NorthConnex tunnel (per kilometre) is less than any of the other road tunnels in Sydney.

8.22.5 Peak oil

Two submissions raised issues regarding peak oil.

Issue description

The viability of the NorthConnex project is questioned due to potential future fuel shortages and the need to reduce oil consumption and dependency.

US shale oil is likely to reach its last peak in 2016. Without US shale oil the world would be in a deep oil crisis. A religious war has started on top of Middle East oil fields. It is naïve to think that this will not impact on oil exports from the region.

We will become more dependent on overseas energy sources once our own crude oil sources in Bass Strait are exhausted.

A proper energy analysis for the entire concession period should be undertaken, including a diesel supply forecast. At least a peak oil analysis should have been included in the traffic forecasts.

Response

The issue of peak oil is considered in Section 8.3.1 of the environmental impact statement.

Roads and Maritime considers that it is prudent to consider that oil production may peak and then decline. This could increase the cost and reduce the availability of transport fuels and construction materials derived from oil. For transport, the solutions to the problem of "peak oil" are similar to those for climate change. Alternatives to fossil fuels need to be found and transport must become more energy efficient. There are moves to establish alternatives to oil as a fuel for transport and to improve energy efficiency. This would enable the economic benefits provided by road transport to continue to be delivered with a reduced need for fossil fuels. Similar action is being taken, through recycling and investigation of alternative materials, to reduce the need for construction products derived from fossil fuels.

Roads and Maritime is also participating with Austroads and industry in research and trials with the goal of developing more sustainable road construction materials and practices and reducing reliance on products derived from oil. As road transport is a significant and necessary element of the NSW economy, that also provides many social benefits, Roads and Maritime will continue to ensure that all potential impacts on this system, such as peak oil, are identified and action is taken to manage these risks.

With reference to the project, traffic modelling across the Sydney network indicated that the proposed project would result in increased travel speeds and shorter distance of the tunnel compared to the surface roads. This would result in an overall reduction in the quantity of fuel consumed by private and freight vehicles and a subsequent reduction in the quantity of emissions produced. As noted in Section 8.4 of the environmental impact statement, it is estimated that by 2027, savings in operational road use emissions would be greater than the estimated emissions generated during construction of the project. Furthermore, it is estimated that operational emission savings from road use of around 68,600 Mt $CO_{2\text{-}e}$ would be achieved by 2029 when compared against the 'do nothing' scenario.

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8.23 Greenhouse gas and climate change

8.23.1 Construction greenhouse gas emissions

One respondent raised issues regarding construction greenhouse gas emissions.

Issue description

The greenhouse gas chapter calculates that emissions from construction alone may just be offset by 2027. The operational savings are marginal. The CO_2 targets are much higher and the timeframes much sooner than this.

Response

One infrastructure project cannot meet the CO_2 reduction targets on its own.

Section 8.4 of the environmental impact statement provides a comprehensive assessment of greenhouse gas emissions during construction and operation. As the project would provide a more efficient route between the M1 Pacific Motorway and the Hills M2 Motorway, it would result in savings of greenhouse gas emissions of around 47,000 t CO_2-e in the year of opening (2019). By 2027 the projected saving would have offset the construction emissions. Therefore, the project assists in reducing transport-related greenhouse gas emissions in NSW.

8.23.2 Operational greenhouse gas emissions

One respondent raised issues regarding operational greenhouse gas emissions.

Issue description

Concern that money is being invested in car and truck infrastructure when we should be building public rail, light rail and bike ways to reduce emissions. Climate change is real and transport accounts for 15 per cent.

Response

Prior to the NorthConnex project being proposed, an alternatives and options assessment including rail upgrades and consideration of various potential road alignments was undertaken by SKM in 2004 (the 2004 report). Specifically, the 2004 report considered a number of strategic alternatives. This included a 'do nothing / do minimum' alternative which involved upgrades to the existing road corridor, a rail and public transport upgrade alternative, and a road link between the M1 Pacific Motorway and the Sydney Orbital Road Network. The 2004 report concluded that a road link best met the transport and planning objectives for the project.

The long term strategic vision for Sydney and NSW is outlined in the NSW State Infrastructure Strategy (NSW Department of Premier and Cabinet, 2012), the NSW Long Term Transport Master Plan (Transport for NSW, 2012), the Metropolitan Plan for Sydney to 2036 (Department of Planning, 2010) and the draft Metropolitan Strategy for Sydney to 2031 (Department of Planning and Infrastructure, 2013). A link between the M1 Pacific Motorway and the Hills M2 Motorway (NorthConnex) is identified in these long term planning documents.

These documents also identify a range of public transport and rail freight initiatives which are being progressed by the NSW Government. In the region of the NorthConnex project, this includes a significant investment by the State Government in projects such as the North West Rail Link and the Epping to Thornleigh Third Track.

Section 8.4 of the environmental impact statement provides a comprehensive assessment of greenhouse gas emissions during construction and operation. As the project would provide a more efficient route between the M1 Pacific Motorway and the Hills M2 Motorway, it would result in savings of greenhouse gas emissions of around 47,000 t CO_2-e in the year of opening (2019). By 2027 the projected saving would have offset the construction emissions. Therefore, the project does assist in reducing transport-related greenhouse gas (GHG) emissions in NSW.

carbon
neutral


australian
made


recycled