Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Part B

Response to key stakeholder submissions

November 2021

B Response to key stakeholder submissions

Contents

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B1 – NSW Environment Protection Authority

November 2021

B1 NSW Environment Protection Authority

Contents

B1.1 Noise and vibration

B1.1.1 General

Issue raised

The NSW Environment Protection Authority notes that a high degree of community engagement should be maintained during the construction stage of the project and opportunities provided for the community to influence certain aspects, such as mitigation, respite periods, etc. A project of this scale and level of impact must effectively engage with the community to successfully co-exist within the community.

Response

Community consultation has been carried out by Transport for NSW throughout the project lifecycle and would continue up to and throughout construction of the project. Details of additional consultation carried out between exhibition of the environmental impact statement and lodgement of this submissions report is summarised in Section A2. Pending any social distancing requirements, meetings would be held with stakeholders near temporary construction support sites and worksites regarding construction activities and out of hours works with the objective of refining Transport for NSW's understanding of the community's issues and identifying opportunities to address these issues, minimise impacts and improve outcomes where reasonable and feasible, as outlined in Section 7.3 of Appendix E (Community consultation framework).

Consultation and engagement which would be carried out with affected receivers prior to and during construction to specifically discuss noise impacts and the implementation of additional mitigation measures is discussed in Appendix J of this submissions report. This strategy outlines how noise impacts would be managed on the project, consolidating the measures within policies, guidelines, standards and regulations which are applicable to the project.

Notifications, including letters, emails, and SMS alerts, would be issued to affected receivers to explain construction activities, work hours, and potential impacts from construction activities prior to work occurring as outlined in Appendix J of this submissions report. Enquires from and issues raised by the community would be addressed in a timely and transparent manner, in accordance with the Community communication strategy which would be developed based on Appendix E (Community consultation framework), to foster and develop positive and meaningful relationships with stakeholders and the community.

B1.1.2 Maritime noise

Issue raised

While the assessment included a qualitative assessment of waterborne activities the NSW Environment Protection Authority requests the predicted noise levels from vessel movements at surrounding sensitive receivers be included, to assist in quantifying their potential impacts on the community.

The NSW Environment Protection Authority considers that with up to 19 barge and boat movements per day, 48 additional movements associated with cofferdam construction, and the potential for some movements at night, there is potential for noise impacts on surrounding receivers. The NSW Environment Protection Authority recommends further details be provided on mitigation and management measures to minimise impacts from vessel movements.

Response

There are no guidelines for the assessment of noise from vessel movements in NSW as stated in Section 3.4.3 of Appendix G (Technical working paper: Noise and vibration). As noted by the NSW Environment Protection Authority, a qualitative assessment was carried out as part of the noise and vibration assessment to consider noise from vessel movements (refer to Section 4.2.6 of Appendix G (Technical working paper: Noise and vibration)). The assessment concluded the noise from project barge movements would not cause substantial amenity or sleep disturbance impacts as it is unlikely that barge movements would occur during the night time period.

However, to address the issue raised regarding the quantification of potential noise impacts from vessel movements and whether additional mitigation is required, a quantitative assessment has been carried out based on the indicative type and number of marine transport and construction vessel movements likely to be used during construction as presented in Table B1-1.

Table B1-1: Indicative typical water based construction traffic movements

Area	Indicative vessel movements per day	Required movements outside of standard construction hours
Between Spit West Reserve (BL9) and Middle Harbour south (BL7) and Middle harbour north (BL8) cofferdams	• 12 small boats for transporting construction workforce • Four barges for support of cofferdam dredging, piling and tube tunnel unit immersion • Three barges for disposal of dredged material to sea	Typically no movements outside of standard construction hours

Operating from the Spit West Reserve construction support site (BL9), barge and boat movements to and from project sites are expected to occur infrequently, typically with up to 19 movements a day and typically no movements outside standard construction hours. During the formation of concrete interface structures for the cofferdams, concrete delivery may require up to 48 barge movements in addition to those shown in Table B1-1 during standard construction hours. This is the peak movements that could occur and would last about one week per cofferdam structure. As such, these movements would occur for a total period of around two weeks.

In absence of applicable guidelines for the assessment of noise from vessel movements, a review of potential noise levels against the *Interim Construction Noise Guideline* (Department of Environment and Climate Change (DECC), 2009) noise management levels has been carried out to determine if vessel pass-by levels would be above the levels acceptable for a construction site.

Potential $L_{Aeq\ 15minute}$ noise levels from vessels were calculated based upon source sound power noise levels presented in Table B1-2. These levels are based on the existing four knot speed limit in and around the Spit Bridge. Outside of this area it was assumed vessels could travel up to eight knots.

Table B1-2: Water based construction assumed noise sources

Vessel	Individual vessel sound power level (pass-by) (L_{Aeq})	Speed
Barge	106	4 knots[2]
Barge	109	8 knots
Small crew vessel[1]	100	4 knots[2]

Vessel	Individual vessel sound power level (pass-by) (L_{Aeq})	Speed
Small crew vessel[1]	103	8 knots

Notes:
1. Based upon a small crew transfer boat (15 metres), assume three dB(A) increase for eight knots.
2. Assumed four knots within mooring area or where designated

The likely closest distance used in the assessment from the vessel travel path to a noise sensitive receiver in surrounding noise catchment areas (NCA) is presented in Table B1-3.

Table B1-3: Likely closest distance from noise sensitive receivers to vessel travel path

Vessel travel path	Middle Harbour – North (near Cofferdams)	Middle Harbour – South (near Cofferdams)	Middle Harbour – northern shoreline (near Spit Bridge)	Middle Harbour – southern shoreline (near Spit West Reserve)
	NCA 42.1	NCA 40.1	NCA 44.1	NCA 43.1
Middle Harbour Crossing to Spit West Reserve	120 metres	220 metres	100 metres	190 metres
Middle Harbour Crossing to Spit Bridge	150 metres	420 metres	100 metres	350 metres

The following conservative assumptions were adopted in the assessment:

- Numerous movements of small crew vessels, transporting construction workforce, may occur within the same hour to transport workers to or from the Middle Harbour crossing. As such, it is assumed up to four vessel movements to the Middle Harbour crossing may occur within the same 15 minute period
- One barge movement to support the cofferdam construction would occur from Spit West Reserve construction support site (BL9) to the Middle Harbour crossing within a 15 minute period
- One barge movement for disposal of dredged material to sea would occur from Middle Harbour crossing to the Spit Bridge within a 15 minute period
- During the peak period, when up to 48 additional barge movements may be required for about a two week period, this would be 4-5 additional movements per hour, which would be one additional movement per 15 minute period.

Based on the above methodology and assumptions, noise levels were modelled along travel paths from Middle Harbour crossing to the Spit West Reserve construction support site (BL9) and Middle Harbour crossing to Spit Bridge. The predicted $L_{Aeq\ 15minute}$ noise levels at the nearest receiver to the vessel travel paths is presented in Table B1-4.

Table B1-4: Predicted construction marine transport and construction vessel noise levels

Vessel type	Travel path	Middle Harbour – North (near Cofferdams)[1]	Middle Harbour – South (near Cofferdams)[2]	Middle Harbour – northern shoreline (near Spit Bridge)[3]	Middle Harbour – southern shoreline (near Spit West Reserve)[4]
Typical period					
Small crew vessel	Middle Harbour crossing to Spit West Reserve	45	39	40	45
Barge	Middle Harbour crossing to Spit West Reserve	45	39	40	45
Barge	Middle Harbour crossing to Spit Bridge	46	35	49	39
Peak period					
Barge	Middle Harbour crossing to Spit West Reserve	48	42	43	48

Note 1: Middle Harbour – North (near Cofferdams) is within NCA42.1 and the noise management level for $L_{Aeq\ 15minute}$ is 52 during standard construction hours

Note 2: Middle Harbour – South (near Cofferdams) is within NCA40.1 and the noise management level for $L_{Aeq\ 15minute}$ is 47 during standard construction hours

Note 3: Middle Harbour – northern shoreline (near Spit Bridge) is within NCA44.1 and the noise management level for $L_{Aeq\ 15minute}$ is 60 during standard construction hours

Note 4: Middle Harbour – southern shoreline (near Spit West Reserve) is within NCA43.1 and the noise management level for $L_{Aeq\ 15minute}$ is 55 during standard construction hours

The noise levels from vessel movements at Middle Harbour are predicted to be lower than the *Interim Construction Noise Guideline* (DECC, 2009) standard construction hours noise management levels. In the absence of applicable guidelines and noise management levels, and considering the predicted noise levels achieve the *Interim Construction Noise Guideline* (DECC, 2009) noise management levels, noise from construction vessel movements is unlikely to impact nearby noise sensitive receivers. Even though impacts on nearby noise sensitive receivers are unlikely, a speed limit of four knots for all marine traffic will be implemented between the Spit Bridge and 100 metres upstream of the Middle Harbour crossing in accordance with new environmental management measure CTT20 (refer to Table D2-1 of this submissions report), which would further minimise potential noise impacts on nearby receivers. Given the above, the need for further activity specific mitigation and management measures to minimise impacts from vessel movements is not considered required. In addition noise monitoring will be carried out to confirm noise levels in relation to noise and vibration management levels during construction in accordance with revised environmental management measure CNV1 (refer to Table D2-1 of this submissions report).

The preparation of a construction noise and vibration management plan as required by revised environmental management measure CNV1 (refer to Table D2-1 of this submissions report) will consider potential noise impacts from vessel movements. This will be developed prior to construction and describe the approach adopted for carrying out location and activity specific construction noise and vibration impact assessments (refer to environmental management measure CNV2 in Table D2-1 of this submissions report) to assist with designing and selecting appropriate mitigation and management measures.

B1.1.3 Operational noise

Issue raised

The operational road noise assessment has assumed quieter pavement surfaces such as open grade asphalt or similar for all sections of the Gore Hill Freeway and Burnt Bridge Creek Deviation affected by the project. If quieter pavements are not adopted for these sections as a result of further design development, then additional alternative measures will be required to achieve acceptable mitigation outcomes.

Response

Operational traffic noise mitigation measures (ie quieter pavements, noise barriers and at-property treatment) recommended for the project are indicative and confirmation of final mitigation measures would be subject to further design development, as discussed in Section 7 of Appendix G (Technical working paper: Noise and vibration).

The use of quieter pavements to reduce operational road traffic noise would be investigated during further detailed design development, as stated in Section 7.2.1 of Appendix G (Technical working paper: Noise and vibration). The final road pavement surfaces used for the project would be subject to various requirements aside from acoustic benefits, including structural integrity, skid resistance, water dispersion, maintenance and design life. Well-designed pavements that consider these requirements are subject to less rutting and cracking, which can deteriorate the operational noise performance of the pavements. Pavements would ultimately be selected by balancing performance, design life, durability, serviceability and noise emissions.

A review of the operational noise performance of the project would be completed during further design development, as required by environmental management measure ONV1 (refer to Table D2-1 of this submissions report). The appropriateness of operational noise mitigation including quieter pavement surfaces would be reviewed at this time and alternative measures proposed if required in accordance with the relevant guidelines.

B1.1.4 Shoulder periods

Issue raised

The project is proposing to apply the standard construction hours recommended in the *Interim Construction Noise Guideline* (DECC, 2009). The use of construction shoulder periods with associated noise management levels should be treated with caution as traffic noise (being the dominant source) may not be present in the same manner as when the noise monitoring was completed particularly with road closures, diversions and other impacts to traffic flow.

Response

A discussion on how shoulder periods could be applied by the project is provided in Section 6.4.5 of Appendix G (Technical working paper: Noise and vibration). Shoulder periods have not been adopted for the construction noise assessment, which focusses on performance against day, evening and night-time noise management levels. Works in shoulder periods are mentioned in Appendix G (Technical working paper: Noise and vibration) as there could be potential to schedule works when ambient noise levels are higher, resulting in less intrusive construction noise levels and reducing potential amenity impacts for adjacent sensitive receivers. This approach is consistent with Strategy 5 (Work Scheduling) from the *Interim Construction Noise Guideline* (DECC, 2009), which provides guidance on scheduling noisy work during periods when people are least affected, including around times of high background noise (such as road traffic noise).

The process for investigating how shoulder periods could be utilised during construction, to minimise potential amenity impacts associated with project activities outside standard construction hours, is provided for by revised environmental management measure CNV4 (refer to Table D2-1 of this submissions report).

Transport for NSW notes existing background and ambient noise levels associated with traffic could change due to the traffic management arrangements in place for construction activities. As such, the sources that control existing background levels would be considered as part of investigating the use of shoulder periods in accordance with revised environmental management measure CNV4 (refer to Table D2-1 of this submissions report).

B1.1.5 Community engagement

Issue raised

Construction and operational noise mitigation must focus on community engagement where engineering and administrative noise controls cannot reduce noise levels.

Response

The approaches, which would be adopted by the project to mitigate noise impacts, includes community consultation, engagement and notification, and are summarised in revised environmental management measure CNV9 (refer to Table D2-1 of this submissions report) and in the Construction noise strategy (refer to Appendix J of this submissions report).

As per the response in Section B1.1.1, community consultation would be ongoing in both construction and operational phases of the project. Consultation and engagement with affected receivers to discuss noise impacts and the implementation of additional mitigation measures is further discussed in Appendix J of this submissions report.

B1.1.6 Blasting

Issue raised

If blasting is proposed, the NSW Environment Protection Authority requests additional blasting assessments to demonstrate that blast impacts are able to comply with the relevant guidelines. The proponent must identify any impacts and address these using all feasible and reasonable mitigation and management measures.

Section 5.17 of Appendix G (Technical working paper: Noise and vibration) has adopted vibration and airblast overpressure limits for blasting which are higher than those in the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (Australian and New Zealand Environment Council (ANZEC), 1990) guidelines. Justification is required to adopt alternative blasting limits from those in the Australian and New Zealand Environment Council (1990) guideline, for reasons other than expediting the works.

Table 5-3 of the Appendix G (Technical working paper: Noise and vibration) states that blasts would be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the NSW Environment Protection Authority. The NSW Environment Protection Authority requests further clarification on how a ‘receiver group’ is defined, and how this blast schedule will be managed so that individual receivers in adjacent groups will not be impacted by successive blasts in any one day.

Response

Where blasting is proposed, potential overpressure and ground vibration impacts from blasting would be managed through site and blast specific assessments as discussed in Section 10.6 of the

environmental impact statement. Overpressure and vibration would be predicted during blast design, which would include test blasts to establish and develop site rules and confirm appropriate blast charges and configurations, to ensure the objectives and criteria identified in Australian Standard *AS 2187.2-2006 Explosives: Storage and use – Part 2 Use of explosives* (Standards Australia, 2006) are achieved. All blasting and associated activities would be carried out in a manner that would not generate unacceptable noise and vibration impacts or pose a significant risk to nearby structures and sensitive receivers.

The *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* guideline (ANZEC, 1990) is not part of the Secretary's environmental assessment requirements for the Beaches Link and Gore Hill Freeway Connection project. The appropriateness of blasting guidelines for the project was discussed and agreed to between Transport for NSW and the Department of Planning, Industry and Environment at the time of issue of the Secretary's environmental assessment requirements.

The guideline used by the noise and vibration assessment (and referred to as the appropriate guideline in the Secretary's environmental assessment requirements) is Australian Standard *AS 2187.2-2006 Explosives: Storage and use – Part 2 Use of explosives* (Standards Australia, 2006).

Australian Standard *AS 2187.2-2006 Explosives: Storage and use – Part 2 Use of explosives* provides air blast criteria and ground vibration limits for different types and lengths of blasting operations. The limits presented in the ANZEC (1990) guideline are identical to the limits in Australian Standard *AS 2187.2-2006 Explosives: Storage and use – Part 2 Use of explosives* for long-term operations (lasting longer than 12 months) or more frequent blasts (greater than 20 blasts). The Australian and New Zealand Environment Council (1990) guideline is more appropriate where there is ongoing scheduled blasting occurring, such as during the operation of mines and quarries, rather than on linear civil construction projects where there are a limited number of blasting events, particularly where they do not affect the same receivers multiple times over an extended period. Adopting the Australian Standard *AS 2187.2-2006 Explosives: Storage and use – Part 2 Use of explosives* criteria is considered to be industry best practice, as it has been widely adopted by similar projects and was conditioned in the Planning Approvals for the New M4, M8 and M4-M5 Link projects. Further discussion is provided in Section 10.4.5 of the environmental impact statement and Section 3.4.6 of Appendix G (Technical working paper: Noise and vibration).

Blasting may be occasionally required during mainline tunnelling or excavation works at Wakehurst Parkway surface road works, as discussed in Section 10.6.2 and Section 10.6.15 of the environmental impact statement. Controlled underground blasting may be used to improve the efficiency of tunnel excavation activities and to shorten the overall excavation program for tunnelling, however this would be confirmed during detailed construction planning. Blasting may also be used during the construction of the Wakehurst Parkway connection ramp tunnels and widening of Wakehurst Parkway, where it is likely there will be one blast every couple of days during excavation.

Blasts would be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the NSW Environment Protection Authority as stated in Table 5-3 of Appendix G (Technical working paper: Noise and vibration). The term 'receiver group' is not defined within Appendix G (Technical working paper: Noise and vibration). It is a term used to describe the group of community receivers who would experience noise and vibration impacts from a blast and would be determined in site and blast specific assessments.

Controlled underground blasting would be scheduled in conjunction with above ground blasting to ensure noise and vibration impacts from blasting affect a receiver group no more than once a day,

unless otherwise agreed by the NSW Environment Protection Authority. The proposed blasting program for different work sites would be regularly reviewed along with the anticipated receiver group to ensure they are not affected by a single detonation more than once a day, unless otherwise agreed by the NSW Environment Protection Authority. Blasting required for the project will be managed in accordance with revised environmental management measure CNV12 (refer to Table D2-1 of this submissions report). This includes:

- Carrying out appropriate tests at each proposed blasting location to develop site-specific laws that take into account relevant factors to determine appropriate charge sizes and blasting design
- Monitoring to determine compliance with the relevant criteria, with the site-specific laws adjusted as required based on the monitoring results to ensure ongoing compliance
- Notification of the potentially affected community about proposed blasting activities.

B1.1.7 Typographical errors

Issue raised

Table 3-2 of Appendix G (Technical working paper: Noise and vibration) states that the Out-of-Hours Work (evening) time window on Monday to Friday is 7 pm to 10 pm. This may be a typographical error and the NSW Environment Protection Authority recommends that future references be amended to refer to a 6 pm to 10 pm time window in accordance with the *Interim Construction Noise Guideline* (DECC, 2009).

Section 3.2 of Appendix G (Technical working paper: Noise and vibration) states that "The ICNG refers to the NPfI (*Noise Policy for Industry* (NSW Environment Protection Authority, 2017))…", The NSW Environment Protection Authority recommends future references are amended to read "The ICNG refers to the Industrial Noise Policy (INP)…".

Response

Transport for NSW confirms these are typographical errors and a clarification is provided in Section A5 of this submissions report.

B1.1.8 Out of hours works

Issue raised

The following issue was raised in the NSW Environment Protection Authority's supplementary submission.

The NSW Environment Protection Authority is concerned that the proponent is proposing to carry out some surface road work activities "up to 24 hour per day, seven days per week".

Section 5.1.6.1 of Appendix G (Technical working paper: Noise and vibration)) states that for the Warringah Freeway surface road works and the Gore Hill Freeway Connection surface road works, Transport for NSW is planning to maintain a requirement to undertake these works over periods of up to five calendar (consecutive) nights to minimise overall disruption to residents and the overall duration of the project's construction programme. The assessment states that "this approach is based on the outcomes of extensive consultation with the affected receivers". The NSW Environment Protection Authority requests further details of consultation that supports this statement as it is not evident in either relevant chapters of the environmental impact statement main document or technical appendices (eg Chapter 7 (Stakeholder and community engagement) or Appendix E (Community Consultation framework)).

Response

Extensive consultation has been carried out with the community for both the Warringah Freeway Upgrade and Gore Hill Freeway Connection projects, including door knocks, letter box drops and community information sessions. Due to the significant volume of works required outside standard construction hours on the Warringah Freeway Upgrade project, much of the consultation effort focussed on residents adjacent to that project. However, consultation also occurred with residents that would be affected by works associated with the Gore Hill Freeway Connection. Chapter 7 (Stakeholder and community engagement) of the environmental impact statement provides a summary of consultation completed. Much of the consultation during information sessions and door knocking exercises focussed on the establishment of the temporary construction support sites, works outside standard construction hours and potential noise impacts and visual amenity impacts due to mitigation measures included in the project methodology (eg acoustic sheds and hoarding).

The consultation referred to in Section 5.1.6.1 of Appendix G (Technical working paper: Noise and vibration) related to works on the Gore Hill Freeway being completed over five nights per week. However, since exhibition of the environmental impact statement, the majority of works associated with the Gore Hill Freeway Connection are no longer proposed to occur on five successive nights per calendar week. This is described further in Section B1.1.9 and included as a clarification in Section A5 of this submissions report.

Work outside of standard construction hours, which result in an $L_{Aeq\ 15\ minute}$ noise level more than five dB(A) above the rating background level (in accordance with the *Interim Construction Noise Guideline* (DECC, 2009)), are generally proposed to be limited to two consecutive nights per week, three non-consecutive nights per week, and 10 nights per month at any one sensitive receiver. Situations when this might not occur include following future community consultation on scheduling preferences, closures of major arterial roads (eg Lane Cove Tunnel) or when approved through an environment protection licence.

Due to the volume and complexity of the work and constraints associated with the location, the Gore Hill Freeway Connection project will require a substantial program of works, involving periods of works outside standard construction hours. Transport for NSW will continue to investigate design, staging and delivery opportunities to minimise the volume of works outside standard construction hours, which will continue once a contractor/s is engaged and further design development has occurred.

Community engagement on the design of mitigation and management measures will be ongoing including during construction of the project. As discussed in Section B1.1.1 of this submissions report, this engagement will be carried out as outlined in Section 7.3 of Appendix E (Community consultation framework). Transport for NSW will continue to consult with the community on a range of issues and will consider a program of additional consultation prior to main construction works with receivers close to the Gore Hill Freeway Connection to determine general community preferences for program and scheduling.

B1.1.9 Staging of works

Issue raised

The following issue was raised in the NSW Environment Protection Authority's supplementary submission.

The proponent has projected that adopting the baseline approach in the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a) of restricting night-time works to no more than two consecutive nights would extend the overall project construction program by nine months. It is proposed that moving the works along the road corridor will provide individual receivers with

respite from construction noise while allowing project works over a continuous period (refer to Section 5.1.6.1 of Appendix G (Technical working paper: Noise and vibration)). However, the proponent has not detailed how such movement or staging will occur in practice, and how the proponent will manage the works to ensure that receivers on the fringes of a given group or catchment, for example, will not be exposed to extended periods of noise impact from different stages of the work.

The NSW Environment Protection Authority requests justification to depart from the baseline *Construction Noise and Vibration Guideline* approach of restricting night-time works to no more than two consecutive nights per week at any work site. This justification must include demonstrated evidence of the need for out of hours works, the extent and type of consultation with affected communities on the proposed approach(es), as well as clear evidence of the degree of community agreement for their adoption. This should also include further information on whether any residual noise impacts are likely after applying all feasible and reasonable mitigation, including commentary on the total duration of night-time work at any one receiver, and any periods of respite between night-time work at any one receiver.

Response

Works on and adjacent to the trafficable parts of the Gore Hill Freeway will be subject to road occupancy licences issued by Greater Sydney Operations (previously Transport Management Centre). The requirements for working on the Gore Hill Freeway would be specified in the road occupancy licence and typically require the work to occur outside standard construction hours when traffic volumes are low, so the functional integrity of the road network is maintained and worker safety is ensured. In addition, where works require the closure of major arterial and tolled roads (eg Lane Cove Tunnel), the times and periods for the closure of these roads are typically dictated by the road operator. Previously, road occupancy licences issued for works on the Gore Hill Freeway and Warringah Freeway have required the work be carried out over a number of consecutive nights to provide consistency and improved wayfinding for motorists in the changed traffic conditions. Such conditions would be outside of the control of the project team, due to Greater Sydney Operations' (or the road operators) responsibility to maintain the integrity of the wider road network.

Transport for NSW has committed that the construction noise and vibration management plan (to be prepared by the appointed contractor/s) would contain provisions to limit noise impacts, where $L_{Aeq\ 15\ minute}$ noise levels are more than five dB(A) above the rating background level, at any one sensitive receiver to no more than two consecutive (or three non-consecutive) nights per week and 10 nights per month, unless otherwise approved through an environment protection licence. Typically, environment protection licences limit works outside standard construction hours so the amenity of any one sensitive receiver is not affected on more than two consecutive (or three non-consecutive) nights per week and 10 nights per month. Unless otherwise agreed with the community through future consultation, required by a road occupancy licence for the closure of a major arterial road (eg Lane Cove Tunnel) or approved through an environment protection licence, these provisions would be adopted for work on the Gore Hill Freeway to reduce the potential for amenity impacts (ie to provide respite) to adjacent residents outside standard construction hours.

On further review of the construction methodology, Transport for NSW believes at this time based on the current stage of project design and planning development, the majority of works on the Gore Hill Freeway can likely be completed within the proposed project timeframes with the above program restrictions imposed. This would continue to be reviewed during further design development and planning by the appointed contractor/s. Accordingly, Transport for NSW does not at this stage propose to work in manner that would generally result in noise impacts to any one receiver on five consecutive nights per week unless required through a specific road occupancy

licence which would still require approval through an environment protection licence. This is clarified in Section A5 of this submissions report.

Transport for NSW has developed the construction noise strategy in Appendix J of this submissions report, which outlines how noise impacts would be managed on the project, consolidating the measures within policies, guidelines, standards and regulations which are applicable to the project. Measures that would be considered and implemented where feasible and reasonable to reduce the potential for noise impacts due to construction are also detailed in revised environmental management measure CNV9 (refer to Table D2-1 of this submissions report). This includes when works are required outside standard construction hours (scheduling during the day wherever practicable), selection of less noisy plant and construction methods, scheduling noisest activities as early as possible in the work shift outside standard construction hours and using portable barriers around particularly noisy equipment/activities.

In addition, to further mitigate construction noise from works outside standard construction hours, noise treatments would be proactively implemented at eligible properties adjacent to the project as early as possible in the construction program as outlined in Appendix I of this submissions report.

B1.2 Surface water

B1.2.1 Construction dredging works

Issue raised

Based on the information provided in the Appendix M (Technical working paper: Contamination), the NSW Environment Protection Authority considers the potential residual water pollution risks associated with the dredging works can be managed through conditions of approval.

The NSW Environment Protection Authority recommends a condition of approval to prepare a Dredging Trigger Action Response Protocol (TARP) to be adopted.

Response

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

A construction environmental management plan would be prepared for the project and a dredge management plan is identified as a sub-plan to this document in Chapter 28 (Synthesis of the environmental impact statement) of the environmental impact statement and Section D1 of this submissions report. The dredge management plan would outline contamination management and contingency measures, backhoe dredging operations, the process for removing sediment to the load out facility and protection for sensitive foreshore areas as described in Table D1-1 of this submissions report. The dredge management plan would be prepared in accordance with the relevant guidelines including the *Waste Classification Guidelines* (NSW Environment Protection Authority (EPA), 2014b) and *National Water Quality Management Strategy Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ), 2000).

B1.2.2 Construction wastewater treatment plant discharges

Issue raised

Wastewater from tunnelling activities would be directed to five wastewater treatment plants – four discharging to the local streams (Willoughby Creek, Flat Rock Creek and Burnt Bridge Creek) via

the stormwater system and one discharging to a drainage channel flowing to the Wakehurst Golf Course dam for onsite reuse.

Proposed discharges are unlikely to pose a risk to the receiving waterways given the default guideline values for toxicants (ie 95 per cent and 99 per cent species protection level) will be met through dispersion and dilution within a short distance of the discharge points (also noting that discharge concentrations would typically be lower than the limits if the criteria were adopted as 100 percentile discharge limits).

The NSW Environment Protection Authority recommends a condition of approval for discharge consistent with the Western Harbour Tunnel project be adopted.

Response

The NSW Environment Protection Authority's comment that the default guideline values for toxicants (ie 95 per cent and 99 per cent species protection level) are appropriate and that discharge concentrations would typically be lower than a 100 percentile discharge limit if this criteria was adopted is noted. The required discharge criteria for discharges from wastewater treatment plants during construction are committed to in environmental management measure WQ11 (refer to Table D2-1 of this submissions report).

While the conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project, environmental management measure WQ11 has been updated for consistency with the Western Harbour Tunnel and Warringah Freeway Upgrade project condition of approval E208 as follows (refer to Table D2-1 of this submissions report):

> Discharges from wastewater treatment plants during the construction phase will be required to meet the following discharge criteria:
>
> - The relevant physical and chemical stressors**, the guideline values** set out in **Table 3.3.2 and 3.3.3 of** the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000)
> - The ANZG (2018) 90 per cent species protection levels for toxicants generally, with the exception of those toxicants known to bioaccumulate, which will be treated to meet the ANZG (2018) 95 per cent species protection levels
> - The draft ANZG default guideline values for iron (in fresh and marine water) and zinc (in marine water).
>
> **Where the ANZG (2018) does not provide a default guideline value for a particular pollutant, the approaches set out in the ANZG (2018) for deriving guideline values, using interim guideline values and/or using other lines of evidence such as international scientific literature or water quality guidelines from other countries, will be used**.

B1.2.3 Construction sediment basin sizing

Issue raised

The proposed sediment basin sizing is consistent with the recommendations of the Department of Environment and Climate Change (2008) for activities with a duration of disturbance of one to three years. Where the duration of disturbance is greater than three years, the Department of Environment and Climate Change (2008) recommends sizing sediment basins for the 90th and 95th percentile five-day rainfall events, for standard and sensitive receiving environments respectively. Noting construction is expected to take five to six years, the applicant would need to ensure that each sediment basin is appropriately sized for the duration of catchment disturbance.

The NSW Environment Protection Authority recommends a condition of approval relating to the design of sediment basins so the potential water pollution risks are appropriately assessed and managed.

Response

The design criteria recommended for construction sediment basins is provided in Table 8-2 of Appendix O (Technical working paper: Surface water quality and hydrology). The final location and size of all sediment basins would be determined during further design development and construction planning. The use of the five-day 90th and 95th percentile rainfall event for standard and sensitive receiving environments respectively to design sediment basins is not considered to be appropriate for the project. As detailed in *Managing Urban Stormwater: Soils and Construction Volume 2D Main Road Construction* (DECC 2008), the use of the five-day 90th and 95th percentile rainfall events for sediment basin design relates to catchments that are disturbed for greater than three years. While the construction period for the project is likely to be greater than three years, it is unlikely a single sub-catchment within the construction footprint would remain disturbed/exposed for longer than three years. Subsequently, it is unlikely any single sediment basin would be in use for longer than three years. As such, the use of the five-day 80th and 85th percentile rainfall events for standard and sensitive receiving environments is considered a more appropriate approach to protecting the environment, and minimising potential property acquisition and construction costs that may be required to construct large sediment basins to accommodate the five-day 95th/90th percentile rainfall events if this was to be applied.

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

B1.2.4 Construction controlled discharges of stormwater

Issue raised

The NSW Environment Protection Authority would like to confirm whether controlled discharges of stormwater are proposed for the construction stage. The NSW Environment Protection Authority notes the environmental impact statement states if controlled sediment basin discharges are required, a water pollution impact assessment commensurate with the potential risk and consistent with the National Water Quality Guidelines would be prepared to inform licensing consistent with Section 45 of the *Protection of the Environment Operations Act 1997*.

The NSW Environment Protection Authority recommends a condition of approval relating to construction stage stormwater discharge so the potential water pollution risks are appropriately assessed and managed.

Response

As outlined in Section 6.8.2 of the environmental impact statement, to support the operation of the temporary construction support sites, stormwater discharge would be required. Revised environmental management measure WQ9 (refer to Table D2-1 of this submissions report) outlines the capacity of the local stormwater system to receive construction wastewater treatment plant inflows would be confirmed during further design development. Additionally, environmental management measure WQ7 (refer to Table D2-1 of this submissions report) discusses the process for a direct connection to Sydney Water stormwater assets if required by the project.

Discharge impact assessments would be prepared for discharge from sediment basins in accordance with environmental management measure WQ14 (refer to Table D2-1 of this submissions report) as noted by the NSW Environment Protection Authority.

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

B1.2.5 Construction erosion and sediment control

Issue raised

There is potentially a risk of contamination of construction stormwater. Appendix M (Technical working paper: Contamination) identifies several areas of moderate to high risk contaminated sites within the project footprint, with contaminants of concern including heavy metals, hydrocarbons, pesticides and volatile organic compounds. Appendix M (Technical working paper: Contamination) states that further detailed investigations are required to quantify the environmental risks prior to construction.

Construction stage erosion and sediment controls to be implemented would be consistent with *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction, Volume 2D Main Road Construction* (DECC, 2008). However, the measures recommended by Landcom (2004) and the Department of Environment and Climate Change (2008) are designed to manage uncontaminated sediment and may not be appropriate for managing potential water pollution risks associated with contaminated lands. Alternative or additional measures may be required subject to the results of the detailed site investigations.

The NSW Environment Protection Authority recommends a condition of approval for the project regarding Contaminated Areas Trigger Action Response Protocol (TARP).

Response

The proposed approach for conducting further site contamination investigations is discussed further in Section B1.4 of this submissions report.

The potential to encounter contaminated soils during construction is discussed in Section 16.4.3 of the environmental impact statement. The management of potentially contaminated areas directly affected by the project is detailed in revised environmental management measure SG8 (refer to Table D2-1 of this submissions report). Further investigations will be carried out in accordance with the requirements of guidelines endorsed under Section 105 of the *Contaminated Land Management Act 1997*. Subject to the outcomes of the investigations, a Remediation Action Plan will be implemented in the event site remediation is warranted, and it would outline the management of contaminated soils and contaminated stormwater as part of the construction works.

The monitoring and management of water pollution risks associated with work in areas of potential contamination would be managed by environmental management measures WQ11, WQ14, SG8, SG9 and SG20 (refer to Table D2-1 of this submissions report).

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

B1.2.6 Operational discharges

Issue raised

Appendix O (Technical working paper: Surface water quality and hydrology) states that wastewater and intercepted groundwater would be directed to the Gore Hill Freeway wastewater treatment plant. Treated wastewater would discharge via a drainage pipe to Flat Rock Creek, which flows to Middle Harbour. These discharges are likely to contribute to achieving the environmental values of the receiving waterways.

The NSW Environment Protection Authority recommends a condition of approval regarding operational water treatment plant discharges.

Response

The NSW Environment Protection Authority's comment that operational discharges from the Gore Hill Freeway wastewater treatment plant are likely to contribute to achieving the environmental values of receiving waterways is noted.

While conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project, the environmental management measure WQ17 has been updated for consistency with the Western Harbour Tunnel and Warringah Freeway Upgrade project condition of approval E211 as follows (refer to Table D2-1 of this submissions report):

> The Gore Hill Freeway wastewater treatment plant will be designed to treat wastewater generated from tunnel groundwater ingress and rainfall runoff in tunnel portals to the following discharge criteria:
>
> - The relevant physical and chemical stressors**, the guideline values** set out in **Table 3.3.2 and 3.3.3 of** the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000)
> - The ANZG (2018) 95 per cent species protection levels for toxicants generally, with the exception of those toxicants known to bioaccumulate, which would be treated to meet the ANZG (2018) 99 per cent species protection levels
> - The draft ANZG default guideline values for iron (in fresh and marine water) and zinc (in marine water).
>
> **Where the ANZG (2018) does not provide a default guideline value for a particular pollutant, the approaches set out in the ANZG (2018) for deriving guideline values, using interim guideline values and/or using other lines of evidence such as international scientific literature or water quality guidelines from other countries, will be used.**

B1.3 Hydrogeology

B1.3.1 Saltwater intrusion and contamination

Issue raised

In assessing against the *NSW Aquifer Interference Policy* (NSW Department of Primary Industries (Office of Water), 2012a) minimal impact considerations, Appendix N (Technical working paper: Groundwater) identified that the saltwater intrusion and the potential migration of contaminants would reduce the quality of local groundwaters greater than 40 metres from the project alignment.

Given the predictions made from modelling, ongoing monitoring of groundwater quality is required during the construction phase of the project to validate model predictions and mitigate impacts caused as a result of project influence.

The NSW Environment Protection Authority notes, potential contaminant migration is expected at, and around, the Flat Rock Reserve precinct in Willoughby. A nested monitoring bore site (B134) currently samples for water quality in this area.

Saltwater intrusion modelling was confined to one specific cross section along the alignment. Due to the varying geology and hydraulic characteristics along the alignment, modelling of potential impact areas across the entire project area was limited. As a result of these limitations, spatial mapping of

potential impact areas of encroaching salinity was not provided or discussed in detail but are included as part of the ongoing groundwater monitoring plan.

The proponent has proposed to continue water level and comprehensive water quality monitoring and the NSW Environment Protection Authority is satisfied with the proposed monitoring objectives. The NSW Environment Protection Authority acknowledges the commitment to a Groundwater Management Plan with the inclusion of recent, updated and continuing monitoring rounds and details.

Response

The groundwater modelling presented in Appendix N (Technical working paper: Groundwater) predicts that migration of the saline interface is negligible and impacts to groundwater users, groundwater dependent ecosystems and the beneficial use of the aquifers are not expected. The predicted migration of the saline interface along the modelled cross section through the deepest part of the tunnel alignment is also considered negligible after 100 years of operation and, as such, impacts to groundwater users, groundwater dependent ecosystems and the beneficial use of the aquifer are not expected. No specific mitigation measures, such as tunnel linings (with the exception of a 125 metre section on either side of Middle Harbour), are warranted to minimise saline intrusion in this context. Transport for NSW will carry out a groundwater monitoring program in accordance with environmental management measures SG18 and SG19 (refer to Table D2-1 of this submissions report).

The NSW Environment Protection Authority comment that there is a nested monitoring bore site (B134) around the Flat Rock Reserve precinct in Willoughby is noted. Bore site, B134 is noted in both Section 4.4.2 of Appendix M (Technical working paper: Contamination) and Section 5.5.2.1 of Appendix N (Technical working paper: Groundwater) and is discussed as relevant throughout both assessments.

As outlined in Section 11 of Annexure F of Appendix N (Technical working paper: Groundwater) the aim of the saline water intrusion assessment was to assess the potential intrusion at areas of maximum drawdown within the project area. The cross-section was selected to pass through the deepest part of the proposed project mainline tunnel and the southern-end of the cross-section line, which is close to the outlet of Flat Rock Creek to the Harbour, where a potential groundwater dependent ecosystem has been identified.

Transport for NSW notes the NSW Environment Protection Authority's comment regarding the proposed monitoring objectives and groundwater management.

B1.3.2 Recommended conditions of approval

Issue raised

The NSW Environment Protection Authority recommends a condition of approval regarding the preparation of a water management plan and groundwater monitoring program (including ongoing updates to the baseline data, trigger action response plans and mitigation measures plan) prior to the commencement of construction and operation of the project

Response

Water and groundwater monitoring programs which would be developed for the project are addressed in environmental management measures WQ10, WQ18, SG1 and SG18 (refer to Table D2-1 of this submissions report). The proposed groundwater management plan and soil and water management plan are discussed in Chapter 28 (Synthesis of the environmental impact statement) of the environmental impact statement and Section D1 of this submissions report.

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

B1.4 Contamination

B1.4.1 Contamination assessment

Issue raised

The NSW Environment Protection Authority noted the following issues:

- A summary of investigation results for soil, groundwater and sediments was provided in the Appendix M (Technical working paper: Contamination). Several areas of environmental interest were identified in the environmental impact statement and the supporting contamination report. However, a detailed site investigation report was not submitted in the environmental impact statement package
- High-level environmental management measures relating to soils, groundwater and ground gas impacts were recommended. However, these measures are generic and without regard to site specific levels and types of contamination
- The NSW Environment Protection Authority notes the need for ground gas investigations in Flat Rock Reserve to further assess the potential presence of landfill-generated gas which could impact on the construction and/or operation of the project
- Limited intrusive site investigations have been conducted, and therefore ecological and human health risks posed by contamination have not been properly determined. A detailed site investigation report was not submitted in the environmental impact statement. Detailed investigations are required to determine the appropriate remedial measures that are required to make the areas suitable for the proposed use
- The NSW Environment Protection Authority recommends a NSW Environment Protection Authority-accredited site auditor is engaged throughout the duration of works to ensure that any work required in relation to contamination is appropriately managed
- Appendix P (Technical working paper: Hydrodynamics and dredge plume modelling) noted key features of the operational infrastructure include groundwater and tunnel drainage management and treatment systems. However, these were not discussed further. Further, information on groundwater contamination modelling or how groundwater contamination will be considered in tunnel design also was not provided
- A Sampling and Analysis Quality Plan which details how the type, quantity, and extent of contamination for the areas of environmental interest will be assessed, should be developed as part of the response to submissions
- Interim audit advice from a NSW Environment Protection Authority-accredited site auditor should be provided as part of the response to submissions, commenting on:
    - The appropriateness of the contamination report prepared by Jacobs as part of this environmental impact statement and the sampling and analysis quality plan which is yet to be prepared
    - Whether the areas of environmental interest have been appropriately identified
    - Adequacy of the proposed management measures.

Response

The objective of the Stage 1 contamination investigation, as documented by Appendix M (Technical working paper: Contamination), was to identify potential areas of environmental interest, which

would assist in identifying construction limitations/constraints and management options for the project with respect to contamination, and to address the Secretary's environmental assessment requirements for soils. Detailed Stage 2 site investigations are not generally carried out at the concept design phase and were not required to be carried out by the Secretary's environmental assessment requirements.

Initial contamination testing was carried out during groundwater monitoring in 2017/2018, which assisted in describing the existing contamination profiles of particular areas of the project footprint. In addition, for the marine area of environmental interest B12 (as shown in Table 5-1 and Figure 5-2 of Appendix M (Technical working paper: Contamination) which includes sediment in Middle Harbour and adjacent to the Spit) two further rounds of sampling and testing of the sediment were carried out. The first were marine investigations carried out by Douglas Partners and Golder Associates (2018) and then subsequent investigations were carried out by Royal HaskoningDHV for the purpose of assessing the suitability of dredged sediments for offshore disposal, an activity regulated under the Commonwealth *Environment Protection (Sea Dumping) Act 1981* (refer to sections A5.1.19 and C15.3.1 of this submissions report for further detail on this investigation). Determination of the offshore disposal permit(s) is subject to assessment and approval by the Commonwealth.

Potentially contaminated areas directly affected by the project (terrestrial areas of environmental interest (B1-B11 and B13-B17 as shown in Table 5-1 and Figure 5-2 of Appendix M (Technical working paper: Contamination)) will be further investigated and managed in accordance with the requirements of guidance endorsed under Section 105 of the *Contaminated Land Management Act 1997.* A Sampling Analysis and Quality Plan will be developed and Stage 2 site investigations will be completed where access is available prior to the commencement of construction on sites with moderate to high potential contamination risk in accordance with the revised environmental management measure SG8 (refer to Table D2-1 of this submissions report). A Remediation Action Plan will be implemented in the event remediation is warranted at terrestrial areas of environmental interest, and will outline the additional management measures for contaminated soil as part of the construction works, if necessary. A NSW Environment Protection Authority-accredited Site Auditor will be engaged where contamination is complex to review applicable contamination reports and evaluate the suitability of sites for a specified use as part of the project. Complex contamination may include where there is significant groundwater contamination, contamination that requires specialised remediation techniques, or contamination that requires ongoing active management during and beyond construction.

Contaminated sediments present in the marine area of environmental interest (referred to as area B12 in Table 5-1 and Figure 5-2 of Appendix M (Technical working paper: Contamination)) will be managed in accordance with environmental management measures SG17 and WM3, with further detail on the management and treatment of marine sediments included in Section C15.3 of this submissions report.

The NSW Environment Protection Authority comment that there is a need for ground gas investigations in Flat Rock Reserve is noted. Revised environmental management measure SG15 (refer to Table D2-1 of this submissions report) commits to ground gas investigations at Flat Rock Reserve.

The interaction of operational infrastructure with groundwater is discussed in Appendix N (Technical working paper: Groundwater). Groundwater contamination is discussed in Appendix M (Technical working paper: Contamination). Appendix P (Technical working paper: Hydrodynamics and dredge plume modelling) focuses on the hydrodynamic and water quality of the marine environment.

Transport for NSW will carry out a groundwater monitoring program in accordance with revised environmental management measure SG18 (refer to Table D2-1 of this submissions report), which will consider additional locations for monitoring subject to medium and high risk of groundwater contamination during construction and operation. This additional information would assist in confirming the level of treatment for encountered contaminated groundwater (if required) during construction and operation.

B1.4.2 Recommended conditions of approval

Issue raised

The NSW Environment Protection Authority recommends five conditions of approval regarding the assessment, management and auditing of contamination.

Response

Potentially contaminated areas directly affected by the project (terrestrial areas of environmental interest (B1-B11 and B13-B17 as shown in Table 5-1 of Appendix M (Technical working paper: Contamination)) will be further investigated and managed in accordance with the requirements of guidance endorsed under Section 105 of the *Contaminated Land Management Act 1997*, in accordance with the revised environmental management measure SG8 (refer to Table D2-1 of this submissions report). A Remediation Action Plan will be implemented in the event site remediation is warranted and would outline the additional management measures for contaminated soil and sediment as part of the construction works, if necessary. A NSW Environment Protection Authority-accredited Site Auditor will be engaged where contamination is complex to review applicable contamination reports and evaluate the suitability of sites for a specified use as part of the project.

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

B1.5 Air quality

B1.5.1 General comments

Issue raised

The NSW Environment Protection Authority considers that Appendix H (Technical working paper: Air Quality) has been conducted in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (NSW EPA, 2016). However, the NSW Environment Protection Authority has identified some points that require clarification and some others that require further assessment and recommends additional information be provided.

Response

Transport for NSW note the NSW Environment Protection Authority comment that the air quality assessment has been carried out in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (NSW EPA, 2016). Where further clarification, assessment and additional information has been requested, this has been provided in Section B1.5.2, Section B1.5.3, Section B1.5.4 and Section B1.5.5 of this submissions report.

B1.5.2 Differences in outlet parameters

Issue raised

Whilst the NSW Environment Protection Authority expected that the ventilation outlet parameters previously used in the Western Harbour Tunnel and Warringah Freeway Upgrade environmental

impact assessment were used for the assessment of Beaches Link and Gore Hill Freeway Connection project, it is noted that some of the ventilation outlet parameters exhibited in Table G-8 with Annexure G of Appendix H (Technical working paper: Air quality) are different from those previously presented for the Western Harbour Tunnel and Warringah Freeway Upgrade assessment.

Although 'Do Something Cumulative' modelling scenarios prepared for the Western Harbour Tunnel and Warringah Freeway Upgrade environmental impact assessment and the project follow the same approach (eg sources), there are differences when comparing the predicted results from each project. For instance, it is likely that this is one of the reasons why the 'Top 10' receivers selected for the 1-hour NO_2 contemporaneous assessment in the vicinity of the Cammeray ventilation outlets (G and H) in the Beaches Link and Gore Hill Freeway Connection assessment are different from those selected for the Western Harbour Tunnel and Warringah Freeway Upgrade assessment.

The NSW Environment Protection Authority recommends that for transparency of assessment evaluation, the proponent provide a detailed discussion on the rationale behind the different ventilation outlet parameters and confirm that the discharge parameters used in the Beaches Link assessment are both appropriate for predicting reasonable worst-case impacts and are consistent with the Beaches Link and Western Harbour Tunnel project designs.

Response

Transport for NSW acknowledges that when comparing Annexure G of Appendix H (Technical working paper: Air quality) for the Western Harbour Tunnel and Warringah Freeway Upgrade project and Annexure G of Appendix H (Technical working paper: Air quality) for Beaches Link and Gore Hill Freeway Connection there are differences in the air flow and exit velocities presented for ventilation outlets F, G, H, I, J and K. The changes in air flow and exit velocities resulted from an updated ventilation assessment to account for minor changes to the Beaches Link portal arrangements and tunnel alignment, and some updates to the fleet assumptions, with updated data provided for ventilation outlets F, G, H, I, J and K. Data for ventilation outlets A-E were unchanged.

When comparing the hourly air flows across the two assessments, it is noted the minimum hourly air flow is generally lower for the project when compared with the Western Harbour Tunnel and Warringah Freeway Upgrade assessment. For example, for outlet I the minimum flow rate is 260 m^3/s for the project and 300 m^3/s for the Western Harbour Tunnel and Warringah Freeway Upgrade. However, the same modelling approach was used for both assessments. The exhaust flow data for each individual ventilation outlet was used to determine source groups, which were entered into the Graz Lagrangian Model (GRAL) model. The source groups (refer to Table G-8, Annexure G of Appendix H (Technical working paper: Air quality)) are identical across both assessments for ventilation outlets A-J. The location of ventilation outlet K also changed compared to Western Harbour Tunnel and Warringah Freeway Upgrade project due to the revised connection to and from Burnt Bridge Creek Deviation. This meant ventilation outlet K has an additional source group for the Beaches Link and Gore Hill Freeway Connection assessment, to account for differences in hourly air flows between the two projects. The time periods (refer to Table G-8, Annexure G of Appendix H (Technical working paper: Air quality)) are identical across both assessments for ventilation outlets A-H. For outlets I, J and K, the time periods are different between the two assessments, due to the differences in airflows, which also meant that the hourly flow rate patterns for outlets I, J and K differed to those for the Western Harbour Tunnel and Warringah Freeway Upgrade project. It is noted there are errors in the referenced time period for outlets I, J and K in Table G-8, Annexure G of Appendix H (Technical working paper: Air quality), which is further discussed as a clarification in Section A5 of this submissions report.

For the assessment of the 'Top 10' receivers, the regulatory worst case (RWC) receivers in each domain around the ventilation outlets were ranked in terms of the largest ventilation outlet contributions. As the emission rates and exhaust flow data had changed for the Beaches Link and Gore Hill Freeway Connection assessment, this led to a different Top 10 receiver list between the assessments. When comparing the selected Top 10 receiver list across both assessments, there are differences but the cluster of receivers to the east/south east of the ventilation outlets appears in both assessments.

B1.5.3 Regulatory Worst Case scenarios

Issue raised

There is uncertainty regarding the selection of the exit velocity used for the Regulatory Worst Case (RWC) scenarios. Whilst Section 8.4.2 of Appendix H (Technical working paper: Air Quality) seems to indicate that the lowest exit velocity (of the different source groups) is used to estimate the mass emissions rates, it is acknowledged that based on information provided in Table G-163 (Annexure G), the maximum exit velocity is used instead.

Considering that results presented in the Western Harbour Tunnel and Warringah Freeway Upgrade project submissions report show that modelling at the maximum flowrate:

- Increased cumulative impacts by up to 10 per cent
- For almost all pollutants, worst case impacts occurred when the flowrate was at a maximum, the NSW Environment Protection Authority considers that for transparency of the assessment evaluation, the proponent should clarify whether the maximum exit velocity is used in the calculation of the mass emissions rates used in the RWC modelling scenarios.

The NSW Environment Protection Authority recommends the proponent clarifies and justifies the selection of the adopted flow rate and exit velocity for predicting reasonable worst-case impacts. Where necessary, results and conclusions for all relevant RWC modelling scenarios must be revised and updated accordingly.

Response

It is acknowledged the text in Section 8.4.2 of Appendix H (Technical working paper: Air quality) contains a typographical error and a clarification is discussed within Section A5 of this submissions report. Consistent with the Western Harbour Tunnel and Warringah Freeway Upgrade assessment, it was determined the most conservative approach was to model the highest exit velocity of the different sources in GRAL. Transport for NSW confirms the highest/maximum exit velocity has been used for the different sources in GRAL and this has been used in the calculation of the mass emission rates used in the RWC modelling scenarios presented in the environmental impact statement.

B1.5.4 Elevated receivers

Issue raised

The NSW Environment Protection Authority comments that predicted ventilation outlet contributions to the predicted exceedances for non-existing receivers are potentially significant. If building heights and/or future developments are not carefully considered within 300 metres of the ventilation outlets, there could be significant exceedances in 24-hour average and annual average PM and 1-hour average formaldehyde at existing and future buildings at height.

The NSW Environment Protection Authority requests further robust justification to demonstrate that the ventilation outlet emissions at the proposed emission limits will not cause adverse air quality impacts. The NSW Environment Protection Authority request that the assessment at a minimum:

- Focus on PM exceedances at existing receivers (at 30 metres) near the Cammeray ventilation outlet, and predicted exceedances of PM and formaldehyde at non-existing receivers
- Assess the frequency (contemporaneous assessment), likelihood and severity of exceedances
- Identify operational management and mitigation measures, including but not limited to augmentation of the ventilation outlets
- Review of the appropriateness of proposed emission limits for the ventilation outlets.

Response

Section 10.2.4 of Appendix H (Technical working paper: Air Quality) acknowledges that there are potential impacts for future buildings above 30 metres in height within 300 metres of the ventilation outlets, but this would not necessarily preclude such development. Further consideration at rezoning or development application stage would be required. To provide consistency with the Western Harbour Tunnel and Warringah Freeway Upgrade project condition of approval E37, environmental management measure LP7 (refer to Table D2-1 of this submissions report) has been updated and states:

> **Transport for NSW will provide data to Northern Beaches Council, North Sydney Council, Willoughby City Council and the Department of Planning, Industry and Environment (as appropriate), detailing pollution concentrations at various heights and distances from the ventilation outlets to facilitate the planning of and assessment of new development in areas within a distance of 300 metres around the ventilation outlets which would be within a potential three-dimensional zone of affectation (buffer volume).** ~~Transport for NSW will assist Northern Beaches Council, North Sydney Council, Willoughby City Council, and the Department of Planning, Industry and Environment (as appropriate) in determining relevant land use considerations applicable to future development in the immediate vicinity of ventilation outlets for inclusion in local environmental plans or development control plans, where required, to manage interactions between the project and future development. This may include procedures for identifying the requirement for consultation with Transport for NSW.~~

Subsequently, any proposed development within 300 metres of the ventilation outlets would require a separate assessment. This is not unusual and would be carried out once the final design is known.

For the elevated receiver assessment, modelling was conducted to determine contributions from the ventilation outlets and combined modelled source contributions plus background, for long term (annual average) and short term (maximum 1-hour and maximum 24-hour) periods. The model was not configured to provide time series results which would allow for a contemporaneous assessment at all residential, workplace and recreational (RWR) receivers. This was only completed for the 42 community receivers.

As noted by the NSW Environment Protection Authority in their submission, for maximum 24-hour average PM_{10} there is one elevated existing RWR receiver predicted to exceed the NSW Environment Protection Authority impact assessment criterion and this occurs during the RWC scenario. For maximum 24-hour average $PM_{2.5}$, there is also one elevated existing RWR receiver predicted to exceed the NSW Environment Protection Authority impact assessment criterion and this also occurs during the RWC scenario. The elevated existing RWR receiver exceeding for both pollutants is the same RWR receiver location of RWR-12249. To address the issue raised by the NSW Environment Protection Authority in their submission additional modelling has been carried out and this receiver (RWR-12249) was added to the model which was rerun to generate a time series at a height of 30 metres for the RWC scenario. Figure B1-1 presents this time series for PM_{10} and shows the exceedances are due to elevated background levels, generally in May when there was a significant hazard reduction burn event that affected much of the Sydney Basin and background

levels at the time. The exception is one predicted exceedance on 22 May, where background levels are less than the NSW Environment Protection Authority impact assessment criterion. The individual contributions on that day are shown in more detail in Figure B1-2. This figure shows that the background is the dominant contribution and it is clear the contributions from the outlets are not the cause of the exceedance.

The time series for $PM_{2.5}$ at that same elevated receiver for the RWC scenario is presented in Figure B1-3, showing again the majority of exceedances are due to elevated background levels in May when a significant hazard reduction burn event affected much of the Sydney Basin and background levels at the time. One additional exceedance of the maximum 24-hour average concentration, occurs on 16 October where background levels are less than the NSW Environment Protection Authority impact assessment criterion. Figure B1-4 outlines the individual contributions on this day, and again shows background levels are the dominant contribution, and the contribution from the outlets are not the cause of the exceedance.

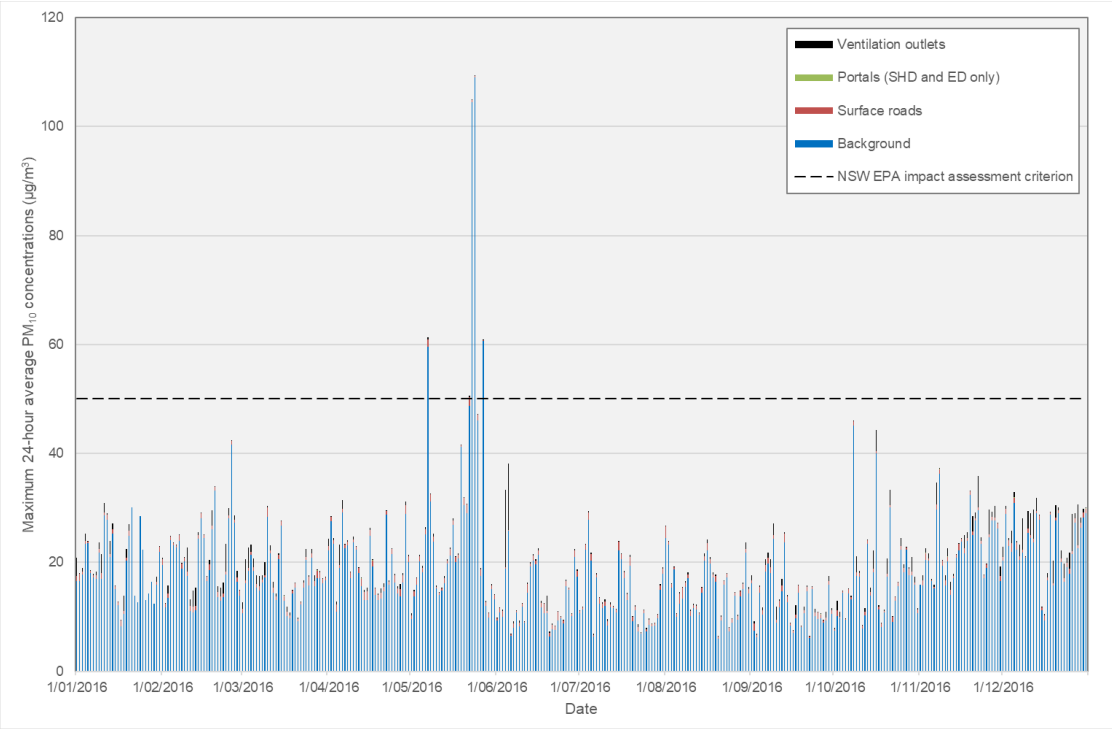


Figure B1-1: Series for RWR-12249 for maximum 24-hour average PM_{10} concentrations at 30 metres above ground level

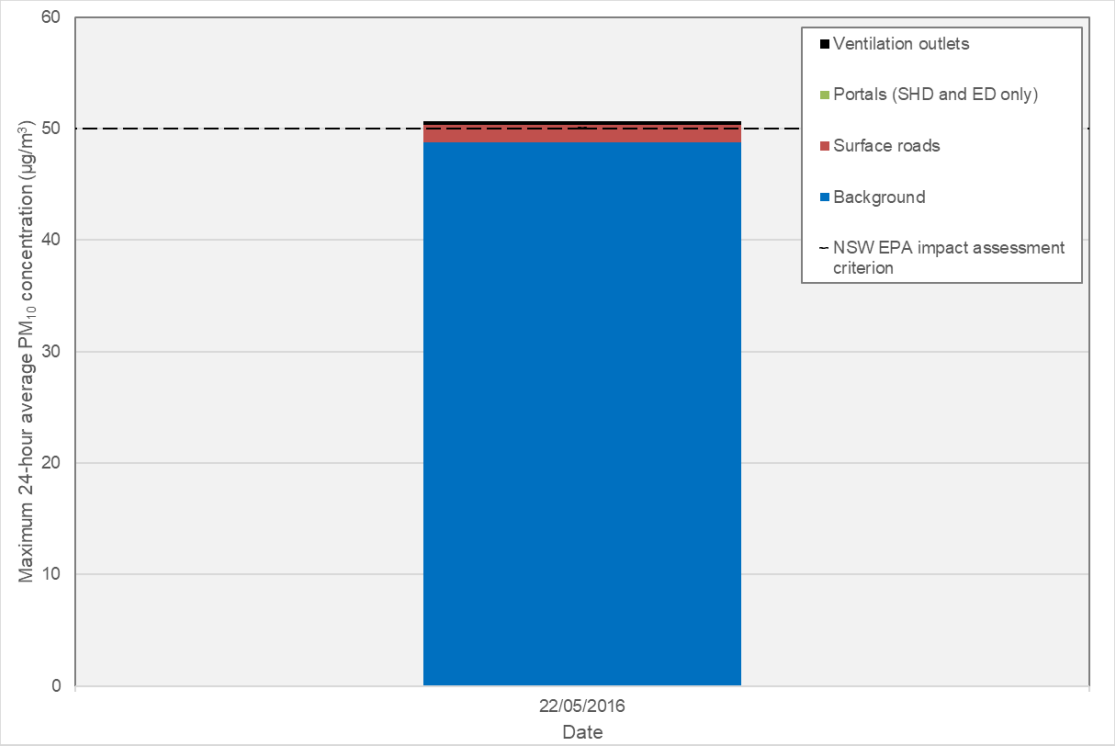


Figure B1-2: Source contributions for exceedance on 22nd May at RWR-12249 at 30 metres above ground level

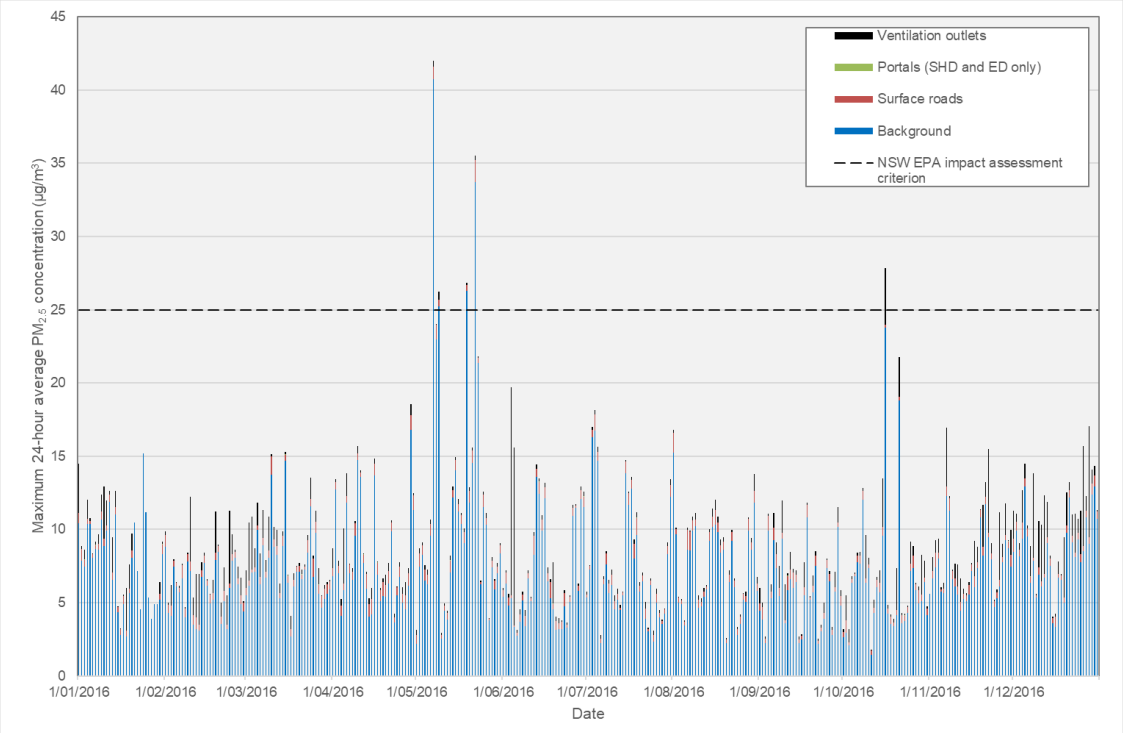


Figure B1-3: Time series for RWR-12249 for maximum 24-hour average $PM_{2.5}$ concentrations at 30 metres above ground level for the RWC scenario

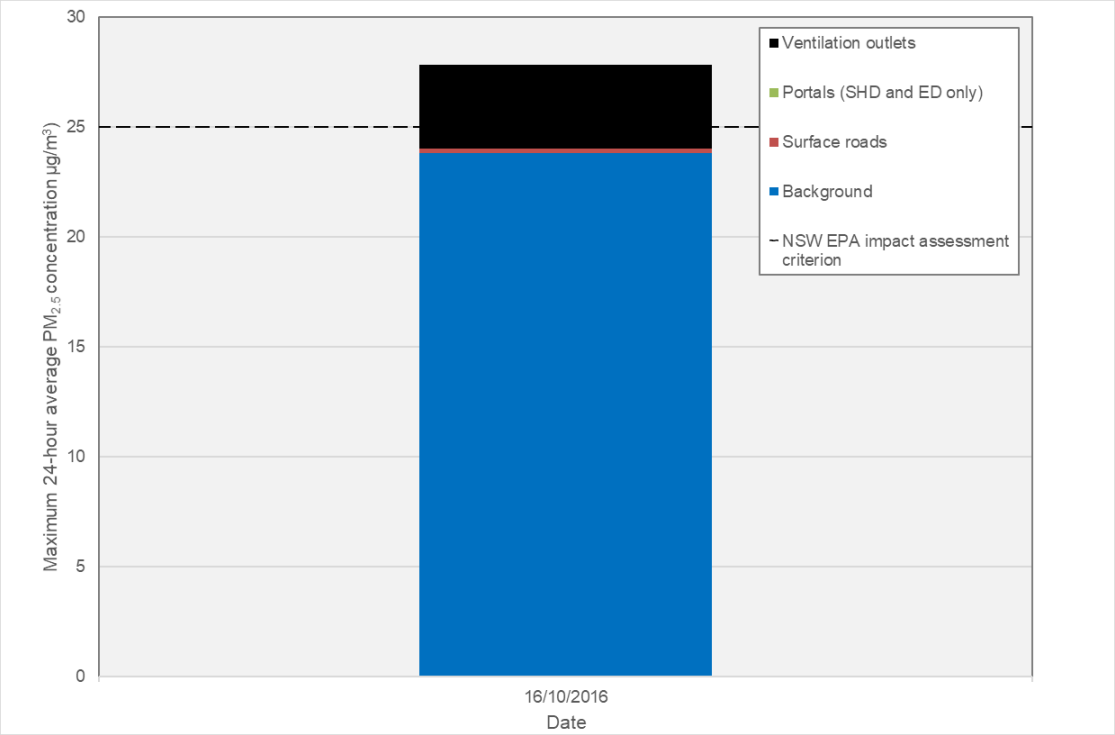


Figure B1-4: Source contributions for exceedance on 16th October at RWR-12249 at 30 metres above ground level for the RWC scenario

B1.5.5 Predictions at the Northern Beaches Hospital

Issue raised

Ventilation outlet only contributions (ie incremental results) for the Expected Traffic modelling scenario are presented in Annexure J of Appendix H (Technical working paper: Air Quality). A review of the '1-hour NO_x for all ventilation outlets' contour plots indicates that it is possible for localised concentrations to be predicted in areas approximately 3-5 kilometres to the north of the Wakehurst (J) and Burnt Bridge (K) ventilation outlets. For instance, Figures J-26 and J-30 show that there are localised concentrations in the area near Northern Beaches Hospital.

It should be noted that none of the RWR receivers located in 'close' proximity to Northern Beaches Hospital were incorporated in either of the following scenarios:

- RWC at the 'Top 10' receivers (1-hr NO_2 contemporaneous)
- Expected Traffic - elevated receivers
- RWC at elevated receivers.

Considering the potential for localised concentrations and that the building heights in the area are between 0-15 metres, the NSW Environment Protection Authority considers that RWR receivers in this area (including Northern Beaches Hospital), should be included in the above-mentioned modelling scenarios. If approved, the NSW Environment Protection Authority will be regulating the ventilation outlets via emission limits informed by the modelled emissions in the RWC scenario. As such, the NSW Environment Protection Authority needs to be confident that the operation at the proposed licence limits will not cause significant adverse air quality impacts.

The NSW Environment Protection Authority requests further assessment of existing and approved elevated receivers located to the north of ventilation outlet J including Northern Beaches Hospital and surrounding areas. The NSW Environment Protection Authority request that the assessment:

- Be conducted for the following modelling scenarios:
  - RWC scenario at the 'Top 10' receivers (1-hr NO_2 contemporaneous)
  - Expected traffic - elevated receivers
  - RWC scenario at elevated receivers
- Consider the potential individual contributions from ventilation outlets J and K
- Present incremental (ventilation outlet), background (surface road and other non-surface road contributions) and cumulative concentrations for NO2 (1 hour) and air toxics (1 hour)
- If applicable, present information regarding the predicted frequency (contemporaneous assessment), likelihood and severity of exceedances.

Response

Localised concentrations

The NSW Environment Protection Authority's comment on the possibility for localised concentrations to be predicted in areas around three to five kilometres to the north the ventilation outlets at Balgowlah and Wakehurst Parkway is noted.

Receivers considered

Within the air quality assessment Appendix H (Technical working paper: Air quality), Northern Beaches Hospital is included as a community receiver (CR42) and as an RWR receiver (RWR-33564). All community receivers and RWR receivers are included in all modelling scenarios. The results for certain RWR receivers were presented based on the methodology for that particular scenario:

- For the RWC scenario at the 'Top 10' receivers, all RWR receivers were modelled and results processed, however when presenting and reporting, only results for the 'Top 10' receivers were provided in the assessment. As outlined in Section 8.4.2 of Appendix H (Technical working paper: Air quality), for this scenario four domains were defined around each outlet for the project
- For the elevated receiver assessment, for both expected traffic and RWC, all RWR receivers were modelled and results processed. When presenting and reporting, only receivers within 300 metres of the ventilation outlets were provided for the assessment (this distance was based on feedback included in the NSW Environment Protection Authority's submission on the Western Harbour Tunnel and Warringah Freeway Upgrade environmental impact statement).

Northern Beaches Hospital (and surrounding RWR receivers) are about three to five kilometres northwest of outlet J, and 4.5 to five kilometres northwest of outlet K. Based on that criteria, Northern Beaches Hospital and surrounding RWR receivers were outside of the 'Top 10' domain (in terms of the largest ventilation outlet contributions, refer to Section 8.4.2 of Appendix H (Technical working paper: Air quality) for further information) and were more than 300 metres from the ventilation outlets. On that basis, these receivers were not included in the reporting for the Top 10 receivers and elevated receiver scenarios. The largest contributions of the tunnel ventilation outlets at any RWR receiver in any scenario were as follows:

- Annual PM_{10}: 0.29 µg/m^3, or 1.2 per cent of the criterion (25 µg/m^3) [2037-DSC]
- Max. 24-hour PM_{10}: 1.80 µg/m^3, or 3.6 per cent of the criterion (50 µg/m^3) [2037-DSC]

- Annual $PM_{2.5}$: 0.18 µg/m^3, or 2.3 per cent of the criterion (8 µg/m^3) [2037-DSC]
- Max. 24-hour $PM_{2.5}$: 1.10 µg/m^3, or 4.4 per cent of the criterion (25 µg/m^3) [2037-DSC].

However, as all RWR receivers are modelled, the results for Northern Beaches Hospital have been extracted and the following provides predicted concentrations.

Expected traffic scenarios at elevated receivers

Table B1-5 to Table B1-7 provide the ventilation outlet contributions, background and total concentrations for PM_{10}, $PM_{2.5}$ and NO_x/NO_2 for the expected traffic 'Do something cumulative – 2037' scenario at ground level and elevated heights above ground level for Northern Beaches Hospital (RWR-33564). Table B1-8 provides ventilation outlet contributions for air toxics for the expected traffic 'Do something cumulative – 2037' scenario at ground level and elevated heights above ground level for Northern Beaches Hospital. For air toxics, only ventilation outlet contributions have been provided which is consistent with the results provided in Appendix H (Technical working paper: Air quality).

It is noted that for the RWR receiver at Northern Beaches Hospital (RWR-33564) there is an exceedance of the NSW Environment Protection Authority impact assessment criterion for the annual average $PM_{2.5}$ at ground level for the expected traffic 'Do something cumulative – 2037' scenario (refer to Table B1-5). At the same receiver, there is also an exceedance during the 'Do minimum – 2037' scenario and therefore this is not an exceedance caused by the project. In fact, the predicted annual average $PM_{2.5}$ concentrations at RWR-33564 across the two scenarios shows no measurable difference. The predicted concentrations for both scenarios are 8.1 µg/m^3, therefore the project is not anticipated to cause any change to air quality at this location.

Results for all other pollutants are below the NSW Environment Protection Authority impact assessment criteria.

Table B1-5: Annual average and maximum 24-hour average $PM_{2.5}$ concentrations for Northern Beaches Hospital (RWR-33564) for expected traffic 2037-DSC

Receiver height (m)	$PM_{2.5}$ concentrations (µg/m^3)		
	Ventilation outlet contributions	Background	Total (all sources plus background)[1]
Annual average $PM_{2.5}$			
Ground level	<0.1	7.7	**8.1**
10 m	<0.1	7.6	**7.7**
20 m	<0.1	7.6	7.6
30 m	<0.1	7.5	7.5
45 m	<0.1	7.5	7.5
24-hour average $PM_{2.5}$			
Ground level	<0.1	22.1	**22.9**
10 m	<0.1	18.3	18.3
20 m	<0.1	18.0	18.0
30 m	<0.1	17.9	**18.0**
45 m	<0.1	17.8	**17.9**

Note 1: Bold values are identified as an exceedance

Table B1-6: Annual average and maximum 24-hour average PM_{10} concentrations for Northern Beaches Hospital (RWR-33564) for expected traffic for 2037-DSC

Receiver height (m)	PM_{10} concentrations (µg/m³)		
	Ventilation outlet contributions	Background	Total (all sources plus background)[1]
Annual average PM_{10}			
Ground level	<0.1	15.4	**16.0**
10 m	<0.1	15.3	15.3
20 m	<0.1	15.2	**15.3**
30 m	<0.1	15.1	15.1
45 m	<0.1	15.0	**15.1**
24-hour average PM_{10}			
Ground level	0.1	48.0	**49.6**
10 m	0.1	41.8	41.8
20 m	0.1	41.6	**41.7**
30 m	0.1	41.3	**41.4**
45 m	0.1	41.2	**41.3**

Note 1: Bold values are identified as an exceedance

Table B1-7: Annual average and maximum 1-hour average NO_x/NO_2 concentrations for Northern Beaches Hospital (RWR-33564) for expected traffic 2037-DSC

Receiver height (m)	NO_x/NO_2 concentrations (µg/m³)		
	Ventilation outlet contributions (NO_x)	Background (NO_x)	Total (all sources plus background) (NO_2)[1]
Annual average NO_x/NO_2			
Ground level	0.2	17.9	15.4
10 m	0.1	14.5	13.0
20 m	0.1	12.2	11.4
30 m	0.1	10.6	9.8
45 m	0.1	8.6	8.3
1-hour average NO_x/NO_2			
Ground level	11	604	197
10 m	4	489	191
20 m	6	411	179
30 m	5	356	177
45 m	7	290	175

Note 1: Bold values are identified as an exceedance

Table B1-8: Maximum 1-hour average air toxics concentrations for Northern Beaches Hospital (RWR-33564) for expected traffic 2037-DSC

Receiver height (m)	Incremental (ventilation outlet) contribution (µg/m³)				
	Benzene	PAH (as b(a)p)	Formaldehyde	1,3-butadiene	Ethylbenzene
Ground level	0.01	<0.01	0.01	<0.01	<0.01

Receiver height (m)	Incremental (ventilation outlet) contribution (µg/m³)				
	Benzene	PAH (as b(a)p)	Formaldehyde	1,3-butadiene	Ethylbenzene
10 m	0.01	<0.01	0.02	<0.01	0.00
20 m	0.02	<0.01	0.02	<0.01	0.01
30 m	0.02	<0.01	0.02	<0.01	0.01
45 m	0.02	<0.01	0.03	0.01	0.01

Note 1: Bold values are identified as an exceedance

RWC at elevated receivers

Table B1-9 to Table B1-11 provide the ventilation outlet contributions, background and total concentrations for PM10, PM2.5 and NO_x/NO_2 for the RWC 'Do something cumulative – 2037' scenario at ground level and elevated heights above ground level for the Northern Beaches Hospital (RWR-33564).

Table B1-12 provides ventilation outlet contributions for air toxics for the RWC 'Do something cumulative – 2037' scenario at ground level and elevated heights above ground level for Northern Beaches Hospital. For air toxics, only ventilation outlet contributions have been provided which is consistent with the results provided in Appendix H (Technical working paper: Air quality).

It is noted there is an exceedance of the NSW Environment Protection Authority impact assessment criterion for the annual average $PM_{2.5}$ at ground level for the RWC 'Do something cumulative – 2037' scenario (refer to Table B1-9). There is also an exceedance at this RWR receiver during the expected traffic 'Do something cumulative – 2037' scenario and expected traffic 'Do minimum – 2037' scenario, therefore this exceedance is not caused by the project.

There is also an exceedance of the NSW Environment Protection Authority impact assessment criterion for the maximum 24-hour average PM_{10} at ground level. For the expected traffic 'Do something cumulative – 2037' scenario, the predicted concentration at this RWR receiver is 49.6 µg/m³, 0.4 µg/m³ below the NSW Environment Protection Authority impact assessment criterion. For the RWC 'Do something cumulative – 2037' scenario, the predicted concentration of 50.1 µg/m³ is dominated by the background (48 µg/m³) with the ventilation outlet contribution relatively small at 0.6 µg/m³. There are no other exceedances of the NSW Environment Protection Authority impact assessment criteria.

Table B1-9: Annual average and maximum 24-hour average $PM_{2.5}$ concentrations for the Northern Beaches Hospital (RWR-33564) for RWC 2037-DSC

Receiver height (m)	$PM_{2.5}$ concentrations (µg/m³)		
	Ventilation outlet contributions	Background	Total (all sources plus background)[1]
Annual average $PM_{2.5}$			
Ground level	0.1	7.7	8.2
10 m	0.1	7.6	**7.7**
20 m	0.1	7.6	**7.7**
30 m	0.1	7.5	**7.6**
45 m	0.1	7.5	**7.6**
24-hour average $PM_{2.5}$			
Ground level	0.6	22.1	**23.4**
10 m	0.5	18.3	**18.7**
20 m	0.5	18.0	**18.5**

Receiver height (m)	$PM_{2.5}$ concentrations (µg/m³)		
	Ventilation outlet contributions	Background	Total (all sources plus background)[1]
30 m	0.6	17.9	**18.6**
45 m	0.5	17.8	**18.3**

Note 1: Bold values are identified as an exceedance

Table B1-10: Annual average and maximum 24-hour average PM_{10} concentrations for the Northern Beaches Hospital (RWR-33564) for RWC 2037-DSC

Receiver height (m)	PM_{10} concentrations (µg/m³)		
	Ventilation outlet contributions	Background	Total (all sources plus background)[1]
Annual average PM_{10}			
Ground level	0.1	15.44	**16.0**
10 m	0.1	15.31	**15.4**
20 m	0.1	15.25	**15.3**
30 m	0.1	15.12	**15.2**
45 m	0.1	15.05	**15.1**
24-hour average PM_{10}			
Ground level	0.6	48.0	**50.1**
10 m	0.5	41.8	**42.2**
20 m	0.5	41.6	**42.1**
30 m	0.6	41.3	**41.9**
45 m	0.5	41.2	**41.7**

Note 1: Bold values are identified as an exceedance

Table B1-11: Annual average and maximum 1-hour average NO_x/NO_2 concentrations for the Northern Beaches Hospital (RWR-33564) for RWC 2037-DSC

Receiver height (m)	NO_x/NO_2 concentrations (µg/m³)		
	Ventilation outlet contributions (NO_x)	Background (NO_x)	Total (all sources plus background) (NO_2)
Annual average NO_x/NO_2			
Ground level	1.6	17.94	15.98
10 m	1.5	14.53	13.70
20 m	1.5	12.20	12.12
30 m	1.4	10.58	10.54
45 m	1.5	8.61	**9.13**
1-hour average NO_x/NO_2			
Ground level	80	604	201
10 m	141	489	199
20 m	117	411	186
30 m	92	356	184
45 m	97	290	182

Note 1: Bold values are identified as an exceedance

Table B1-12: Maximum 1-hour average air toxics concentrations for the Northern Beaches Hospital (RWR-33564) for RWC 2037-DSC

Receiver height (m)	Incremental (ventilation outlet) contribution (µg/m^3)				
	Benzene	PAH (as b(a)p)	Formaldehyde	1,3-butadiene	Ethylbenzene
Ground level	0.48	0.01	0.65	0.13	0.15
10 m	0.71	0.01	0.96	0.19	0.23
20 m	0.60	0.01	0.81	0.16	0.19
30 m	0.73	0.01	0.99	0.20	0.24
45 m	0.73	0.01	0.99	0.20	0.24

Note 1: Bold values are identified as an exceedance

Requested additional assessment

As mentioned previously, regarding the 'Top 10' receivers, Northern Beaches Hospital (and surrounding RWR receivers) are around three to five kilometres northwest of outlet J, and 4.5 to five kilometres northwest of outlet K, therefore they were outside of the 'Top 10' domain (refer to Section 8.4.2 of Appendix H (Technical working paper: Air quality) for further information). As a result, these receivers were not included in the reporting for the Top 10 receivers.

Consideration of the individual contributions from outlets J and K, is not feasible given the current model set up. The models are configured to include all ventilation outlets in one model run. The extracted model results are therefore for all ventilation outlets and not each individual outlet.

As Northern Beaches Hospital is included as a Community Receiver (CR42) within the assessment, a contemporaneous assessment (time series) for expected traffic modelling for PM_{10} and $PM_{2.5}$ is provided in Figure B1-5 and Figure B1-6. The figures show the background concentration and the source contribution (surface roads, portals and ventilation outlets), and comparison with the NSW Environment Protection Authority impact assessment criterion.

Figure B1-5 presents a time series of maximum 24-hour average PM_{10} concentrations at Northern Beaches Hospital (CR42) and shows there are seven days where levels are predicted to be above the NSW Environment Protection Authority impact assessment criterion. In each of these instances, the high background level is the dominant contribution, and it is clear the contribution from the outlets is not the cause of the exceedance. There are no additional exceedances of the criterion caused by source contributions.

Figure B1-6 presents a time series of maximum 24-hour average $PM_{2.5}$ concentrations at Northern Beaches Hospital (CR42) and shows there are seven days where levels are predicted to be above the NSW Environment Protection Authority impact assessment criterion. Again, in each of these instances the high background level is the dominant contribution, and it is clear the contribution from the outlets is not the cause of the exceedance. There are no predicted exceedances of the criterion caused by source contributions.

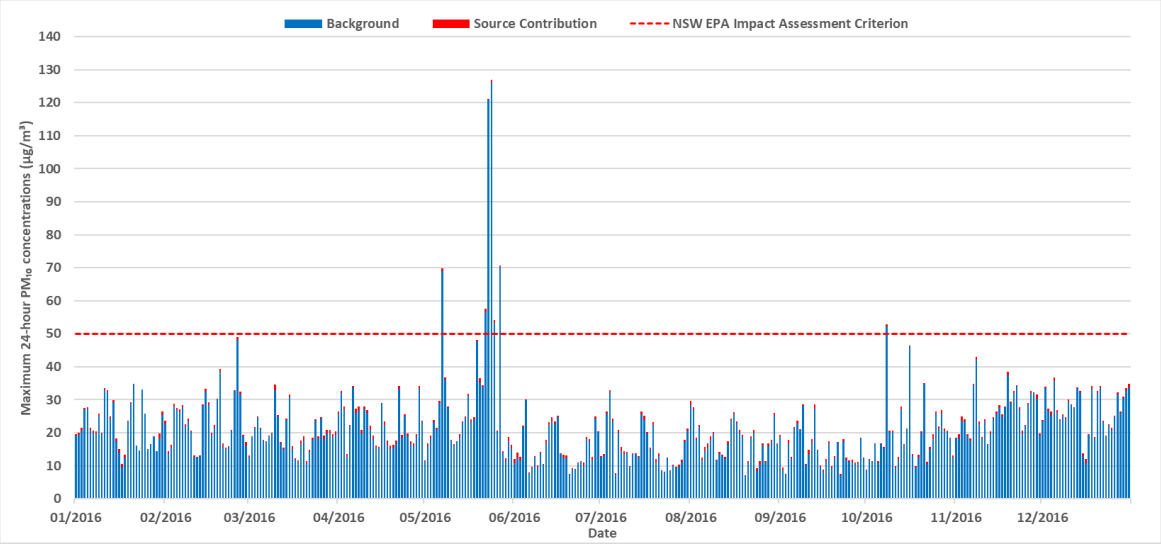


Figure B1-5: Time series for CR42 for maximum 24-hour average PM_{10} concentrations

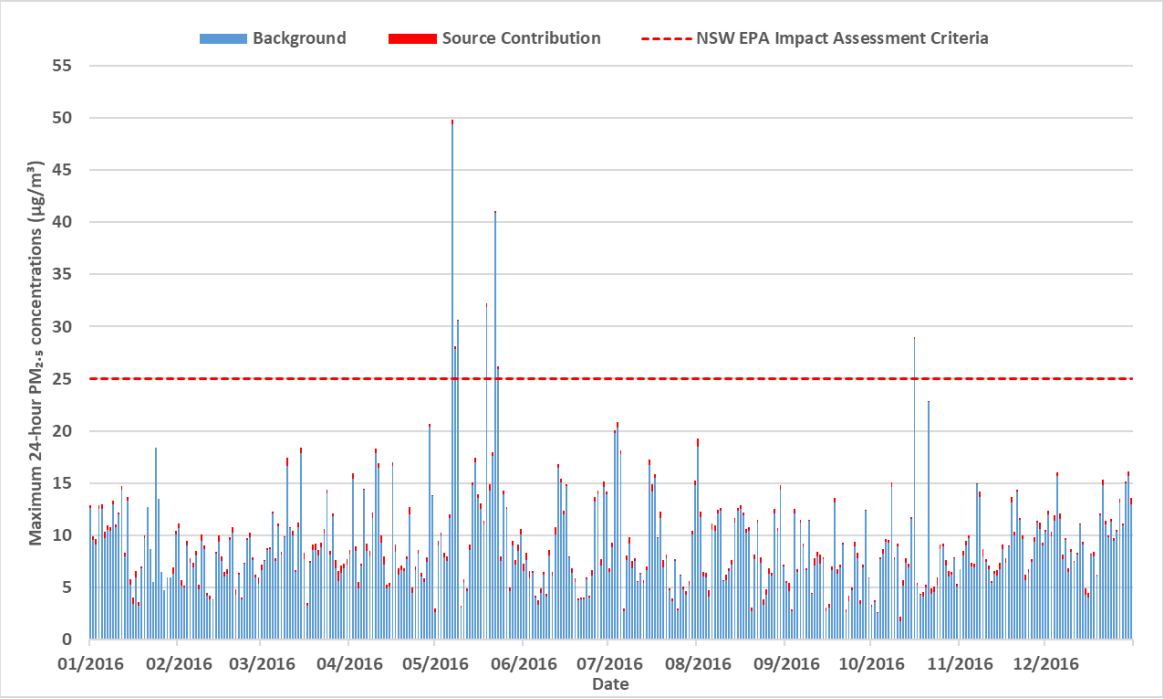


Figure B1-6: Time series for CR42 for maximum 24-hour average $PM_{2.5}$ concentrations

B1.6 Waste management

B1.6.1 Waste segregation, tracking and disposal

Issue raised

Waste that is generated by the project will need to be segregated, uniquely identified, classified using the NSW Environment Protection Authority *Waste Classification Guidelines* (NSW EPA, 2014b), and tracked to its destination. Further, waste must only be delivered to facilities that can lawfully accept the waste. The environment protection licence of a potential waste facility must be referred to ensure that the elected facility can lawfully accept that type of waste.

The proponent will also be required to perform audits of the waste tracking process to ensure that waste is being delivered to the appropriate destination. Some examples of waste tracking and auditing protocols include volumetric surveys, reviewing of waste classification reports prepared by environmental contractor/s for the waste, tracking the transport of waste from the area of waste generation to disposal, reviewing the receiving waste facilities' environment protection licence and storing and reviewing waste disposal dockets.

Response

The environmental impact statement notes specific facilities and collection contractor/s for the disposal of putrescible and non-putrescible general solid waste, special and hazardous waste would be selected during construction and documented in the waste management plan. The waste management plan would include procedures for handling and storing potentially contaminated substances, documentation requirements for the management of waste and spoil, monitoring and inspection requirements and compliance tracking as described in Table D1-1 of this submissions report. The waste management plan would be prepared in accordance with the relevant guidelines including the *Waste Classification Guidelines* (NSW EPA, 2014b) and the *Work health and safety procedure: Hazardous chemicals* (Roads and Maritime Services, 2018c).

Section 24.5 of the environmental impact statement discusses the location of facilities within Sydney licensed to accept waste. Section 24.1 of the environmental impact statement also notes the requirement to track certain types of waste under the Protection of the Environment Operations (Waste) Regulation 2014, which includes hazardous waste.

In accordance with environmental management measures WM3 and WM4 (refer to Table D2-1 of this submissions report), wastes for land disposal will be classified in accordance with the NSW Environment Protection Authority's *Waste Classification Guidelines: Part 1 Classifying Waste* (2014). Wastes will be appropriately transported, stored and handled according to their waste classification and in a manner than prevents pollution of the surrounding environment.

B1.6.2 Recommended conditions of approval

Issue raised

The NSW Environment Protection Authority recommends three conditions of approval regarding waste.

Response

The identification and tracking of waste, and the disposal or recycling of waste generated by the project are legal requirements and would be adhered to by the project. A waste management register and waste avoidance and resource recovery reporting would be carried out by the project, in accordance with *QA Specification G36 – Environmental Protection* (Transport for NSW, 2020d). The waste management plan for the project would outline the requirements for monitoring, inspection and compliance tracking as described in Table D1-1 of this submissions report. The schedule for compliance tracking would be confirmed during the preparation of the plan.

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B2 – NSW Health (Northern Sydney Public Health Unit)

November 2021

B2 NSW Health (Northern Sydney Public Health Unit)

Contents

B2.1 Ambient air quality

Issue raised

The most appropriate scenario to assess for health impacts is the 'Do something cumulative' scenario which includes both the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project.

Although the *National Environment Protection (Ambient Air Quality) Measure* (National Environment Protection Council (NEPC), 2016) has been set for regional air quality, it should be emphasised that applying this to the assessment of an individual project is not necessarily appropriate and that evaluating the impact of incremental changes in air quality should be carried out when assessing health impacts of the project.

The modelling based on expected traffic flows predicts an improvement in air quality in some areas and a deterioration in some others. The assessment of changes in air quality should be considered in the context that current air quality in some parts of the project region does not currently comply with the *National Environment Protection (Ambient Air Quality) Measure* and pollutants such as particulate matter do not have a threshold below which exposure is without health effects.

The largest predicted decrease in annual $PM_{2.5}$ concentration, presented in the environmental impact statement for the 'Do something cumulative' scenario, is 2.12 µg/m^3 in 2027 and 2.28 µg/m^3 in 2037. The largest predicted increase in annual $PM_{2.5}$ concentration presented in the environmental impact statement for the 'Do something cumulative' scenario is 0.86 µg/m^3 in 2027 and 0.71 µg/m^3 in 2037. Notwithstanding the predicted decreases for some areas, the increases predicted in others indicate that all reasonable and feasible measures need to be undertaken to reduce community exposure to pollutants.

Although Table I-48 (Annexure I of Appendix H (Technical working paper: Air quality) lists the 10 most affected residential, workplace and recreational receivers, it is unclear where these receivers are geographically located and the population they would represent. When comparing Figure I-48 ('Do something 2037') and Figure I-50 ('Do something cumulative 2037') it appears that the areas are likely to be different dependent upon whether the assessment is being done for 'Do something' or 'Do something cumulative' projects. Unfortunately the scale of these figures does not allow the above information to be obtained.

Response

NSW Health's (Northern Sydney Public Health Unit) comment that the most appropriate scenario to assess health impacts is the 'Do something cumulative' scenario is noted.

The *National Environment Protection (Ambient Air Quality) Measure* (NEPC, 2016) is a national monitoring and reporting protocol and includes standards (or criteria) applicable to urban background monitoring sites, which are broadly representative of population exposure. In New South Wales, emissions and air quality are managed in relation to source type, and State legislation includes design goals, licence conditions or other instruments for protecting local communities from ground-level impacts of pollutants in residential areas outside site boundaries. *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (NSW Environment Protection Authority (EPA), 2016) (NSW Environment Protection Authority Approved Methods) sets out the approaches and criteria to be used. The NSW Environment Protection Authority Approved Methods are designed mainly for the assessment of industrial point sources, and do not contain specific information on the assessment of transport schemes and land use changes. In this instance air quality impacts must be assessed against standards (or criteria) from several sources, including the *National Environment Protection (Ambient Air Quality) Measure*.

The assessment must therefore contain reference and some comparisons to the *National Environment Protection (Ambient Air Quality) Measure* to meet the Secretary's environmental assessment requirements to be in accordance with 'current guidelines'. However, as noted by NSW Health (Northern Sydney Public Health Unit), the impact of incremental changes in air quality should also be evaluated when assessing the health impacts of the project. For this reason the air quality impact assessment of the project analyses the predicted air quality change due to the project, and the results are presented in the forms of contours maps, graphs and tables in Section 12.6 of the environmental assessment and in detail in Appendix H (Technical working paper: Air quality). These outputs from the air quality assessment were used to inform the human health assessment of the project.

The assessment of changes to $PM_{2.5}$ levels was prepared with reference to the NSW Environment Protection Authority Approved Methods and *National Environment Protection (Ambient Air Quality) Measure*. The $PM_{2.5}$ criteria used is taken from the NSW Environment Protection Authority Approved Methods and is provided in Table 12-4 of the environmental impact statement. A discussion of current $PM_{2.5}$ levels in Sydney is provided in Table 12-6 of the environmental impact statement. It notes maximum 24-hour concentrations of $PM_{2.5}$ are often close to or above the air quality criterion of 25 µg/m^3, and are generally above the long-term goal of 20 µg/m^3. Similarly, annual mean $PM_{2.5}$ levels are very close to or above the air quality criterion of eight µg/m^3, and above the long-term goal of seven µg/m^3.

The project tunnel would be designed in such a way to minimise the generation of pollutant emissions by the traffic using the tunnels and would use a longitudinal ventilation system which would ensure emissions are dispersed and diluted with minimal or no effect on ambient air quality. Refer to the response in Section B2.2 below for further information.

Each column in Table I-48 in Annexure I of Appendix H (Technical working paper: Air quality) represents the 10 residential, workplace and recreational receivers predicted to experience the greatest increases in $PM_{2.5}$ concentration for each different modelled scenario, relative to the 'Do minimum' scenario. Figures I-43, I-45, I-48 and I-50 show geographical locations of all affected receivers including the 10 most affected, allowing for the identification of broader trends across the dispersion modelling domain. Plotting of the locations of these 10 most effected residential, workplace and recreational receivers is not considered required to appreciate potential impacts due to the project.

The potential health impacts of the predicted changes to $PM_{2.5}$ levels have been presented in Appendix I (Technical working paper: Health impact assessment). The health impact assessment included the 'Do something 2027', 'Do something cumulative 2027', 'Do something 2037' and 'Do something cumulative 2037' scenarios. Population exposure was taken into account in the health impact assessment using the smallest statistical division provided by the Australian Bureau of Statistics within a suburb (ie mesh blocks – which are small blocks that cover an area of about 30 urban residences). Predictions of the change in $PM_{2.5}$ levels were made at the centre of each mesh block. The relative risk was calculated for a population weighted annual average incremental change in air quality by multiplying the population living in the mesh block (data available from the Australian Bureau of Statistics for the 2016 census year) by the predicted change in $PM_{2.5}$ levels. The weighted average has been calculated by summing these calculations for each mesh block in a suburb and dividing by the total population in the suburb (ie in all the mesh blocks).

The potential health impacts of the predicted changes to $PM_{2.5}$ levels during operation are summarised in Section 13.5.1 of the environmental impact statement. The calculated changes in risk (associated with individual mortality, cardiovascular illness, respiratory or asthma hospitalisations, and lung cancer) during operation of the project indicates the maximum risks associated with the changes to $PM_{2.5}$ and PM_{10} concentrations would be less than or equal to one in

10,000, for exposures in residential, commercial and industrial areas, childcare centres, schools, aged care homes and open space areas. This is considered to be tolerable or acceptable. A review of the calculated impacts in terms of the change in incidence of the relevant health impacts for $PM_{2.5}$ in the community (being the change in the number of cases per year of mortality, hospital or emergency department admissions), indicates the following:

- The total change in the number of cases (totals for each local government area considered) relevant to the health impacts evaluated for the project in both 2027 and 2037 ('Do something' and 'Do something cumulative') are mostly negative, meaning an overall decrease in incidence in the community as a result of the project. The largest increase in health incidence for a local government area is less than one case therefore the change incidence is not of significance and would not be measurable within the community
- Within these local government areas there are several smaller suburbs. The assessment for the individual suburbs predominantly indicates small decreases in health incidence, with some suburbs showing an increase. The largest increase in health incidence for any individual suburb would be less than one case per year. Therefore, there would be no individual suburbs within the local government areas assessed for which the increased health incidence would be of significance or measurable.

B2.2 Traffic flows

Issue raised

A sensitivity analysis using a 'worst case scenario' and a 'sensitivity analysis scenario' has been presented around each of the project's ventilation outlets.

Figure 8-99 in Appendix H (Technical working paper: Air quality) describes the levels for annual average $PM_{2.5}$ for expected traffic, sensitivity and regulatory worst case scenarios. Although not clearly stated it is presumed the data presented relates to the 'Do something cumulative' scenario. Figure 8-99 contains data labelled according to individual outlets with the levels presented for Outlets G and H appearing to be identical. This would suggest the data labelled Outlets G and H are actually data for the two outlets combined and the labelling is incorrect. In Figure 8-99 it is unclear whether the data labelled Outlet F are actually a combination of data for Outlets C, D and F and mislabelled Outlet F. This should be clarified by the proponent and appropriate changes made to the presentation of the data to allow a full assessment of the data presented.

The 'worst case scenario' and 'sensitivity analysis scenario' predict a maximum increase in annual $PM_{2.5}$ around ventilation outlet H of approximately 0.65 $\mu g/m^3$ and 0.34 $\mu g/m^3$ (expected levels are below 0.1 $\mu g/m^3$) respectively. The above sensitivity analysis demonstrated that underestimating traffic flows has the potential to substantially underestimate the levels of $PM_{2.5}$ local residents will be exposed to and hence their risk of developing health effects. As the use of ventilation outlets has the potential to improve dispersion of pollutants from motor vehicle emissions, it logically follows that parameters such as exit velocity and ventilation rate should be maximised where practical to mitigate local impacts on air quality around ventilation outlets.

Given the local air quality in some parts of the project area is already above the *National Environment Protection (Ambient Air Quality) Measure* for some pollutants, ensuring the project can minimise local air quality impacts to levels described for the expected traffic flow is desirable as the traffic flow described in the sensitivity analysis scenario may conceivably eventuate. This may well require the project to have the capacity to achieve higher ventilation and exit velocity rates than those used in the 'sensitivity analysis scenario' assessment.

Response

The potential impacts of tunnel emissions from the proposed ventilation outlets are assessed using dispersion modelling, the results of which are presented in detail in Section 8.4 of Appendix H (Technical working paper: Air quality). In relation to the sensitivity analysis referred to by NSW Health (Northern Sydney Public Health Unit), the analysis carried out is based on the 'regulatory worst case scenario' and the 'sensitivity analysis scenario' as discussed in Section 8.4.12 of Appendix H (Technical working paper: Air quality). Specifically, the analysis presented in Section 8.4.6 assesses the sensitivity of the contributions to annual average $PM_{2.5}$ concentrations at ground level due to emissions from the ventilation outlets.

The 'regulatory worst case scenario' assumes emissions from the ventilation outlets are always at the regulatory limits, ie the ventilation outlets are operating at the regulatory limits for 8760 hours per year. This is analogous to the tunnels being at maximum capacity in both directions continuously over a year. The 'sensitivity analysis scenario' takes the expected daily emission profile for the road and scales it up by between 3.7 and 5.6 times so maximum daily $PM_{2.5}$ emissions are at the regulatory limit. This is analogous to the traffic profile being increased so the tunnel reaches maximum capacity every day of the year – with traffic in non-peak periods being increased by at least 3.7 times. The traffic scenarios that would be required to produce these emission scenarios are unrealistic and are not based on modelled traffic scenarios or anticipated traffic volumes for the project. They have been modelled purely to test the sensitivity of contributions to annual average $PM_{2.5}$ concentrations at ground level to changes in emissions from the ventilation outlets and should not be used to assess the impacts of the project, rather the expected scenario results should be used.

The dispersion modelling of the project includes all of the ventilation outlets (Outlets A, B, C, D, E, F, G, H, I, J and K) in the modelling domain, ie it includes emissions from the project-related ventilation outlets and emissions from other approved ventilation outlets in the modelling domain. Each of the modelled ventilation outlets is identified in Table 2-1 of Appendix H (Technical working paper: Air quality). The six Western Harbour Tunnel and Beaches Link program ventilation outlets are: Outlet F, Outlet G, Outlet H, Outlet I, Outlet J and Outlet K.

Annual average $PM_{2.5}$ concentration data for the 'Do something cumulative' scenario in 2037 is presented in Figure 8-99 of Appendix H (Technical working paper: Air quality). The figure shows $PM_{2.5}$ concentrations for the 10 most impacted receivers surrounding each of the program-related ventilation outlets.

Outlets F, G and H are labelled correctly in Figure 8-99 of Appendix H (Technical working paper: Air quality). Outlets G and H are co-located and operate simultaneously for the 'Do something cumulative' scenarios. Where ventilation outlets are co-located, the 10 most impacted receivers are likely to be the same for each co-located ventilation outlet.

As Outlets C and D are already approved under the WestConnex M4-M5 Link Planning Approval, emissions from these approved ventilation outlets are included in the modelling. However, as these ventilation outlets are not program-related they have not been shown in Figure 8-99 of Appendix H (Technical working paper: Air quality).

Of the program-related ventilation outlets, Outlet H is predicted to make the greatest contribution to annual average $PM_{2.5}$ concentrations at nearby residential, workplace and recreational receivers. The predicted contributions to annual average $PM_{2.5}$ at ground level at the 10 most impacted residential, workplace and recreational receivers surrounding Outlet H are presented in Figure 8-100 of Appendix H (Technical working paper: Air quality). Results are provided for the 'expected traffic scenario', the 'regulatory worst case scenario' and the 'sensitivity analysis scenario'. The results indicate emissions at Outlet H for the 'expected traffic scenario' are predicted

to only make a contribution of about 0.05 to 0.10 µg/m^3 to the overall annual average $PM_{2.5}$ concentrations at ground level. For the 'sensitivity analysis scenario', the predicted contributions to annual average $PM_{2.5}$ at ground level due to emissions from the ventilation outlet increase to between about 0.25 µg/m^3 and 0.35 µg/m^3. These contributions are very low compared to the typical annual average $PM_{2.5}$ concentrations (about 8 µg/m^3) predicted in the vicinity of the project. Changes of this order of magnitude are so small they would be difficult to measure and confirm in practical terms.

The traffic volumes that would be required to achieve the 'sensitivity analysis scenario' emission profile would be several times greater than the expected traffic and regulatory worst case scenarios, for all times of the day, and so are considered highly unlikely to occur. This indicates that even if the tunnel carries significantly more traffic than anticipated, and significantly more than what has been modelled as expected traffic, the contribution to air quality at ground level due to emissions from the ventilation outlets would still be minimal in the context of overall air quality.

The project tunnel would be designed in such a way to minimise the generation of pollutant emissions by the traffic using the tunnels through the inclusion of minimal gradients as far as reasonably practicable, large tunnel cross-sectional areas and increased tunnel height. The project would also use a longitudinal ventilation system with elevated outlets which would ensure emissions are dispersed and diluted with minimal or no effect on ambient air quality. This system also meets the requirement to avoid portal emissions, is more effective for the management of smoke in the tunnel in the event of a fire and is less costly to construct and operate than transverse ventilations systems. In addition, the tunnel ventilation system for the project would be designed to ensure that in-tunnel, ventilation outlet and ambient air quality criteria are met. An assessment of the performance of the tunnel ventilation system is provided in Annexure K of Appendix H (Technical working paper: Air quality). The assessment considered a range of expected traffic scenarios as well as worst case traffic scenarios. The assessment demonstrates the proposed tunnel ventilation system would meet the in-tunnel, ventilation outlet and ambient air quality criteria even under worst case conditions.

B2.3 Ventilation outlets

Issue raised

The Department of Planning, Industry and Environment assessment report for the Western Harbour Tunnel and Warringah Freeway Upgrade project (page 83) considers the issue of co-location of ventilation outlets such as Outlets G and H. The Department of Planning, Industry and Environment stated the cumulative air quality impacts of co-location must be considered in the final design of the outlets. It would be prudent to consider how these cumulative impacts could be minimised in the current assessment for the Beaches Link and Gore Hill Freeway Connection project.

Table 8-68 of Appendix H (Technical working paper: Air quality) demonstrates that increasing the height of the ventilation outlet can substantially reduce ground level impacts at sensitive receivers around the Warringah Freeway outlet (by up to 26 per cent for annual $PM_{2.5}$). Consequently, increasing the height of some ventilation outlets above the currently proposed height should be considered to help disperse pollutants.

Response

The cumulative air quality impacts of the Western Harbour Tunnel and Warringah Freeway Upgrade project and Beaches Link and Gore Hill Freeway Connection project have been considered within

the current assessment with the co-location of ventilation outlets at the Warringah Freeway modelled both separately and together, with:

- The outlet for the Beaches Link tunnel (Outlet H) only operating in the 'Do something' (with project) scenarios in 2027 and 2037
- The outlets for the Western Harbour Tunnel (Outlet G) and Beaches Link tunnel (Outlet H) both operating in the 'Do something cumulative' scenarios in 2027 and 2037.

Results for both of these scenarios (separate and combined) are presented in the air quality assessment of the project.

It is well understood in dispersion science the more elevated the plume, the better the dispersion. Increasing ventilation outlet height is one way of doing this and would generally lead to a reduction in ground level concentrations, all other things being equal. However, it is not always practical to increase the height of a ventilation outlet and so the benefits of doing this always need to be considered in the context of other constraints. These constraints might include considerations such as visual amenity, distance from an airport or other planning restrictions.

A sensitivity analysis of ventilation outlet height has been carried out for the Warringah Freeway ventilation outlets (Outlet G for Western Harbour Tunnel and Outlet H for the project) and is presented in Section 8.4.11 of Appendix H (Technical working paper: Air quality). Increasing the ventilation outlet heights from 30 metres to 40 metres resulted in a reduction of annual average $PM_{2.5}$ concentrations of up to 26 per cent at receiver CR11 (Neutral Bay Medical Centre), as shown in Table 8-68 of Appendix H (Technical working paper: Air quality). However, this needs to be considered in the context of the absolute value of the reduction achieved. The outlet contribution at receiver CR11 for the 30 metre ventilation outlets was 0.027 µg/m^3, reduced to 0.020 µg/m^3 for the 40 metre ventilation outlets. This is a decrease of 0.007 µg/m^3, or less than 0.1 per cent of the annual average $PM_{2.5}$ criteria of eight µg/m^3. This would equate to a reduction of four in 10,000,000 (or less than one in 1,000,000) risk in all-cause mortality for ages 30 and over.

This absolute change is likely to be unmeasurable in the ambient air, and so increasing the height of the ventilation outlets would therefore not result in any material benefit. As described above, this would also result in additional impacts such as visual amenity impacts.

B2.4 In-tunnel air quality

Issue raised

The modelled in-tunnel pollutant levels comply with current recommendations made by the NSW Advisory Committee on Tunnel Air Quality (ACTAQ) under expected traffic operation. However the worst-case design traffic flow scenario traffic operations presented in Section 8 of Annexure K to Appendix H (Technical working paper: Air quality) predicts average NO_2 levels over 0.45 ppm for some sections of the tunnel at both 20 and 40 kilometres per hour under the 'Do something' scenario. Furthermore, in Section 9 of Annexure K of Appendix H (Technical working paper: Air quality) the worst-case scenario (breakdown) traffic operations predicts average NO_2 of 0.403 ppm southbound for the 'Do something cumulative' scenario in some sections of the tunnel. Hence there is very limited excess capacity should the modelling have underestimated pollutant level. Therefore, consideration should be given to ensuring additional tunnel ventilation capacity is available during exceptional traffic situations.

There is limited information about the short term health effects associated with particulate matter exposure although some studies have suggested adverse impacts when people are exposed to periods of 60 to 120 minutes at levels likely to be experienced in the tunnel (Jefferson Vieira et al.,

2016). This may be of particular relevance for motorists that travel multiple tunnels during their journeys.

As highlighted in Appendix I (Technical working paper: Health impact assessment), closing windows and placing cabin vents onto recirculate can substantially reduce pollutant levels inside vehicles for transits through motorway tunnels. Consequently a robust process that ensures regular communication and reminders to motorists to employ this simple mitigation strategy needs to be implemented.

Response

The comments by NSW Health (Northern Sydney Public Health Unit) that the in-tunnel pollutant levels comply with current recommendations by the ACTAQ under expected traffic operational conditions are noted.

During operation, air quality within the tunnel and the tunnel ventilation system would be continuously monitored and controlled to ensure air quality limits are not exceeded. In addition, traffic management measures may also be applied to assist in managing traffic flow and emissions, in the unlikely event the ventilation system alone is unable to achieve the limits.

Further, the tunnel ventilation system would be designed to cater for major traffic incidents, including where there is a breakdown or major incident at any point along the tunnel. The in-tunnel operational air quality limits for nitrogen dioxide, carbon monoxide and visibility would also be achieved during all breakdown or major traffic incident scenarios.

An assessment of the performance of the project's tunnel ventilation system is provided in Annexure K of Appendix H (Technical working paper: Air quality). The assessment provides an overview of the proposed tunnel ventilation system, the basis of design and design criteria, and outlines the methodology of the tunnel ventilation system assessment. The assessment considered a range of expected traffic scenarios as well as worst case traffic scenarios.

The worst case scenarios are designed to account for the worst traffic conditions that are physically possible to occur in the tunnels during operation. Worst case scenarios such as those in Figures 9- 1, 9-2, 9-3 and 9-4 of Annexure K in Appendix H (Technical working paper: Air quality) demonstrate the tunnel ventilation system can manage in-tunnel NO_2 levels and comply with air quality limits even when traffic is at its theoretical maximum capacity in the tunnel and for any given speed.

The comment by NSW Health (Northern Sydney Public Health Unit) that limited information about the short term health effects associated with particulate matter exposure is noted. The project has been designed to achieve in-tunnel air quality that meets relevant air quality criteria and is protective of human health and amenity, providing a safe travel environment. The change in the peak in-tunnel NO_2 (rolling 15-minute average) emissions throughout the tunnel and the adjoining tunnels confirms the tunnel ventilation system would maintain in-tunnel air quality well within operational limits under the expected traffic conditions. The in-tunnel operational air quality limits for CO and visibility would also be achieved under all expected traffic scenarios as outlined in Chapter 12 (Air Quality) of the environmental impact statement. Adverse health effects associated with exposure to particulate matter within a tunnel are discussed in Section 6.4 of Appendix I (Technical working paper: Health impact assessment).

Consistent with advice from the ACTAQ, it is now considered common practice to provide signage to remind motorists to close their windows and recirculate the air in their vehicles while traveling through tunnels; this signage would be implemented as part of the project. Public information and advice measures including traffic lights, barriers, variable message signs, radio broadcasts, public

address systems (used in emergencies) and other measures would be used as required to provide information to influence driver behaviour in tunnels to manage exposure to in-tunnel emissions and ambient air quality, as outlined in Section 12.7.2 of the environmental impact statement.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B3 – Office of the Chief Scientist and Engineer (Advisory Committee on Tunnel Air Quality)

November 2021

B3 Office of the Chief Scientist and Engineer (Advisory Committee on Tunnel Air Quality)

Contents

The Advisory Committee on Tunnel Air Quality and Chief Scientist and Engineer completed a scientific review of sections of the environmental impact statement which relate to emissions from the ventilation outlets and provided this review to the Chief Health Officer on 4 December 2020. The review is one of the stronger measures introduced by the NSW Government in 2018 on emissions from motorway tunnels and is an additional check in the environmental assessment process. The statements made by the Advisory Committee on Tunnel Air Quality, the Chief Scientist and Engineer and Chief Health Officer are available on the Department of Planning, Industry and Environment's major projects website at www.planningportal.nsw.gov.au/major-projects/project/10456.

B3.1 Introduction

Issue raised

The Advisory Committee on Tunnel Air Quality's overall conclusion of the Beaches Link and Gore Hill Freeway Connection environmental impact statement is that the documents constitute a thorough review of high quality. It covers all of the major issues and areas that an environmental impact statement for a project of this scale should. The information presented is of suitable detail and logical in order. The choices made regarding data used and methods followed have been logical and reasonable and it is the Advisory Committee on Tunnel Air Quality's view that the benefit of exploring alternative approaches would be questionable or marginal.

Response

Comments from the Advisory Committee on Tunnel Air Quality on the assessment process are noted.

B3.2 Assessment methodology

Issue raised

The Advisory Committee on Tunnel Air Quality finds that the assessment methodology is sound and represents best practice. All of the models and data used are appropriate and expertly used, and the Advisory Committee on Tunnel Air Quality found no significant errors nor important omissions.

Response

Comments from the Advisory Committee on Tunnel Air Quality on the adequacy of the air quality impact assessment methodology are noted.

B3.3 Modelling

B3.3.1 In-tunnel emissions

Issue raised

The methodology used to estimate in-tunnel emissions to assess in-tunnel air quality and further being used as input to the dispersion modelling of exhaust emitted through the tunnel ventilation outlets, is thoroughly and clearly described in the environmental impact statement. The Advisory Committee on Tunnel Air Quality notes improvement in the emission modelling was introduced with the Western Harbour Tunnel and Warringah Freeway Upgrade environmental impact statement in late 2019 implementing the new Permanent International Association of Road Congresses (PIARC) approach for calculating vehicle emissions in tunnels, and the modelling of worst-case traffic operation scenarios.

Since the PIARC-based approach applied to the Beaches Link tunnel does not consider emission deterioration as vehicles age beyond 150,000 kilometres (see Section 6.2.4.5 of Annexure K of Appendix H (Technical working paper: Air quality)), modelled in-tunnel nitrogen oxides (NO_X) emissions may be underestimated. However, it is not considered likely that the incorporation of deterioration factors in the emission modelling would affect the air concentrations of nitrogen dioxide (NO_2) in the tunnel that much such that the adopted Air Quality Criteria for NO_2 of 0.5 parts per million as an average along the tunnel would be exceeded in any of the scenarios.

The Advisory Committee on Tunnel Air Quality notes that in-tunnel emissions modelling assumes that the Euro 6 emission standard will not be introduced in Australia until after 2027, which yields a conservative estimate of the in-tunnel NO_X emissions.

Response

The Advisory Committee on Tunnel Air Quality's comments on in-tunnel air quality modelling and dispersion modelling are noted.

As noted by the Advisory Committee on Tunnel Air Quality, changes to the modelling approach which have been incorporated since the Western Harbour Tunnel and Warringah Freeway Upgrade environmental impact statement have resulted in a more conservative estimate of NO_x. These changes include:

- The Beaches Link and Gore Hill Freeway Connection project assumes that the Euro 6 emission standard would not be introduced in Australia until after 2027. This yields a conservative estimate of the in-tunnel NO_X emissions since it is considered likely that some Euro 6 vehicles would have penetrated the Australian fleet before 2027, irrespective of the adoption of further (stricter) Euro 6 legislation in Australia
- The PIARC-based approach applied to modelling does not consider emission deterioration as vehicles age beyond 150,000 kilometres as the Beaches Link and Gore Hill Freeway Connection project has used the Handbook Emission Factors for Road Transport (HBEFA) 3.3 mileage correction for NO_x (CO) as opposed the HBEFA4.1 which was introduced in late 2019. Under the HBEFA 3.3 correction, no further deterioration of emissions is assumed to occur above 150,000 kilometres.

B3.3.2 Emissions on surface roads

Issue raised

The methodology used to estimate emissions on surface roads is thoroughly and clearly described in the environmental impact statement. In general, the emission estimates for surface roads are conservative, which is particularly true for future years, since no further (stricter) emission legislation is assumed after Euro 5. This is because any Euro 6 emission legislation has not been adopted in Australia yet. Therefore, the emission levels calculated for the years 2027 and 2037 can generally be considered as “upper limits”, especially in regard to NO_x.

According to the environmental impact statement emission modelling, the overall traffic emissions in the Beaches Link Graz Lagrangian (GRAL) domain decrease by about five per cent for all pollutants due to the project in 2027, whereas in 2037 the emissions of all pollutants remained unchanged compared to the ‘Do minimum’ scenario, except for total hydrocarbons which decreased by 2.5 per cent. These changes were small compared to the modelled changes in the overall traffic emissions during the time periods 2016-2027 and 2016-2037 in the range of -10 per cent to -60 per cent depending on pollutant (the lowest reduction for PM_{10}, the highest for total hydrocarbons). Although the emission calculations in the environmental impact statement are considered to be quite conservative, it would be of interest (and recommended) for future environmental impact statements involving the NSW Environment Protection Authority emission model applied to surface roads and

the PIARC methodology (emission factors) applied to in tunnel emissions, to compare the two to look for potential inconsistencies between the two models and as a means of conducting a sensitivity analysis of the emission modelling of the Sydney/Australian vehicle fleet, especially since the NSW Environment Protection Authority model was developed already 10 years ago and the HBEFA 3.3 emission factors contained in the PIARC approach reflects the conditions “post-dieselgate” (after 2015).

Response

The Advisory Committee on Tunnel Air Quality's comments on modelling of emissions on surface roads are noted. The Advisory Committee on Tunnel Air Quality’s comment regarding comparison of the NSW Environment Protection Authority emission model and the PIARC methodology is noted; while this could be a useful exercise, it is outside the scope of this submissions report regarding the modelling approach in future environmental impact statements.

B3.3.3 Meteorological and dispersion models

Issue raised

The Advisory Committee on Tunnel Air Quality notes that the environmental impact statement has given careful attention to the implication for meteorological modelling of the location of the project which may be impacted by the coast and harbour. The Advisory Committee on Tunnel Air Quality outline that the approach used to address variation in wind speed and direction due to local land-sea breezes using the ‘Match-to-Observations’ function in the Graz Mesoscale Model (GRAMM) is highly appropriate in this situation and are comfortable that this is likely to provide the most representative results whilst retaining slight conservatism.

While the study area also contains some complex terrain (specifically the shallow valley or basin through which the Warringah Freeway passes) having the potential to lead to the accumulation of some air pollutants, the Advisory Committee on Tunnel Air Quality is satisfied that the way the GRAMM-GRAL modelling suite has been used is sufficient to capture these potential effects. While the Advisory Committee on Tunnel Air Quality notes that they are likely to be of minimal significance for this project, to provide additional confidence an additional modelling task could be carried out for 2018 and compared with measurements carried out at the project monitoring stations. If the modelling was failing to capture this phenomenon it would show up as a relative under-prediction of concentrations at station WHTBL:03 on calm and cold winter evenings and/or mornings.

In general, the GRAMM-GRAL dispersion modelling suite has been used appropriately and appears to be giving credible results. The evaluation of the models provided in Appendix H (Technical working paper: Air quality) relates to the model’s ability to capture dispersion from open roadways. The models’ apparent success in doing this (albeit with some conservatism) may be used to infer that they will perform similarly well in predicting dispersion from a tunnel ventilation outlet.

Additionally, the Advisory Committee on Tunnel Air Quality observes that data has become available from monitoring around the ventilation outlets of the M4 East (now New M4) tunnel, which provides an opportunity to re-evaluate the model (noting that this probably lies outside the scope of the environmental impact statement). The Advisory Committee on Tunnel Air Quality notes that recent data from the M4 East (now New M4) tunnel has indicated that, to date, no impact from ventilation outlet emissions has been detected.

Response

The comments from the Advisory Committee on Tunnel Air Quality on the GRAMM-GRAL model evaluation are noted.

The GRAMM-GRAL is a system consisting of two main modules: a prognostic wind field model (GRAMM) and a dispersion model (GRAL itself).

The evaluation of the GRAMM-GRAL system performance is described in Annexure H of Appendix H (Technical working paper: Air quality). The assessment for the project adopted a model evaluation approach based on the monitoring data and model predictions for the base case year (2016). The monitoring data available for model evaluation were limited at the commencement of the assessment, with only five monitoring stations located inside the GRAL domain, and of these, only one background station (Rozelle) had a complete year of data for 2016. One roadside station (M4-M5:01, alongside the City West Link) had data for April-December 2016. Data from these two stations only were used in the model evaluation. The performance of GRAL was not investigated using data collected at the project-specific monitoring stations, as no data from the stations were available for 2016. The project-specific monitoring stations are discussed further in Section B3.4 below.

As acknowledged by the Advisory Committee on Tunnel Air Quality, use of the GRAMM-GRAL modelling suite is sufficient to capture the potential effects of complex terrain in the study area. Transport for NSW is confident in the modelling carried out to date and as such, does not consider it necessary to carry out additional modelling for the year 2018 with consideration of measurements carried out at the project monitoring stations. This is based on the results of the model evaluation which support the application of GRAL in the assessment, along with the empirical conversion methods for NO_2, noting the results are conservative. The results suggest the estimated concentrations should be conservative for most of the modelling domain, introducing a clear margin of safety into the assessment.

It is noted that monitoring data has become available around the ventilation outlets of the M4 East (now New M4) tunnel. However, as acknowledged by the Advisory Committee on Tunnel Air Quality, the modelling competed to date is considered appropriate for the environmental impact statement, and re-modelling incorporating new data from monitoring around the ventilation outlets of the M4 East (now New M4) tunnel, as suggested by the Advisory Committee on Tunnel Air Quality, is therefore not considered warranted.

B3.4 Background air quality

Issue raised

The Advisory Committee on Tunnel Air Quality considers that while the assessment is sound, air quality monitoring could have been deployed and sited more effectively and efficiently, increasing the accuracy of the assessment. In common with the previous M6 (Stage 1), WestConnex and NorthConnex projects, considerable funds have been spent on air quality monitoring, putting the project in the enviable position of having a far richer observational dataset available than most comparable projects.

The Advisory Committee on Tunnel Air Quality notes that of the 29 project monitoring stations, 12 are classed as “background” stations, eight are listed as having been used to assess background air quality for this project, and only two (M4E:05 and NewM5:01) appear to have been used in any substantive way. Notwithstanding, it is noted that WHTBL:01 is used to validate the background map for long-term mean concentrations at that site. Although this is not clearly expressed in the environmental impact statement, the agreement is very good.

It is recommended that relevant agencies across Australia consider approaches to resolve the persistent problem of monitoring being commissioned too late for the purpose for which it is intended for future projects.

The Advisory Committee on Tunnel Air Quality notes that the approach taken in creating a 'synthetic' time series combining fragments of data from other stations that were operating in 2016, in the absence of directly usable background time series data, is suitable. However, the Advisory Committee on Tunnel Air Quality notes the approach of creating a single time series representing the maximum likely background concentrations across the domain (using data from the southern and western edges of the domain), makes the assessment increasingly conservative towards the north-east of the project. This limitation is acknowledged in the environmental impact statement and does not impact the outcome of the assessment but is a situation which could be improved.

A potentially more significant gap in the assessment is the lack of background data from the heavily trafficked area of North Sydney (south-west end of the project). The background maps (Annexure D of Appendix H (Technical working paper: Air quality), Figures D-24, D-25 and D-26) indicate a gradual and smooth transition in concentrations of NO_x, PM_{10} and $PM_{2.5}$ from higher concentrations in inner west Sydney (where data is relatively abundant) decreasing to lower concentrations in the north-eastern coast, whereas in reality a (currently unobserved and unmodelled) increase in concentrations in North Sydney is plausible. This could have been investigated using screening monitoring (eg passive diffusion tubes) at relatively low cost when the project monitoring sites were being established, and such a campaign may still be worth it now. An alternative source of information on background concentrations in North Sydney can be derived from the project 'roadside' monitoring site WHTBL:03 in Naremburn. This site is immediately to the north-east of the Gore Hill Freeway, meaning it effectively functions as an urban background site in north, north-east and easterly winds.

Inclusion of summary data from sites M4E:05 and NewM5:01 (for example in the trends tables in Annexure D of Appendix H (Technical working paper: Air quality)) would have made review and checking of the data easier, given they are used in the assessment of background data.

Response

The Advisory Committee on Tunnel Air Quality's comments in relation to the acceptability of the background air quality assessment are noted.

The Advisory Committee on Tunnel Air Quality's recommendation that relevant agencies across Australia consider approaches to resolve the persistent problem of monitoring being commissioned too late for the purpose for which it is intended for future projects is noted. However, such considerations are outside of the scope of the environmental impact statement.

Annual average background maps are presented in Annexure D of Appendix H (Technical working paper: Air quality). These maps indicate lower pollutant levels to the north-east of the GRAL domain (for example, Figure D-24). As noted in the Advisory Committee on Tunnel Air Quality's submission, the methodology used to model the synthetic profiles adopts the maximum concentrations across the domain, which are more representative of air quality in areas to the south and west of Sydney. Using these synthetic profiles would therefore potentially lead to more conservative predictions in the north-east where most of the project lies.

It is agreed the ambient pollutant concentrations are likely to be higher in the built up areas around North Sydney, predominantly due to vehicle emissions on surface roads, however, emissions from these surface roads were included in the modelling, with analysis required to estimate the background levels in the absence of this source. In other words, it was necessary to remove the influence of the surface road emission source from the assumed background concentrations as much as possible. This approach meant there was still some residual surface road contribution included, adding some conservatism to the predictions, however as noted by the Advisory Committee on Tunnel Air Quality, this did not impact the outcome of the assessment.

With consideration of the context outlined above, the relatively gradual and smooth transition of background concentrations across the domain is reasonable, with the approach designed to remove as much influence from the surface roads as possible as these emissions were added into the total as a modelled source. Any additional monitoring data in North Sydney would include emissions from surface roads and so not be representative of background.

The Advisory Committee on Tunnel Air Quality's comment on the inclusion of summary data is noted but it is considered the data provided within the environmental impact statement is sufficient for the purposes of the environmental impact statement.

B3.5 Future background air quality

Issue raised

The Advisory Committee on Tunnel Air Quality notes that the environmental impact statement assumes, as is common practice, that background air quality in the future will be the same as in the assessment year 2016. This is assumed to be conservative due to the general long-term downward trend in background air pollutant levels associated with general improvements in vehicle emissions over the last few decades. However, analysis of long-term monitoring data in Annexure D of Appendix H (Technical working paper: Air quality) appears to contradict this assumption with trends in many observations becoming more steady or upwards in recent years (eg Figures D-6, D-7, D-9, D-11, D-12 and D-13 of Annexure D of Appendix H (Technical working paper: Air quality)). It is understood that this is partly due to the particularly severe impact of bushfires in 2019, which temporarily and substantially increased PM (but not NO_x or NO_2) concentrations, now complicated by temporary reductions in concentrations due to reduced traffic (mainly NO_2 and NO_x) caused by COVID-19 in 2020. However, Section D5.6 of Annexure D of Appendix H (Technical working paper: Air quality) also shows downward trends in emissions (seen in Figures D-13 and D-14 around 2016/2017 – 2018) reversing for some pollutants in the timeframe of this environmental impact statement (ie 2018 –2019).

Response

It is agreed there is significant variability in pollutants such as PM_{10} and $PM_{2.5}$, due to events such as bushfires as noted by the Advisory Committee on Tunnel Air Quality. It is also agreed there is variability for pollutants such as NO_2 and NO_x which are not related to bushfires but rather the changes in traffic due to COVID-19 in 2020. For the purposes of this assessment, assuming 2016 levels for the assessment years is appropriate.

Given the recent draft changes to the *National Environment Protection (Ambient Air Quality) Measure* (National Environment Protection Council (NEPC), 2016), standards for $PM_{2.5}$ and NO_2 have been reduced and would require initiatives at a government and strategic planning level to achieve these reductions, likely resulting in lower background concentrations in the future.

B3.6 Method to estimate NO_2 concentration

Issue raised

The method used has limitations, which the environmental impact statement appropriately acknowledges. However, the Advisory Committee on Tunnel Air Quality finds the empirical approach of estimating NO_2 concentrations using observational NO_2 and NO_x data to be sound, appropriate and the approach most suited to the purposes of the environmental impact statement.

Response

The Advisory Committee on Tunnel Air Quality's comments on the methodology used to estimate NO_2 concentrations in the air quality assessment are noted.

B3.7 Treatment of elevated receivers

Issue raised

This project domain contains a number of elevated receivers, ie taller buildings and locations where ground level is higher than at the base of the tunnel ventilation outlets. The Advisory Committee on Tunnel Air Quality finds that this has been well considered in the environmental impact statement with the explicit modelling of such receivers handled thoroughly and appropriately.

Response

The Advisory Committee on Tunnel Air Quality's comment on the treatment of elevated receivers in the air quality assessment is noted.

B3.8 Assessment and management of construction air quality impacts

Issue raised

The approach applied for the assessment of construction impacts in the Beaches Link and Gore Hill Freeway Connection environmental impact statement is the same as the one used for the previous recent Sydney tunnel construction projects. The Advisory Committee on Tunnel Air Quality considers the stepwise, semi-quantitative risk assessment method sound and is systematically and thoroughly conducted.

The risk assessment showed that three of the five assessed construction zones were classified as high risk zones with regard to dust impacts on all the three impact categories of dust soiling, human health and ecological receptors, and for all the four activity types (demolition, earthworks, construction and track-out) in all cases, except for demolition, which was classified as a medium risk in six cases. For the remaining two zones risks were classified as medium, low or negligible. The proposed management measures to mitigate dust impacts are comprehensive and highly valid, especially the proposed monitoring and adjustment or management of dust generating activities during unfavourable weather conditions.

Within the environmental impact statement the management of odour impacts has been considered. The proposed site investigations, including to carry out odour monitoring during relevant site activities and adjustment of mitigation and management measures to minimise potential off-site impacts, are acknowledged and appropriate.

Response

The Advisory Committee on Tunnel Air Quality's comments on the methodology used to assess the impacts of construction works on air quality and odour are noted as are the comments about validity and appropriateness of proposed environmental management measures.

B3.9 Conclusions and equity

Issue raised

The Advisory Committee on Tunnel Air Quality commented that overall, the project (as assessed) seems to deliver a small improvement in ambient air quality at a slight majority of receptors, and a slight worsening in air quality at a slight minority of receptors. This is broadly in response to the

anticipated redistribution in surface road traffic. This conclusion is dependent on the validity of the modelled changes in traffic flows. The largest improvements in air quality appear to be associated with predicted reduction in traffic volumes along the Warringah Freeway. As this central area is amongst the most polluted in Sydney at present, the project could be seen as making a positive contribution to tackling an air pollution hot-spot. However, this is only true if the predicted traffic reductions actually occur.

The Beaches Link and Gore Hill Freeway Connection project adds substantial new road capacity to Sydney in an area of high demand. It is reasonable to expect a high degree of additional demand induced by the project, and the additional economic growth it is likely to enable. Whereas the environmental impact statement indicates that such induced traffic growth is included in the traffic modelling, the environmental impact statement does not explicitly indicate the sensitivity of the air quality impacts of the project on that induced demand, nor the magnitude of the potential error in predictions of traffic.

Response

The accurate characterisation of traffic activity (such as number of vehicles, trip distances and modes of operation) and the fleet composition is vital to the estimation of emissions, as discussed in Section 8.2.4 of Appendix H (Technical working paper: Air quality). Although models and emission factors are continually improving, activity data remains one of the main sources of uncertainty in the calculation of emissions.

Data on traffic volume, composition and speed for surface roads in the GRAL model domain, which covered an extensive area of Sydney, were taken from the Sydney Motorway Project Model (SMPM). The SMPM provided outputs on a link-by-link basis for the different scenarios and for all major roads affected by the project.

The SMPM is linked to the Strategic Travel Model, which includes trip generation, trip distribution and mode choice modules, and incorporates demographic data related to land uses including population, employment and education enrolment projections. For the SMPM these data were supplied by Transport for NSW's Transport Performance and Analytics as data extracts from the Strategic Travel Model, and are based on the population and employment projections released by the former Department of Planning and Environment in 2017.

Induced demand projected by the SMPM due to the project equates to about 0.3 per cent of additional daily trips in the Sydney metropolitan area in 2037, which would result in a negligible impact to the traffic network. The project induced demand would come from:

- New trips as a result of improved travel times between homes and destinations, such as workplaces, shopping centres and education facilities, which cause changes to region-wide trip patterns
- Trips attracted from competing routes or modes as a result of improved travel times on the new or upgraded road
- Regional increase in number of trips due to population growth and increased economic activity.

The calibration and validation of the SMPM was assessed by independent peer reviewers and received agreement that the model was suitable for the purposes of the environmental impact statement, as discussed in Section 3.3.2 of Appendix F (Technical working paper: Traffic and transport).

NSW GOVERNMENT

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B4 – Department of Planning, Industry and Environment (Environment, Energy and Science Group)

November 2021

B4 Department of Planning, Industry and Environment (Environment, Energy and Science Group)

Contents

B4.1 Direct impacts

Issue raised

Department of Planning, Industry and Environment (Environment, Energy and Science Group) (referred to as Environment, Energy and Science Group hereafter) recommends that offsetting be required through the purchase and retirement of like-for-like biodiversity credits and that this be completed prior to the commencement of construction.

Response

The biodiversity offset requirements for the project are discussed Section 19.6.1 of the environmental impact statement and detailed in Section 7 of Appendix S (Technical working paper: Biodiversity development assessment report).

Transport for NSW's approach to the delivery of the offsets required is discussed in Section 7.3 of Appendix S (Technical working paper: Biodiversity development assessment report). It is noted the options for offsetting under the Biodiversity Offsets Scheme and available to the project include one or more of the following:

- Purchase and retirement of an appropriate number and class of like-for-like biodiversity credits from landholders participating in the Biodiversity Offsets Scheme
- Payment to the NSW Biodiversity Conservation Fund, administered by the Biodiversity Conservation Trust. Under this model the Biodiversity Conservation Trust takes on the responsibility for purchasing the required credits.

Consistent with the requirements of Section 7.14(4) of the *Biodiversity Conservation Act 2016*, offsets must be achieved prior to the commencement of construction impacts on biodiversity values.

B4.2 Duffys Forest threatened ecological community

B4.2.1 Groundwater drawdown beneath Duffys Forest threatened ecological community

Issue raised

Table 5.10 of Appendix S (Technical working paper: Biodiversity development assessment report) indicates the project may result in water table drawdown beneath patches of Duffys Forest endangered ecological community adjoining the Wakehurst Parkway to the east and south of Seaforth Oval. It states "Groundwater modelling for the project has predicted up to three to five metres of water table drawdown beneath these patches of Duffys Forest (by 2027 and 2126 respectively) (Jacobs, 2020b)" but it is not clear from where in Appendix N (Technical working paper: Groundwater) this is derived. While Appendix S (Technical working paper: Biodiversity development assessment report) considers that Duffys Forest endangered ecological community is not a groundwater dependent ecosystem and would likely only draw on groundwater opportunistically during periods of low rainfall, Environment, Energy and Science Group considers the groundwater assessment to be deficient in a number of respects, as described in later comments.

Response

The extent of drawdown of the water table due to the project, and the cumulative impacts of the project together with the Sydney Metro City & Southwest and Western Harbour Tunnel and Warringah Freeway Upgrade projects, is included in Section 6.2.2 of Appendix N (Technical working paper: Groundwater). The assessment of drawdown extent and impacts to biodiversity within Appendix S (Technical working paper: Biodiversity development assessment report) has used this

information, namely the drawdown for the cumulative project scenario at the end of construction (2028) and 100 years after operation (2128). Drawdown contours for these timeframes and scenario are provided in Figure 6.4 and Figure 6.8 of Appendix N (Technical working paper: Groundwater), respectively.

It is noted that Table 5.10 of Appendix S (Technical working paper: Biodiversity development assessment report) has an error in discussing the potential drawdown extent impact on Duffys Forest endangered ecological community. The discussion within Table 5.10 (with respect to assessment requirement (g) of the serious and irreversible impact assessment for Duffys Forest endangered ecological community) should reflect the drawdown assessment from the groundwater assessment, and as such should read:

“The project may result in water table drawdown beneath patches of Duffys Forest TEC adjoining the Wakehurst Parkway to the east and south of Seaforth Oval. Groundwater modelling for the project has predicted up to three to five metres of water table drawdown beneath these patches of Duffys Forest **after 100 years of operation (2128)** (Jacobs, 2020b). The Duffys Forest TEC is not considered to be a groundwater dependent ecosystem and would likely only draw on groundwater opportunistically during periods of low rainfall.”

The above clarification is included in Table A5-13 of this submissions report. Notwithstanding the typographical error, the outcomes of the assessment of drawdown extent on Duffys Forest endangered ecological community remains consistent with what was reported in Appendix S (Technical working paper: Biodiversity development assessment report) (further detail is also provided in Section B4.16 below).

It should be noted that the modelling carried out for Appendix N (Technical working paper: Groundwater) is based on a conservative scenario with unconstrained groundwater inflows and full hydraulic connectivity assumed between the surface geology and the tunnel (which would likely be stratified, with disconnected aquifer horizons, limiting the potential for vertical groundwater movement). This means that the sub-surface drawdown at tunnel depth might not result in the same (or any) drawdown in the water table and might reduce actual drawdown substantially compared to predictions.

Revised groundwater drawdown modelling was conducted (refer to Appendix E of this submissions report) following exhibition of the environmental impact statement, in response to submissions received. The findings of the revised groundwater modelling and impact assessments are consistent with and confirmed the findings of the environmental impact statement; that the predicted drawdown is unlikely to impact on groundwater dependent ecosystems and that the environmental management measures presented in the environmental impact statement would be sufficient to manage likely impacts.

The drawdown impact (if experienced) would be further reduced following implementation of the following environmental management measures (refer to Table D2-1 of this submissions report):

- Groundwater modelling will be updated with ongoing groundwater monitoring to refine inflow predictions and detailed design to consider these predictions and include designed tunnel linings where required (refer to revised environmental management measure SG2)
- Measures will be implemented during tunnel construction to ensure that groundwater inflows into each tunnel during the operation phase do not exceed 1 litre per second per kilometre (1L/s/km) across any given kilometre (refer to revised environmental management measure SG16).

B4.2.2 Extent of Duffys Forest threatened ecological community

Issue raised

Environment, Energy and Science Group recommends that:

- The extent of Duffys Forest endangered ecological community as mapped by Office of Environment and Heritage (OEH) (2013, minor update 2016 as version 3) be reviewed against recent aerial imagery, information from the Mona Vale Road West Upgrade Species Impact Statement, and Northern Beaches Council to determine the actual extant distribution within the Pittwater IBRA subregion
- As a consequence, Appendix S (Technical working paper: Biodiversity development assessment report) be revised and resubmitted with updated information SAII to support the assessment.

Response

Since the exhibition of the environmental impact statement, Transport for NSW has refined the design of the ramps for the new shared user bridge at the northern end of the upgraded and realigned Wakehurst Parkway as outlined in Section A4.3 of this submissions report. The design refinement would improve connectivity and has reduced the area of Duffys Forest endangered ecological community that would be impacted by the project from 1.38 hectares to 1.21 hectares.

As recommended by Environment, Energy and Science Group, the extent of Duffys Forest endangered ecological community as mapped by OEH (2016b) was reviewed with reference to the Mona Vale Road West Upgrade Species Impact Statement and the most recent aerial imagery available from SIX Maps (available at: maps.six.nsw.gov.au). The OEH (2016b) mapping includes about 13 hectares of Plant Community Type (PCT) 1786 (Red Bloodwood – Scribbly Gum/Old-man Banksia open forest on sandstone ridges of northern Sydney and the Central Coast), equivalent to Duffys Forest endangered ecological community, within the Mona Vale Road West Upgrade study area. The vegetation of this area was ground truthed for the Mona Vale Road West Upgrade Species Impact Statement, and only 4.79 hectares of Duffys Forest endangered ecological community was identified within the same area. Of this, 1.86 hectares will be directly impacted by the Mona Vale Road West Upgrade project.

The areas mapped as Duffys Forest endangered ecological community by OEH (2016b) that have been identified during ground truthing as not meeting the criteria for this community, as well as areas that will be directly impacted by the Mona Vale Road Upgrade West project were removed from the layer; these total about 10 hectares. Detailed analysis of the aerial imagery in all other areas resulted in removal of an additional 16.65 hectares of cleared and disturbed areas from the layer; these areas include patches of Duffys Forest endangered ecological community that have been cleared since the date of the aerial photography that the mapping was based on, as well as areas that were mapped at a higher scale and with less detail than the current aerial photograph resolution affords.

The amended layer, in addition to the revision in project impacts as a result of design refinements, was used to inform a revised serious and irreversible impact assessment for Duffys Forest endangered ecological community (refer to Appendix F1 of this submissions report). In summary:

- There is 28.92 hectares of Duffys Forest endangered ecological community mapped within an area of 1000 hectares surrounding the subject land (compared with 30.72 hectares identified in Appendix S (Technical working paper: Biodiversity development assessment report))
- There is 59.31 hectares of Duffys Forest endangered ecological community mapped within an area of 10,000 hectares surrounding the subject land (compared with 63.61 hectares identified in Appendix S (Technical working paper: Biodiversity development assessment report))

- There is 359.63 hectares of Duffys Forest endangered ecological community mapped within the Pittwater IBRA subregion (compared with the 386.35 hectares identified in Appendix S (Technical working paper: Biodiversity development assessment report)). Together with the 1.21 hectares of Duffys Forest mapped in the subject land, a total of 360.84 hectares of the endangered ecological community has been identified in the Pittwater IBRA subregion. Given that the Duffys Forest endangered ecological community only occurs within the Pittwater IBRA subregion, this figure also represents the total area of Duffys Forest endangered ecological community remaining in NSW
- The removal of 1.21 hectares of Duffys Forest endangered ecological community represents a reduction of 0.34 per cent of the area of the endangered ecological community in the Pittwater IBRA subregion. Following the removal of 1.21 hectares of Duffys Forest endangered ecological community for the project, the total area remaining would be 359.63 hectares
- Of the total of 359.63 hectares of Duffys Forest endangered ecological community mapped within the Pittwater IBRA subregion, 155.04 hectares (43 per cent) is located within Garigal and Ku-ring-gai National Parks.

The review did not include consideration of information from Northern Beaches Council as suggested by Environment, Energy and Science Group as this was considered to be outside the scope of the project and biodiversity development assessment report. It is likely that the majority of developments approved by Northern Beaches Council since 2009 that could have impacted Duffys Forest endangered ecological community would be identified through review of the most recent aerial imagery as described above.

The recommendation by Environment, Energy and Science Group to revise and resubmit Appendix S (Technical working paper: Biodiversity development assessment report) based on issues raised in their submission on the environmental impact statement is noted. Additional requests for information and comments on the content of Appendix S (Technical working paper: Biodiversity development assessment report) by Environment, Energy and Science Group are addressed within this section and supported by Appendices F1, F2 and F3 of this submissions report. Specifically with regards to revising the serious and irreversible impact assessment for Duffys Forest endangered ecological community based on the updated information, this has been carried out and is provided in Appendix F1 of this submissions report.

To aid stakeholders in understanding updates to the biodiversity assessment which have occurred since the exhibition of the environmental impact statement, and to navigate where this information is included in this submissions report, a clarification has been included in Section A5.1.18 and a Biodiversity development assessment roadmap provided in Appendix F4 of this submissions report.

Appendix F5 of this submissions report provides an updated biodiversity assessment to synthesise the updated and supplementary information provided in this submissions report, with Appendix S (Technical working paper: Biodiversity development assessment report).

B4.2.3 Revegetated area at Wakehurst Parkway north construction support site (BL14)

Issue raised

The environmental impact statement indicates Wakehurst Parkway north construction support site (BL14) would be the same site that was used as the main construction support site for the Northern Beaches Hospital road upgrade project. It notes revegetation works were carried out at this site, including planting with species consistent with the Duffys Forest endangered ecological community within the eastern section of the site (refer to section 19.3.1, page 19.10 of the environmental impact statement). It confirms this revegetated area would remain fenced off and protected from disturbance and that during further design development and construction planning the temporary construction support site layout would be refined to show the revegetation area, to ensure it is

avoided and protected during construction. Environment, Energy and Science Group recommends the protection and ongoing management of the planted Duffys Forest is included as a condition of consent.

Response

The recommendation from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

As described in Chapter 6 (Construction work) and Chapter 19 (Biodiversity) of the environmental impact statement, and as noted by Environment, Energy and Science Group, the Wakehurst Parkway north construction support site (BL14) was used as the main construction support site for the Northern Beaches Hospital road upgrade project, which was completed in August 2020. On completion of the Northern Beaches Hospital road upgrade project revegetation works were carried out and the eastern section of the site was planted with species consistent with the Duffys Forest endangered ecological community. The current site layout, as identified in Figure 6-42 of the environmental impact statement, does not show the revegetated area. However, during further design development and construction planning, the temporary construction support site layout would be refined to show the revegetation area, and ensure it is avoided and protected during construction.

Accordingly, a new environmental management measure B41 has been prepared to reflect this commitment, in addition to the commitment to continue to protect and manage the revegetation area during operation (refer to Table D2-1 of this submissions report):

> During site establishment of the Wakehurst Parkway north construction support site (BL14), the project will ensure that the revegetated area within the eastern section of the site (planted as part of the Northern Beaches Hospital road upgrade project with species consistent with Duffys Forest endangered ecological community) is fenced adequately so that it is avoided and protected from disturbance during construction. During operation, this revegetation area will continue to be protected and managed.

B4.3 Indirect impacts to vegetation, including native vegetation and threatened flora and fauna species habitat

Issue raised

Under the Biodiversity Assessment Method (BAM), indirect impacts on vegetation attributed to plant community types (PCTs) (including PCT 1786) and on ecosystem species' habitat are not required to be offset by ecosystem biodiversity credits, although the approval authority has the discretion to do so. Transport for NSW has estimated the impacts of these indirect impacts in terms of ecosystem biodiversity credits, as tabulated in Table 7.2 of Appendix S (Technical working paper: Biodiversity development assessment report), and suggested an additional 50 ecosystem credits as a means to offset indirect impacts at the discretion of the Minister for Planning and Public Spaces. Environment, Energy and Science Group recommends that this be accepted and made a condition of approval.

Response

The recommendation from Environment, Energy and Science Group regarding ecosystem credits for indirect impacts from the project is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

As noted in Section B4.2.2 above, Transport for NSW has refined the new shared user bridge at the northern end of the upgraded and realigned Wakehurst Parkway (refer to Section A4.3 of this

submissions report) which has reduced the area of Duffys Forest endangered ecological community that would be impacted by the project from 1.38 hectares to 1.21 hectares. In consideration of the refinement and reclassification of PCT 1292 (refer to Section B4.4 below), a revised biodiversity credit calculation has been carried out and is provided in Appendix F2 of this submissions report. Due to the design refinement at the northern end of the upgraded and realigned Wakehurst Parkway, the number of ecosystem credits required for indirect impacts has reduced from 50 to 45 (refer to Table 2-2 of Appendix F2 of this submissions report).

To aid stakeholders in understanding updates to the biodiversity assessment which have occurred since the exhibition of the environmental impact statement, and to navigate where this information is included in this submissions report, a clarification has been included in Section A5.1.18 and a Biodiversity development assessment roadmap provided in Appendix F4 of this submissions report. Appendix F5 of this submissions report provides an updated biodiversity assessment to synthesise the updated and supplementary information provided in this submissions report, with Appendix S (Technical working paper: Biodiversity development assessment report).

B4.4 Plant community type identification

Issue raised

Environment, Energy and Science Group acknowledges that it has not carried out a thorough analysis of plant community typing in Appendix S (Technical working paper: Biodiversity development assessment report), but does question the identification of PCT 1292 Coastal Sandstone Riparian Scrub (Water Gum-Coachwood Riparian Scrub Along Sandstone Streams, Sydney Basin) along Burnt Bridge Creek within the Balgowlah Golf Course construction support site (BL10) (Section 3.3, Figure 3-3, page 86 of Appendix S). Environment, Energy and Science Group notes that OEH (2016b) modelled PCT 1292 as occurring only in the sandstone plateaux south of urban Sydney and the floristics data from plots BB05 and BB07 were not analysed in Table 3.4 of Appendix S (Technical working paper: Biodiversity development assessment report) against PCT 1780 Coastal Sandstone Riparian Forest (Sydney Peppermint/Coachwood - Water Gum open forest in protected sandstone gullies around Sydney and the Central Coast) as a possible choice.

Response

OEH (2016b) regional vegetation mapping describes PCT 1292 Coastal Sandstone Riparian Scrub as a low scrub that comprises a mix of hardy shrubs growing on rocky creek lines or shallow alluvial soils at the base of deep sandstone gully systems. The PCT is described as 'widespread across the Sydney region' but has only been mapped south of the Georges River. PCT 1780 Coastal Sandstone Riparian Forest is described by OEH (2016b) as a sandstone gully forest with a suite of riparian and rainforest species that occurs along narrow sandstone gorges and minor creek lines of sandstone plateaus; its distribution spans the major sandstone plateaus to the north and south of Sydney.

The 0.4 hectares of PCT 1292 mapped within the subject land consists of regrowth and revegetation of previously cleared and disturbed areas along Burnt Bridge Creek within the Balgowlah Golf Course construction support site (BL10). Two plots (Plots BB05 and BB07) were carried out within this vegetation patch, shown on Figure 3-4 (map c) and discussed in Section 3.3.1.2 of Appendix S (Technical working paper: Biodiversity development assessment report). This patch has moderate to high levels of disturbance and is intersected by walking paths and roads as well as rubbish, stormwater debris and erosion of substrates and creek banks. Exotic species cover is high, but generally restricted to the mid-storey and groundcover.

It is agreed that based on the distribution of PCT 1292 as mapped by OEH (2016b) and the description of this vegetation map unit that PCT 1780 may be a more suitable fit for the vegetation

along Burnt Bridge Creek. There are also several other PCTs in the locality which could also be a suitable fit based on floristics and landscape position, including PCT 1250 Coastal Sandstone Gully Forest and PCT 1841 Coastal Enriched Sandstone Moist Forest. OEH (2016b) maps PCT 1250 along the riparian zone of Burnt Bridge Creek upstream of the subject land (ie construction footprint). A brief analysis of the characteristic species in each strata, as well as the diagnostic species lists in OEH (2016b), suggests that PCT 1250 is the most suitable fit for this vegetation (refer to Table B4-1).

Table B4-1 Analysis of vegetation quadrats in areas mapped as PCT 1292 against positive diagnostic species lists in OEH (2016b)

Plant Community Type	Positive diagnostic canopy species recorded	Positive diagnostic midlayer species recorded	Positive diagnostic groundlayer species recorded	Total positive diagnostic species in Plot BB05	Total positive diagnostic species in Plot BB07
PCT 1292	None	*Callistemon citrinus* *Dodonaea triquetra*	*Lomandra longifolia*	1	3
PCT 1250	*Angophora costata*	*Banksia ericifolia* *Callicoma serratifolia* *Dodonaea triquetra* *Grevillea linearifolia* *Hakea sericea* *Leptospermum polygalifolium*	*Dianella caerulea* *Lomandra longifolia* *Pteridium esculentum*	7	10
PCT 1780	None (Note: *Angophora costata* is included in the description for this PCT, but not in the species list)	*Banksia ericifolia* *Callicoma serratifolia* *Dodonaea triquetra* *Leptospermum polygalifolium*	*Lomandra longifolia* *Pteridium esculentum*	4	5
PCT 1841	*Angophora costata*	*Breynia oblongifolia* *Callicoma serratifolia* *Glochidion ferdinandi* *Pitosporum undulatum* *Trema tomentose*	*Dianella caerulea* *Lomandra longifolia* *Microlaena stipoides* *Pteridium esculentum*	9	10

It is noted that revising PCT 1292 along Burnt Bridge Creek to PCT 1780, PCT 1250 or PCT 1841 would not have any effect on the predicted or candidate threatened species lists, but would result in different ecosystem credit values. Changing the vegetation zone 1292 – Moderate/Good to an additional vegetation zone within PCT 1250 (1250 – Moderate/Good_02) results in a change in the vegetation integrity value and a corresponding change in biodiversity credit requirement as outlined in Table B4-2.

Table B4-2 Summary of reclassification of PCT1292 to PCT 1250

	Previous classification	Revised classification
Vegetation zone	1292 – Moderate Good	1250 – Moderate/Good_02
Vegetation integrity value	67.6	54
Biodiversity credit requirement	10	8

Due to the above PCT reclassification and changes to vegetation impacts from the design refinement associated with the new shared user bridge at the northern end of the upgraded and realigned Wakehurst Parkway (refer to Section A4.3 of this submissions report), a revised biodiversity credit calculation has been carried out and is provided in Appendix F2 of this submissions report.

To aid stakeholders in understanding updates to the biodiversity assessment which have occurred since the exhibition of the environmental impact statement, and to navigate where this information is included in this submissions report, a clarification has been included in Section A5.1.18 and a Biodiversity development assessment roadmap provided in Appendix F4 of this submissions report. Appendix F5 of this submissions report provides an updated biodiversity assessment to synthesise the updated and supplementary information provided in this submissions report, with Appendix S (Technical working paper: Biodiversity development assessment report).

B4.5 Avoid and minimise impacts on native vegetation

B4.5.1 Relocation of construction support sites to minimise vegetation clearing

Issue raised

Table 19-18 in the environmental impact statement includes an environmental management measure B6 that states “Vegetation removal including the clearing of native vegetation and fauna habitat will be further minimised during further design development and construction planning, where feasible and reasonable”. All attempts should be made for the project to firstly avoid and then minimise impacts on native vegetation and where possible the project should be amended to avoid/minimise vegetation clearing. Environment, Energy and Science Group recommends this includes relocating the proposed construction support sites such as:

- The Wakehurst Parkway south construction support site (BL12)
- The Wakehurst Parkway east construction support site (BL13) to reduce impacts on remnant bushland, particularly as Appendix S (Technical working paper: Biodiversity development assessment report) indicates there are recent BioNet records of Eastern Pygmy-possum (page 146), Large-eared Pied-bat (page 147) and the Large Bent-winged Bat and Little Bent-winged Bat (page 154) at the Wakehurst Parkway east construction support site (BL13).

Response

The project design development process has considered a number of opportunities to avoid or minimise biodiversity impacts through selection of the preferred corridor, refinement of the preferred corridor design and development of construction methodology as described in Section 19.4 of the environmental impact statement.

With respect to Wakehurst Parkway, several tunnel portal location options were considered, as outlined in Section 4.5.4 of the environmental impact. Of the three portal location options considered (shown in Figure 4-21 of the environmental impact statement), the selected option (‘option B’) was chosen due to a range of benefits related to connectivity and network performance, constructability and design, community and environment, and economic factors (detailed in Table 4-6 of the

environmental impact statement). This included that portal location option B reduced the potential impact on Duffys Forest endangered ecological community compared to portal location option A.

The factors that were considered in the selection of temporary construction support site locations are described in Section 4.5.7 of the environmental impact statement. The primary drivers for locating temporary construction support sites included the objective to minimise environmental and community impacts whilst also being suitably located to facilitate construction of the project. The key factors considered included:

- Locating the temporary construction support sites as close as possible to project construction areas
- Avoiding sensitive environments and community locations where possible
- Avoiding material impacts on heritage sites or items
- Maximising opportunities for direct access to motorways and arterial roads or water transport opportunities for construction traffic, and avoiding the need to use local residential streets if possible
- Minimising direct and indirect property impacts and acquisition requirements, particularly in residential areas.

Wakehurst Parkway south construction support site (BL12) provides an important function in supporting the upgrade of Wakehurst Parkway and also the construction of the cut and cover tunnel and trough and motorway facilities at Wakehurst Parkway. It should be noted that the Wakehurst Parkway south construction support site (BL12) is located on land owned by Transport for NSW in order to minimise residential property impacts and impacts to surrounding bushland (as discussed in Chapter 20 (Land use and property) of the environmental impact statement).

Wakehurst Parkway east construction support site (BL13) was selected based on the tunnel portal location chosen, as described above, in addition to further community consultation (refer to Section 4.5.7 of the environmental impact statement). The preferred location for Wakehurst Parkway east construction support site (BL13) was chosen as it:

- Avoids impact to the operation of Seaforth Oval
- Minimises potential impacts on the nearby community precinct
- Uses land owned by the NSW Government (the land is owned by Sydney Water)
- Allows tunnelling to occur in both a northerly and southerly direction (reducing construction duration).

In addition, Wakehurst Parkway east construction support site (BL13) does not contain breeding or roosting habitat for any of the three microbat species historically recorded there as identified by Environment, Energy and Science Group. While foraging habitat is present, microbats are highly mobile species that have broad habitat requirements for foraging. There is sufficient foraging habitat available in the surrounding landscape. Overall, the Wakehurst Parkway east construction support site (BL13) is not located in an area of high value habitat for Large-eared Pied-bat, Large Bent-winged Bat and Little Bent-winged Bat and removal of vegetation on this site would have a minor impact.

Similarly, while the Eastern Pygmy-possum was recorded in this area in the past, recent surveys of bushland adjacent to Wakehurst Parkway targeting Koalas (refer to Section B4.8.2 of this submissions report) recorded the species at several locations further north. This implies the Eastern Pygmy-possum are inhabiting connected bushland and are not restricted to this area. Wakehurst

Parkway east construction support site (BL13) is on the edge of a larger patch of woodland, much of it is subject to disturbance and is not likely to be critical to the species.

Notwithstanding the above, while the establishment and operation of these temporary construction support sites potentially impact biodiversity values, a number of environmental management measures have been proposed as noted by Environment, Energy and Science Group, to minimise and manage impacts to biodiversity including threatened species and communities, including revised environmental management measure B6, which commits to further minimising vegetation removal including the clearing of native vegetation and fauna habitat during further design development and construction planning to the extent reasonably practicable. Other environmental management measures (including new and revised environmental management measures) which commit to minimising impacts of vegetation removal include B10-B14, B16, B22, B23 and B43 (refer to Table D2-1 of this submissions report for the full wording of these environmental management measures). These measures would be supported by the implementation of a flora and fauna management plan as described in Section D1 of this submissions report.

B4.5.2 Relocation of Flat Rock Drive construction support site (BL2)

Issue raised

The submissions report needs to clarify if it is possible to relocate the Flat Rock Drive construction support site (BL2) to reduce impacts on the bushland rehabilitation area within Flat Rock Reserve (refer to Section 22.4.2 of the environmental impact statement).

Response

As noted in the above response, the project design development process has considered a number of opportunities to avoid or minimise community and biodiversity impacts. This approach equally applies to the selection of the preferred location for Flat Rock Drive construction support site (BL2). The alternative locations that were considered for the Flat Rock Drive construction support site (BL2) is described in Section 4.5.7 of the environmental impact statement. Multiple locations were considered and two were shortlisted. These included:

- On the Flat Rock Baseball Diamond located on the western side of Flat Rock Drive
- Within part of Flat Rock Reserve on the eastern side of Flat Rock Drive in land that was revegetated post 1998 (preferred option).

Other alternative intermediate tunnelling sites (not short-listed) were considered unfavourable as they would have required haulage of spoil on local streets (some of which are narrow), caused local amenity impacts and resulted in the acquisition of a substantial number of private residential and/or commercial properties. It was also considered unfavourable to not provide an intermediate tunnelling site as this would negatively impact upon the safety of construction workers, the efficiency of tunnelling, and the project program and costs.

The Flat Rock Reserve site was chosen as the preferred location for the temporary construction support site as it avoids direct impacts to the Willoughby Recreation Centre, netball courts, the Flat Rock Baseball Diamond and other recreation facilities on the western side of Flat Rock Drive, which are in high demand for use by the local community. The preferred site also provides direct arterial road access, and the size of the site would facilitate tunnelling in three different directions, thereby reducing the need for intermediary tunnelling sites elsewhere.

Further discussion on the selection of the preferred location of Flat Rock Drive construction support site (BL2) is provided in Section 2 (Flat Rock Drive construction support site (BL2) options analysis) of the preferred infrastructure report. This includes discussion on the necessity of the Flat Rock Drive construction support site (BL2) to the overall project and the stakeholder and community

engagement activities that have occurred in the selection of the preferred location. A comparative assessment of Flat Rock Reserve option and Flat Rock Baseball Diamond option is also provided. The outcomes of the comparative assessment confirm the Flat Rock Reserve option to continue to be the preferred option for the Flat Rock Drive construction support site (BL2) for the following reasons:

- Reduced impact to the community as there would be no impact to organised sporting facilities within Bicentennial Reserve and informal recreation at Flat Rock Reserve will still be feasible throughout construction of the project
- Reduced risk of contamination impacts with the Flat Rock Reserve option. There would also be a lower human health risk associated with the exposure of potential release of landfill gases with the Flat Rock Reserve option compared to the Flat Rock Baseball Diamond option
- The Flat Rock Reserve option would require less land to be temporarily leased from Willoughby City Council.

In addition, the majority of the native vegetation that would be impacted at the Flat Rock Drive construction support site (BL2) consists of vegetation that has been planted over the last 20 years as part of the progressive rehabilitation of a former landfill site (refer to Section 3.4.1.1 of Appendix S (Technical working paper: Biodiversity development assessment report)). The site has avoided impacting the remnant vegetation, and the southern part of the site also includes a large area of cleared, maintained exotic grassland, a carpark and shared user paths equating to about 27 per cent of the site area.

Similar to the temporary construction support sites along Wakehurst Parkway, a number of environmental management measures would apply to the establishment and operation of Flat Rock Drive construction support site (BL2) to minimise and manage impacts to biodiversity including threatened species (such as the Powerful Owl (*Ninox strenua*) and threatened microbats as noted by Environment, Energy and Science Group). In addition to the general management measures described in the above response, environmental management measure B1 has been developed to specifically apply to Flat Rock Drive construction support site (BL2) and requires refinement of the site layout during further design development and construction planning to avoid direct impacts on PCT 1841 Coastal Enriched Sandstone Moist Forest, where feasible and reasonable (refer to Table D2-1 of this submissions report).

Transport for NSW will work closely with Willoughby City Council on its preferred final form of the Flat Rock Drive construction support site (BL2) in consultation with the local community, in accordance with new environmental management measure LP8 (refer to Table D2-1 of this submissions report). The site will be rehabilitated in line with the land use zoning. Vegetation and landscaping will be determined in consultation with Willoughby City Council and the community and will be implemented as soon as practicable at the completion of construction.

B4.6 Fauna crossing of Wakehurst Parkway

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) notes the proposal would increase existing fragmentation, mainly where the Wakehurst Parkway would be widened from two lanes to a four-lane divided carriageway. Environment, Energy and Science Group recommends that the project should improve native fauna connectivity and minimise risk to fauna.

Response

The project has included a number of design measures to minimise impacts to fauna connectivity along Wakehurst Parkway and reduce the risk of vehicle strike and fauna mortality as discussed in Section 19.4 of the environmental impact statement and detailed in Section 5.4.4 of Appendix S (Technical working paper: Biodiversity development assessment report). This includes the provision of three new fauna rope crossings and three new fauna underpasses, as well as the replacement of three existing fauna rope crossings that currently span Wakehurst Parkway (refer to Table 5-10 and Figure 5-7, Figure 5-8 and Figure 5-9 of the environmental impact statement, and Section A4.4 of this submissions report). The underpasses and rope crossings would provide fauna connectivity between Garigal National Park to the west and Manly Warringah War Memorial State Park to the east.

The project also includes the provision of fauna fencing along the eastern and western margins of the Wakehurst Parkway. The fauna exclusion fence would guide animals to move along the fence towards the proposed fauna underpasses, in addition to minimising the risk of vehicle strike and fauna mortality. The fauna exclusion fence would also tie-in to new fauna fencing provided for the Northern Beaches Hospital road upgrade project at the northern end of Wakehurst Parkway.

To support the above, a number of environmental management measures are proposed to ensure successful design and implementation of the connectivity measures and fauna fencing, including (refer to Table D2-1 of this submissions report):

- Connectivity measures will be designed during further design development in accordance with the *Wildlife Connectivity Guidelines: Managing Wildlife Connectivity of Road Projects* (Draft) (Roads and Maritime Services, 2011c), taking into account best available knowledge and consider measures to facilitate the crossing of native fauna species including the Eastern Pygmy-possum, Red-crowned Toadlet, Southern Brown Bandicoot and Rosenberg's Goanna. Maintenance requirements for fauna crossings and fauna exclusion fencing will be developed during further design development and incorporated into an Operational Environmental Management Plan or existing Environmental Management System as relevant (refer to revised environmental management measure B2)
- Fauna exclusion fencing will be designed to exclude small fauna species from the road corridor, such as Eastern Pygmy-possum, and will be installed for the full extent of the Wakehurst Parkway within the construction footprint. In addition, frog fencing will be added to the fauna exclusion fencing within identified Red-crowned toadlet habitat. The design specifications of the fauna exclusion fence will be based on best available knowledge from other Transport for NSW projects, and in consultation with NSW National Parks and Wildlife Service and Northern Beaches Council (refer to revised environmental management measure B3)
- Artificial light impacts on native fauna in the operational phase of the project will be minimised to the extent reasonably practicable through further design development where the project adjoins tracts of fauna habitat (eg along the Wakehurst Parkway) consistent with the requirements of *Australian Standard AS 4282 – 2019 Control of the obtrusive effects of outdoor lighting* (Standards Australia, 2019a) (refer to revised environmental management measure B4).

In addition to above, and to minimise impacts to fauna during construction of the project, the following new environmental management measure B39 has been included for the project (refer to Table D2-1 of this submissions report):

> Removal of the existing fauna fencing installed as part of the Northern Beaches Hospital road upgrade project will be avoided where possible in overlapping construction areas. Where this is not possible, temporary fauna fencing will be installed during construction to ensure fauna are guided to existing underpasses and away from construction areas and/or live traffic.

Further information on the connectivity measures for the project and their potential effectiveness is provided in the following sections. This also includes provision for monitoring the structures during operation (refer to Section B4.15 below).

B4.7 Efficacy of fauna passage structures proposed as mitigation for target fauna

B4.7.1 Effectiveness of fauna passage structures

Issue raised

Environment, Energy and Science Group considers that a major issue with the project is the lack of data and evidence as to the effectiveness of the various fauna passage structures (underpasses, rope crossings) and fauna exclusion fencing.

Environment, Energy and Science Group considers Appendix S (Technical working paper: Biodiversity development assessment report) and environmental impact statement to lack any demonstration of the likely efficacy of the proposed fauna passage structures in providing migration passage for the threatened fauna species suggested. Further, for some of the target species for which these measures are proposed, Appendix S (Technical working paper: Biodiversity development assessment report) acknowledges that their effectiveness is unknown and/or not demonstrated. For example, in relation to the use of the proposed rope canopy bridges by the Eastern Pygmy-possum the Appendix S (Technical working paper: Biodiversity development assessment report) states “to date this species has not been known to use rope bridges” (Table 5.16).

Environment, Energy and Science Group considers that the proposed structures are not “proven successful” for the target fauna species.

Response

The project would implement various fauna crossing structures to facilitate the safe crossing of target threatened and protected fauna species including rope crossings and underpasses. Fauna exclusion fencing would be installed to prevent roadkill and funnel fauna to crossing structures. Target species include the species listed in Table 5.16 of Appendix S (Technical working paper: Biodiversity development assessment report) and discussed in Section B4.8.1 below, which comprise a range of native arboreal and ground mammals, frogs and reptiles. There is an absence of data on use of crossings by some fauna species which may be the result of the natural rarity of the species, relatively new use of crossing structures on road projects and limitations of monitoring surveys. The lack of evidence of use by specific threatened species should not preclude the installation of these structures, as provision of habitat connectivity for a range of fauna species is an important consideration and needs to be addressed.

The fauna crossing structures, including design specifications of the fauna underpasses, proposed as part of the project are based on an understanding of the behaviour and ecology of target species and Transport for NSW experience from Pacific Highway Upgrade and other road upgrade projects. Species with similar behaviour and ecology to target species have utilised structures with similar dimensions and lengths to those provided by the project, as outlined below. Crossing structures would be monitored to confirm their use by targeted threatened species and inform future mitigation as a process of continual improvement on Transport for NSW projects in accordance with new environmental management measure B44 (refer to Table D2-1 of this submissions report, and discussed further in Section B4.7.2 below). Crossing structures would also function to maintain connectivity for a range of common protected fauna which are known to use these types of

crossings including for those that are susceptible to road strike associated with the existing unfenced road.

Fauna rope canopy bridges

Three existing rope bridges would be replaced and lengthened to accommodate the widened road and three additional rope bridges would be installed by the project, evenly spread across the length of Wakehurst Parkway to improve habitat connectivity for arboreal fauna.

Rope canopy bridges have demonstrated use by most target arboreal fauna species and similar species including Squirrel Gilder (*Petaurus norfolcensis*), Sugar Gilder (*Petaurus breviceps*) and Feathertail Glider (*Acrobates pygmaeus*), Common Brushtail Possum (*Trichosurus vulpecula*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Antechinus sp. on upgraded sections of the Pacific Highway and Hume Highway (Sandpiper Ecological Surveys, 2018a). Table B4-3 provides examples of target fauna species use of rope canopy bridges, or use by species with similar behaviour and ecology, and provides lengths of rope canopy bridges used.

Table B4-3 Examples of documented use of rope canopy bridges by targeted fauna species/similar species

Target species	Conservation Status	Confirmed use	Confirmed use by similar species
Eastern Pygmy-possum (*Cercartetus nanus*)	Vulnerable – *Biodiversity Conservation Act 2016*	-	Feathertail Glider (*Acrobates pygmaeus*) - See examples below Antechinus sp. - Sapphire to Woolgoolga Pacific Highway upgrade, 86 m long (Sandpiper Ecological Surveys, 2018a)
Common Ringtail Possum (*Pseudocheirus peregrinus*)	Protected	Karuah to Bulahdelah and Bonville Pacific Highway upgrades, 55 m long (Goldingay et al., 2013) Hume Highway Upgrade, 86 m (Sandpiper Ecological Surveys, 2020)	
Common Brushtail Possum (*Trichosurus vulpecula*)	Protected	Karuah to Bulahdelah and Bonville Pacific Highway upgrades, 42 m to 75 m long (Goldingay et al., 2013) Hume Highway Upgrade, 86 m (Sandpiper Ecological Surveys, 2020)	
Sugar Glider (*Petaurus breviceps*)	Protected	Karuah to Bulahdelah and Bonville Pacific Highway upgrades, 42 m to 75 m long (Goldingay et al., 2013). Sapphire to Woolgoolga Pacific Highway upgrade, 86 m long (Sandpiper Ecological Surveys, 2018a) Hume Highway Upgrade, 86 m (Sandpiper Ecological Surveys, 2020)	Squirrel Glider (*Petaurus norfolcensis*) Hume Highway Upgrade, 86 m (Sandpiper Ecological Surveys, 2020)

Target species	Conservation Status	Confirmed use	Confirmed use by similar species
Feathertail Glider (*Acrobates pygmaeus*)	Protected	Karuah to Bulahdelah and Bonville Pacific Highway upgrades, 42 m to 75m long (Goldingay et al., 2013) Sapphire to Woolgoolga Pacific Highway upgrade, 86 m long (Sandpiper Ecological Surveys, 2018a)	

Common Ringtail Possums are located in high densities adjacent to the Wakehurst Parkway (Australian Museum Business Services (AMBS), 2006) and are subject to road strike in the project area (SMEC, 2011; wildlifemapping.org/views/map). This species is likely to use and benefit from installation of additional rope canopy bridges being provided by the project.

Though Eastern Pygmy-possum (*Cercartetus nanus*) has not been previously recorded on rope canopy bridges, it is possible the species could utilise rope bridges given their arboreal nature. Small marsupial mammals have previously been recorded using rope canopy bridges (eg Feathertail Glider, Antechinus sp.). Underpasses are also an alternative potential crossing structure for the species.

Refer to Table B4-7 for further details on the proposed fauna rope canopy bridges proposed for the project.

Fauna underpasses

Three fauna underpasses would be provided as part of the project. Their type, location and indicative dimensions is detailed below in Table B4-6.

Fauna usage of underpasses of similar dimensions and lengths to that proposed for the project has been detected on multiple sections of the Pacific Highway Upgrade and other roads. Table B4-4 provides some examples of target fauna species use of underpasses, or use by species with similar behaviour and ecology, and provides dimensions/lengths of underpasses used.

Table B4-4 Examples of documented use of underpasses by targeted fauna species/similar species

Target species	Conservation Status	Confirmed use	Use by similar species
Amphibians			
Red-crowned Toadlet (*Pseudophryne australis*)	Vulnerable – *Biodiversity Conservation Act 2016*	-	Striped Marsh Frog (*Limnodynastes peroni*), Lesueur's Frog (*Litoria lesueuri*) (AMBS, 1997), Giant Barred Frog (*Mixophyes iteratus*) and other frog species - culverts ranging in size from 1.5 m diameter pipe culverts to 3 m by 3 m box culverts up to 75 m in length (Sandpiper Ecological Surveys, 2020; Sandpiper Ecological Surveys, 2018b)
Peron's Tree Frog (*Litoria peroni*)	Protected	-	

Target species	Conservation Status	Confirmed use	Use by similar species
Reptiles			
Rosenberg's Goanna (*Varanus rosenbergi*)	Vulnerable – *Biodiversity Conservation Act 2016*	-	Lace monitor - Sapphire to Woolgoolga, Pacific Highway upgrade, 2.3 m by 3 m, and 3 m by 3 m box culverts ranging in lengths from 19-102.4 m (Sandpiper Ecological Surveys, 2018a)
Red-bellied Black Snake (*Pseudechis porphyriacus)*	Protected	-	Eastern Small-eyed Snake (*Rhinoplocephalus nigrescens*) and Golden Crowned Snake (*Cacophis squamulosus*) – Sapphire to Woolgoolga Pacific Highway Upgrade, used 1.05 m diameter concrete pipes culvert ranging 55-56 m in length (Sandpiper Ecological Surveys, 2016)
Eastern Brown Snake (*Pseudonaja textilis*)	Protected	-	
Diamond Python (*Morelia spilota spilota*)	Protected	-	Carpet Python (*Morelia spiloa*) Woolgoolga Pacific Highway Upgrade, used 1.0 m diameter concrete pipes culvert ranging from 55-56 m in length (Sandpiper Ecological Surveys, 2016)
Lace Monitor (*Varanus varius*)	Protected	Sapphire to Woolgoolga, Pacific Highway upgrade, 2.3 m by 3 m, and 3 m by 3 m box culverts ranging in lengths from 19 m to 102.4 m (Sandpiper Ecological Surveys, 2018a)	-
Small terrestrial mammals			
Eastern Pygmy-possum (*Cercartetus nanus*)	Vulnerable – *Biodiversity Conservation Act 2016*	Recorded on a ledge in an underpass on the Pacific Highway at Mooney Mooney (AMBS, 1997) and in 1999 using a 10 m Bebo arch culvert under the M1 Motorway (Roads and Maritime Services, 2017b)	Mountain Pygmy-possums (*Burramys parvus*) concrete box culverts (0.9 m by 1.2 m and about 19 m in length) in Mount Higginbotham (van der Ree et al., 2009)

Target species	Conservation Status	Confirmed use	Use by similar species
Southern Brown Bandicoot (*Isoodon obesulus obesulus*)	Endangered – *Environment Protection and Biodiversity Conservation Act 1999*, *Biodiversity Conservation Act 2016*	-	Northern Brown Bandicoot (*Isoodon macrourus*) 1.2 m diameter pipe culvert 74.5 m in length in Emerald Beach (Sandpiper Ecological Surveys, 2018a) Long-nosed Bandicoot (*Perameles nasuta)* 2.4 m by 3 m box culvert 102.4 m in length in Moonee (Sandpiper Ecological Surveys, 2018a) and 1.05 m diameter pipe culverts ranging 55-56 m in length (Sandpiper Ecological Surveys, 2016)
Brown Antechinus (*Antechinus stuartii*)	Protected	Nambucca Heads to Urunga Upgrade, box culverts 2.4 m by 2.4 m ranging 36.5 – 42 m in length, 3 m by 3 m ranging 67-75 m in length, and 3 m by 2.1 m ranging 25-27 m in length (Sandpiper Ecological Surveys 2020)	-
Short Beaked Echidna (*Tachyglossus aculeatus*)	Protected	Warrell Creek to Nambucca Heads Upgrade, 3 m by 3 m culverts (culvert length not specified) (Sandpiper Ecological Surveys, 2019)	-
Large Terrestrial Mammals			
Swamp Wallaby (*Wallabia bicolor*)	Protected	Sapphire to Woolgoolga Pacific Highway upgrade, 2.4 m by 3 m and 3 m by 3.3 m box culverts ranging in length from 19 m to 102.4 m (Sandpiper Ecological Surveys, 2018b) Nambucca Heads to Urunga Pacific Highway Upgrade, 1.5 m (height) by 2.4 m (width) multicell culverts, 18 m in length (Sandpiper Ecological Surveys, 2020)	-

Target species	Conservation Status	Confirmed use	Use by similar species
Arboreal Mammals			
Common Brushtail Possum (*Trichosurus vulpecula*)	Protected	Warrell Creek to Nambucca Heads Upgrade 2.4 m by 2.4 m box culverts (culvert length not specified) (Sandpiper Ecological Surveys 2019b). Sapphire to Woolgoolga 2.4 m by 3 m box culvert 102 m in length (Sandpiper Ecological Surveys, 2018b)	-
Common Ringtail Possum (*Pseudocheirus peregrinus*)	Protected	-	Brushtail Possum - Warrell Creek to Nambucca Heads Upgrade 2.4 m by 2.4 m box culverts (Sandpiper Ecological Surveys, 2019b). Sapphire to Woolgoolga 2.4 metre by 3 m box culvert 102 m in length (Sandpiper Ecological Surveys, 2018b)

The Red-crowned Toadlet (*Pseudophryne australis*) has not been previously recorded using an underpass, however lack of detection does not necessarily preclude its future use of underpasses. The species has a very limited distribution around the Sydney Basin (NSW Department of Planning, Industry and Environment (DPIE) (Environment, Energy and Science (EES)), 2017b) where underpass monitoring data is limited relative to other areas of NSW (eg Mid North Coast). The species is a relatively small frog, measuring less than 30 millimetres and may not be detected on underpass monitoring. Whilst there is uncertainty around the species use of underpasses, the detection of other frog species on underpasses is encouraging, and it is preferable to incorporate frog-friendly design elements in absence of certainty.

Though Eastern Pygmy-possums have not frequently been recorded using underpasses, this may be due to a lack of data/monitored culverts in areas of high population density around the Sydney Basin (NSW DPIE (EES), 2017a), rather than an aversion to their use. There is evidence of the Eastern Pygmy-possum using an underpass on the Pacific Highway at Mooney Mooney. Given the usage of box culverts by a similar species, eg the Mountain Pygmy-possum, it is feasible that the Eastern Pygmy-possum would utilise the proposed underpasses.

Fauna exclusion fencing

Fauna exclusion fencing would be installed for the length of the upgraded and realigned Wakehurst Parkway to prevent roadkill and funnel fauna through crossings (refer to Section B4.11 below for further detail). Fauna exclusion fence monitoring of the Pacific Highway between Nambucca Heads and Urunga detected 83 per cent of fauna species/groups recorded at fauna exclusion fencing were also recorded in underpasses suggesting the fence is funnelling fauna to the underpasses (Sandpiper Ecological Surveys, 2020).

Monitoring of fauna fencing along the Sapphire to Woolgoolga Pacific Highway Upgrade found a variety of fauna species detected adjacent to the fence including Swamp Wallaby (*Wallabia bicolor*), Eastern Grey Kangaroo (*Macropus giganteus*), Northern Brown Bandicoot (*Isoodon macrourus*) and

Black Rat (*Rattus rattus*), mostly moving either along the fence or non-directional (Sandpiper Ecological Surveys, 2020). Over a three year monitoring period, the only species detected moving through the fence were Black Rat and Antechinus sp. (probably Brown Antechinus (*Antechinus stuartii*)). Both species are small enough to easily move through the chain mesh fencing. However, for the project, fauna exclusion fencing will be designed to minimise the likelihood that small fauna species, including the Eastern Pygmy-possum, can fit through the fence. In addition, frog fencing will be added to the fauna exclusion fencing within identified Red-crowned Toadlet habitat in accordance with revised environmental management measure B3 (refer to Table D2-1 of this submissions report).

B4.7.2 Monitoring of fauna passage structures

Issue raised

There is no commitment in Appendix S (Technical working paper: Biodiversity development assessment report) to pre, during or post-approval monitoring of usage of fauna passage structures and local fauna populations, or to consult with the Environment, Energy and Science Group, the NSW Local Land Services or Northern Beaches Council in preparation of a monitoring plan that would consider remedial actions in responses to declines in the local population over the period of monitoring the local population following construction.

Response

An ecological monitoring program would be developed in consultation with Environment, Energy and Science Group and Northern Beaches Council to determine the effectiveness of the proposed fauna connectivity measures and fauna exclusion fencing. The program would include pre-construction baseline monitoring and construction/post-construction monitoring of targeted fauna species and key performance criteria that trigger the need for corrective actions.

Accordingly, a new environmental management measure B44 has been developed as follows (refer to Table D2-1 of this submissions report):

> Monitoring will occur during pre-construction, construction and post-construction phases of the project to determine the effectiveness of the proposed fauna connectivity measures and exclusion fencing to be provided as part of the project.
>
> Pre-construction baseline monitoring will commence prior to project construction works impacting fauna habitat adjacent to the Wakehurst Parkway and include adequate sampling of threatened and protected targeted fauna species in line with relevant guidelines.
>
> A construction/post-construction ecological monitoring program will be developed prior to construction in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Group) and Northern Beaches Council. The program will include monitoring of targeted fauna species, threatened or protected species, and pest species, in addition to key performance criteria that trigger the need for and feasibility of potential corrective actions. The program will consider the pre-construction baseline monitoring results and ecological monitoring data collected for the Northern Beaches Hospital road upgrade project where relevant.
>
> Post-construction monitoring will extend for 10 years after the opening of the project.

Environment, Energy and Science Group's recommendation of including consultation with the Greater Sydney Local Land Services is not considered necessary as ecological monitoring would be more relevant to the work of Environment, Energy and Science Group rather than Greater Sydney Local Land Services.

B4.8 Target species

B4.8.1 Identification of which native species are targeted to use fauna crossings

Issue raised

It is important the project identifies which native species (threatened and non-threatened species) are specifically targeted to use the underpasses and rope crossings. While Table 5.16 in Appendix S (Technical working paper: Biodiversity development assessment report) includes a list of target species which may use the crossing structures, it appears there is no certainty that some of the species listed will use the crossings, such as the Eastern Pygmy Possum. It is also unclear if the threatened Red-crowned Toadlet is likely to use the fauna underpasses.

Response

The targeted native species (threatened and protected species) for rope canopy crossings and fauna underpasses are discussed in Table 5.16 of Appendix S (Technical working paper: Biodiversity development assessment report).

In addition, following consideration of issues raised by Environment, Energy and Science Group, further review of roadkill data (refer to Section B4.8.3) and species recorded in adjacent habitat to Wakehurst Parkway, additional protected species have been included as targeted species for fauna underpasses, including:

- Lace Monitor (*Varanus varius*)
- Peron's Tree Frog (*Litoria peronii*)
- Common Ringtail Possum.

For completeness, a consolidated list of target species is provided in Table A4-2 of this submissions report.

Refer to discussion above in Section B4.7.1 regarding the effectiveness of fauna passage structures for targeted fauna species, including the Eastern Pygmy Possum and Red-crowned Toadlet.

B4.8.2 Consideration of Koalas

Issue raised

Since Appendix S (Technical working paper: Biodiversity development assessment report) was prepared new BioNet records have been submitted in December 2020 of Koala calls having recently been heard in 2017 and 2019 in the locality. Environment, Energy and Science Group is aware that a Koala was observed in 1979 in what is part of Garigal National Park and this information was recorded in *Aus Zoologist Vol 26 (3) Sept 1990*. Environment, Energy and Science Group recommends Appendix S (Technical working paper: Biodiversity development assessment report) is revised to include consideration of this new information as Appendix S (Technical working paper: Biodiversity development assessment report) has discounted the Koala as a candidate species by the BAM credit calculator (Section 3.6.2.3 of Appendix S (Technical working paper: Biodiversity development assessment report)).

Environment, Energy and Science Group notes there are inconsistencies between how Appendix S (Technical working paper: Biodiversity development assessment report) has treated the likelihood of occurrence of the Koala compared to the Southern Brown Bandicoot (*Isoodon obesulusobesulu*).

Due to the recent BioNet records of Koalas in the locality, the submissions report needs to consider the likelihood of Koalas using the underpasses and it should include details on specific underpass design features that are known to be required for Koala use.

Response

In consideration of the issue raised by Environment, Energy and Science Group, a supplementary Koala survey and assessment has been carried out and provided as Appendix F3 of this submissions report. Koala surveys were carried out over four days and three nights in June and July 2021 within the subject land (ie construction footprint) plus a 100 metre buffer in areas of potential Koala habitat at Wakehurst Parkway and Burnt Bridge Creek. Targeted surveys were carried out using three survey techniques:

- The Spot Assessment Technique (SAT – Koala survey method) (Phillips and Callaghan, 2011)
- Camera traps
- Nocturnal spotlighting surveys, which included the use of a thermal monocular to increase chances of detection.

There are no specific guidelines on Koala survey techniques by Environment, Energy and Science Group to determine presence. However there are *Environment Protection Biodiversity Act* (EPBC) *1999* guidelines – namely *The EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (Commonwealth of Australia, 2014) - which outline a number of survey methods, recommending selecting methods most suited to the type of data desired and the size and complexity of the site. The approach adopted for the targeted surveys, as described above, contains survey methods outlined in the referral guidelines and is considered appropriate for the study area size with a level of survey effort sufficient to detect the species, if present.

No Koalas or evidence of their presence were detected during targeted surveys. Previous surveys carried out by WSP in 2017 to inform Appendix S (Technical working paper: Biodiversity development assessment report), including three surveys using the SAT survey approach and spotlighting in vegetation adjacent to the Wakehurst Parkway, also did not detect the species (refer to Table 2.6 of Appendix S (Technical working paper: Biodiversity development assessment report)).

Koalas have historically been recorded in very low numbers in the Northern Beaches local government area. BioNet database (NSW DPIE (EES), 2021) records show a total of 10 records of the species within around five kilometres of the subject land at Wakehurst Parkway and Burnt Bridge Creek. An additional three records of the species from 2020 are located just over five kilometres from the subject land and are considered relevant to this discussion. All 13 records are mapped in Figure B4-1 and a summary of the records is provided in Table B4-5 (presented in order of distance from subject land).

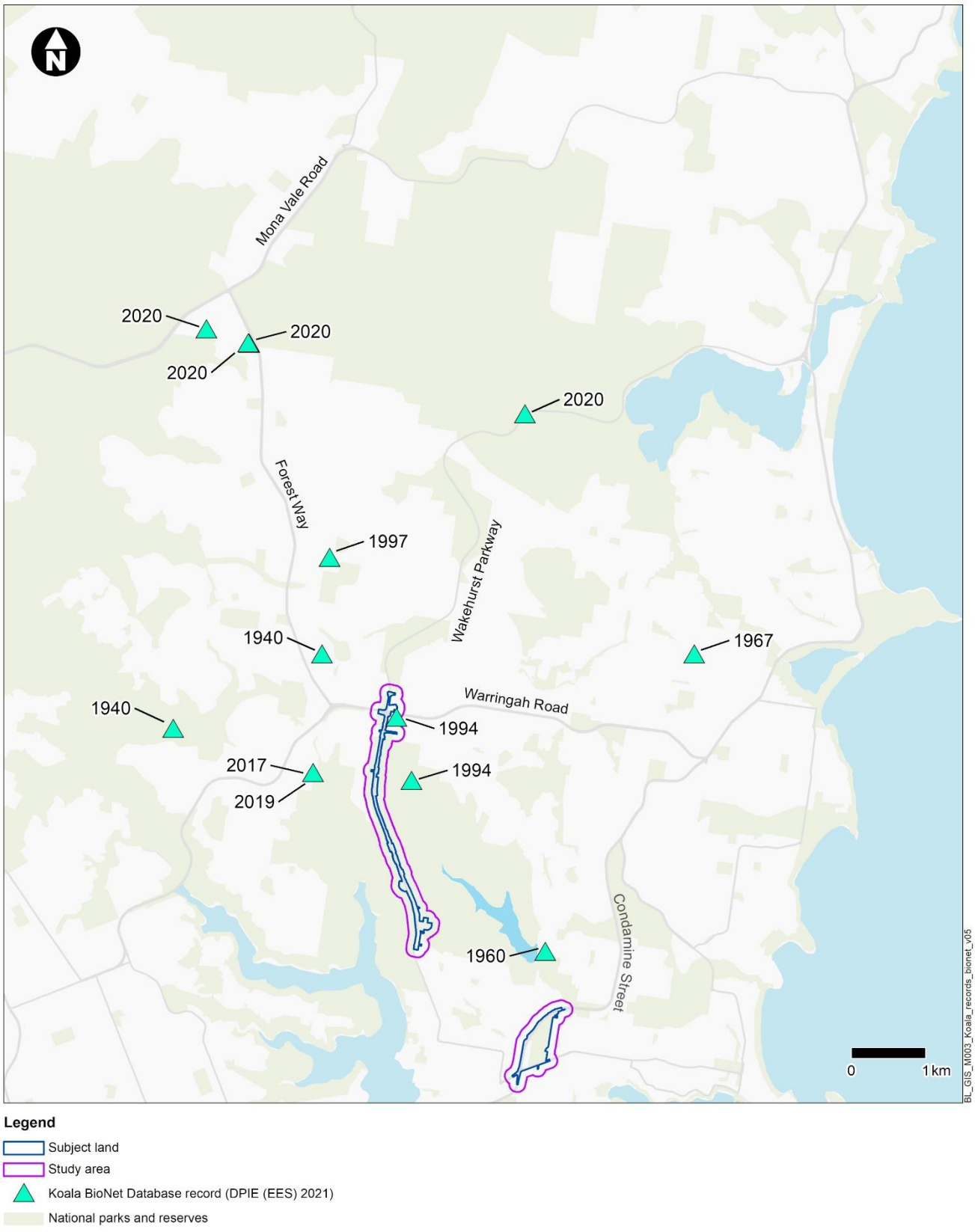


Figure B4-1 Koala records within around five kilometres of the survey area, including year of record (DPIE (EES), 2021)

Table B4-5 Koala records about five kilometres from the subject land (DPIE (EES), 2021)

Year of record	Location	Distance from subject land
1994	Warringah Road, Frenchs Forest	85 m
1994	Manly Warringah War Memorial State Park, east of Wakehurst Parkway	450 m
1960	Manly Warringah War Memorial State Park, north of Burnt Bridge Creek	785 m
2017	West of Wakehurst Parkway in urban area adjacent to Garigal National Park, Frenchs Forest	810 m
2019	West of Wakehurst Parkway in urban area adjacent to Garigal National Park, Frenchs Forest (identical location to above)	810 m
1940	Frenchs Forest off Forest Way by Adams Street, north-west of subject land	1.03 km
1997	Vegetation near St Andrews Close, Frenchs Forest	1.95 km
1940	Garigal National Park west of subject land	2.75 km
1967	Kerr Close, Cromer	4.06 km
2020	Wakehurst Parkway 800 m west of the Narrabeen Sport & Recreation centre	4.17 km
2020	22 Narabang Way, Belrose	5.06 km
2020	22 Narabang Way, Belrose	5.06 km
2020	Narabang Way, Belrose, close to Mona Vale Road	5.46 km

As detailed in Table B4-5, there are records from 2017 and 2019 of the species to the west of the project, in close proximity to the subject land (about 810 metres away) and several further north (more than four kilometres) from 2020. Most of the remaining records are dated (ie from 1994 or older) and varying distances from the subject land.

Given the lack of detection in surveys carried out 2021 and as part of Appendix S (Technical working paper: Biodiversity development assessment report), it is considered unlikely that there is a resident Koala population within 100 metres of or on the subject land, or that the subject land forms part of the core habitat for this species. The relatively low frequency of species records and age of most records mean it is likely that the species occurs in the locality in very low densities. However, with the five most recent records in the locality, it is possible that the Koala could occur as a vagrant and use the subject land for movement purposes.

In consideration of the above, and the additional survey effort, the species is identified as having a low likelihood of occurrence within the subject land. This is consistent with the conclusions made in Table.3.29 and Annexure A of Appendix S (Technical working paper: Biodiversity development assessment report). Offsets are also not required for this species in accordance with Section 5.2.4 of the *Biodiversity Assessment Method* (OEH, 2017a) due to the lack of detection during targeted surveys carried during the preparation of Appendix S (Technical working paper: Biodiversity development assessment report) and subsequent surveys in 2021. This is consistent with the approach for Southern Brown Bandicoot, which was also not detected during targeted surveys and therefore did not require offsets.

Due to the low likelihood of occurrence of the species within the subject land, there is a low likelihood of the species utilising the three proposed fauna underpasses along Wakehurst Parkway.

Discussion on the fauna underpasses to be provided as part of the project is provided in sections B4.7.1, B4.8.4 and B4.9 of this submissions report. Notwithstanding, the proposed fauna underpasses for the project are of an adequate height and would allow for incidental Koala crossings and ensure habitat connectivity across the landscape is retained for the species.

As noted above in Section B4.2.2, additional requests for information and comments on the content of Appendix S (Technical working paper: Biodiversity development assessment report) by Environment, Energy and Science Group are addressed within this section and supported by Appendices F1, F2 and F3 of this submissions report. Specifically with regards to providing supplementary Koala survey and assessment, this has been carried out and is provided in Appendix F3 of this submissions report.

To aid stakeholders in understanding updates to the biodiversity assessment which have occurred since the exhibition of the environmental impact statement, and to navigate where this information is included in this submissions report, a clarification has been included in Section A5.1.18 and a Biodiversity development assessment roadmap provided in Appendix F4 of this submissions report. Appendix F5 of this submissions report provides an updated biodiversity assessment to synthesise the updated and supplementary information provided in this submissions report, with Appendix S (Technical working paper: Biodiversity development assessment report).

B4.8.3 Selection of fauna crossing locations

Issue raised

Targeted research needs to be carried out to gain an awareness of the conditions and populations adjacent to the fauna crossings.

Once a list of target species is identified (threatened and non-threatened), the proposed locations and design of the crossings needs to be appropriate for these species, such as whether the proposed height, width and length of the underpass is adequate.

The crossing should be located as close as possible to existing fauna pathways and at locations with highest rates of road kill (see Volume 2, Chapter 6, page 46 of *Fauna Sensitive Road Design Manual* (Queensland Department of Transport and Main Roads, 2010)). “The Fauna Fencing should account for repetitive pathway behaviour, as many species are averse to changing paths and will try to use the same path even if it is blocked” (Volume 2, Chapter 6, page 67 of *Fauna Sensitive Road Design Manual* (Queensland Department of Transport and Main Roads, 2010)).

Response

Roadkill data collected by the Northern Beaches Roadkill Prevention Committee between 2010 and 2015 is mapped in Figure B4-2 below. Fauna species have been recorded across the entire section of the Wakehurst Parkway within the subject land (construction footprint), with no obvious clusters of roadkill evident. The most commonly recorded roadkill species on the Wakehurst Parkway are Common Brushtail and Ringtail Possums (SMEC, 2015; AMBS, 2006), Swamp Wallabies, Long-nosed Bandicoots and Lace Monitors (wildlifemapping.org/views/map; SMEC, 2011).

The target fauna species for rope canopy crossings and fauna underpasses described in Section B4.8.1 above are consistent with those commonly identified as roadkill species on the Wakehurst Parkway.

In addition, habitat for terrestrial fauna species is present adjacent to the entire length of Wakehurst Parkway and most of the target fauna species have been recorded adjacent to Wakehurst Parkway and/or in connected bushland either side (NSW DPIE (EES), 2021).

Proposed fauna crossing locations have considered:

- The even spread of roadkill recorded along Wakehurst Parkway, as described above
- The occurrence/distribution of target species and species habitat along the alignment
- The need to provide sufficient coverage of the full length of the upgraded and realigned section of Wakehurst Parkway
- Design and engineering constraints such as road alignment and topography
- Location of existing fauna crossings constructed as part of the Northern Beaches Hospital road upgrade project.

Red-crowned Toadlet habitat is only present at the northern end of the subject land (construction footprint) as shown on Figure 3-8 (map c) of Appendix S (Technical working paper: Biodiversity development assessment report). As such, a new dedicated fauna underpass (at chainage 12475 – see Section B4.9.4for discussion on design chainages) would be installed at this location, designed to facilitate the crossing of the Red-crowned Toadlet.

Following exhibition of the environmental impact statement, Transport for NSW carried further investigations and development of the design with regard to the fauna underpasses with the aim to further optimise the location of the underpasses along the Wakehurst Parkway and their dimensions, and to determine if any of the combined drainage/fauna underpasses could become dedicated fauna underpasses. While refinements have occurred to the fauna underpasses presented in the environmental impact statement (refer to Section B4.9 below and Section A4.4 of this submissions report), the design investigations confirmed the challenges presented by engineering constraints such as topography along the Wakehurst Parkway and the existing general locations of the underpasses are the only suitable areas to locate fauna underpasses without carrying out significant design modifications (eg increases in vertical alignment). Increasing the vertical alignment of the Wakehurst Parkway would result in additional property impacts, potential impacts to Garigal National Park and Manly Warringah War Memorial State Park, and additional vegetation clearing.

Fauna crossing designs and fauna exclusion fencing will be developed in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) as required by revised environmental management measures B2 and B3 (refer to Table D2-1 of this submissions report). This would include integrating crossing structures with fauna exclusion fencing to guide animals towards the underpass structure. The best available knowledge and experience gained from the Pacific Highway upgrade projects and other Transport for NSW projects which have implemented fauna crossing mitigation would also be used in developing design and specifications during further design development.

Pre-construction baseline monitoring and construction/post-construction monitoring of targeted fauna species would be carried out to ascertain the effectiveness of crossing structures and fauna exclusion fencing and implement any changes to increase effectiveness, where required. This is reflected in new environmental management measure B44 (refer to Table D2-1 of this submissions report). Refer to Section B4.15 below for further discussion on proposed monitoring.

Discussion regarding the adequacy of proposed height, width and length of the underpasses and their effectiveness for the target species is addressed in sections B4.7.1 and B4.9 of this submissions report. Discussion of fauna rope crossing locations is also provided in Section B4.13.2 below.

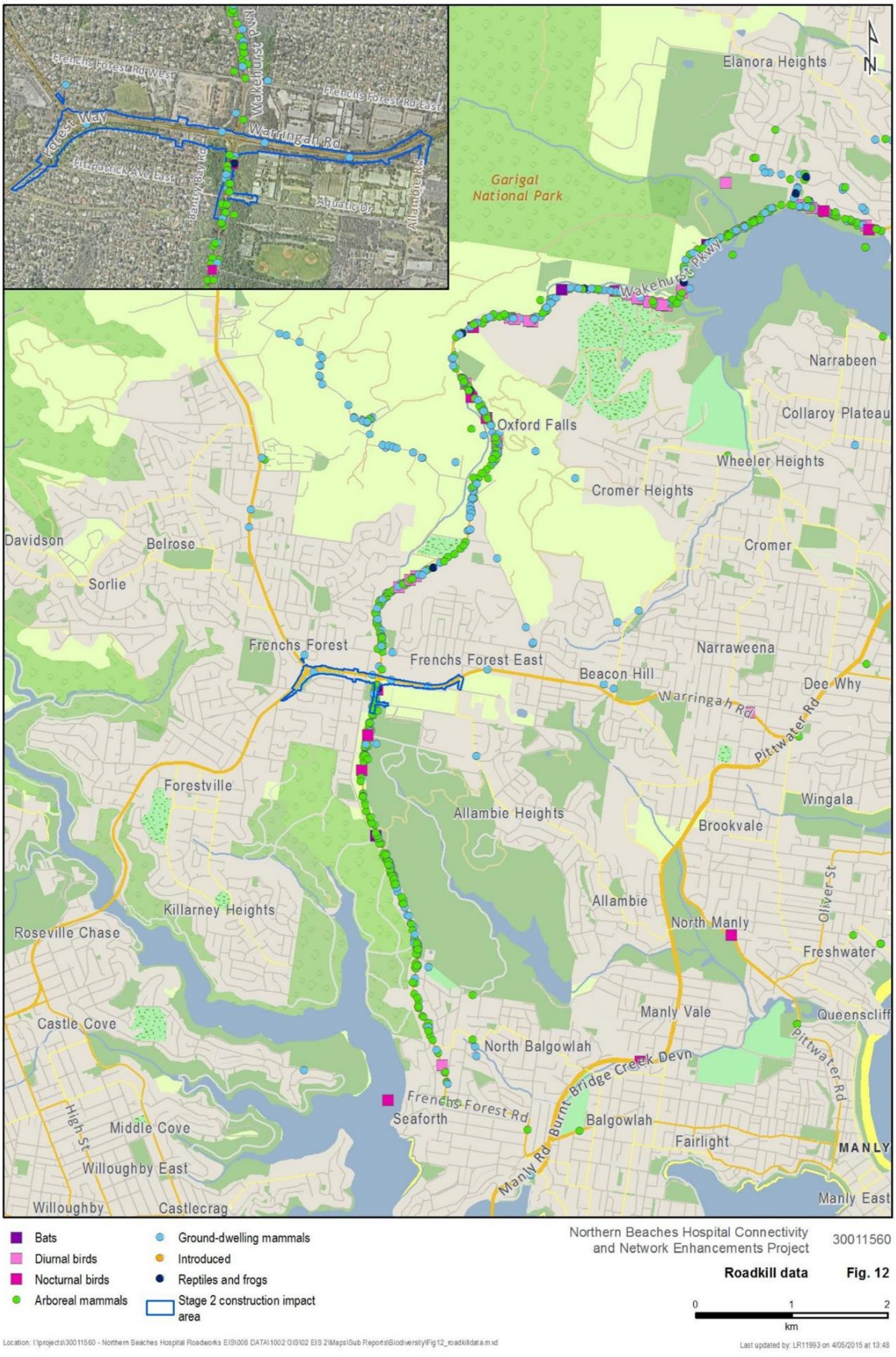


Figure B4-2 Extract from Northern Beaches Hospital Connectivity and Network Enhancements Biodiversity Assessment Report (Figure 12) (SMEC, 2015)

B4.8.4 Design of fauna crossings

Issue raised

Environment, Energy and Science Group recommends the fauna crossings are designed in consultation with experts on the target fauna species so the crossing structures are effective. A condition of approval should be included to this effect:

- The fauna crossings (including underpasses and rope crossings) must be designed in consultation with experts on the target fauna species that may potentially use the crossings and experts in fauna crossings.

Response

The recommendation from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Notwithstanding, a number of environmental management measures (refer to Table D2-1 of this submissions report) have been proposed to ensure successful design and implementation of the connectivity measures and fauna fencing as detailed in the response in Section B4.6 above. This includes but is not limited to designing the connectivity measures in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) and taking into account best available knowledge and consider measures to facilitate the crossing of native fauna species including the Eastern Pygmy-possum, Red-crowned Toadlet, Southern Brown Bandicoot and Rosenberg's Goanna as required by revised environmental management measure B2 (refer to Table D2-1 of this submissions report). In addition, the fauna exclusion fencing will also use the best available knowledge from other Transport for NSW projects for the design specifications in accordance with revised environmental management measure B3 (refer to Table D2-1 of this submissions report).

B4.8.5 Reference to Queensland and Victoria guidelines for road crossing structures

Issue raised

Environment, Energy and Science Group recommends that the project also refers to the *Fauna Sensitive Road Design Manual* (Queensland Department of Transport and Main Roads, 2010) or the *Fauna Sensitive Road Design Guidelines* (VicRoads, 2012) when considering appropriate specifications for road crossing structures, assuming that comparable species are available for consideration.

Response

The recommendation from Environment, Energy and Science Group is noted. Fauna crossing designs and fauna exclusion fencing would be developed in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) as required by revised environmental management measures B2 and B3 (refer to Table D2-1 of this submissions report). The best available knowledge and experience gained from Pacific Highway upgrade projects and other Transport for NSW projects which have implemented fauna crossing mitigation will also be used in developing design and specifications during further design development.

The *Fauna Sensitive Road Design Manual* (Queensland Department of Transport and Main Roads, 2010) and *Fauna Sensitive Road Design Guidelines* (VicRoads, 2012) are guidelines for Victoria and Queensland road authorities and are not requirements for Transport for NSW in designing

fauna crossing mitigation. Notwithstanding, these guidelines would be considered during further design development where relevant.

B4.9 Fauna underpasses

B4.9.1 Fauna crossings delivered as part of the Northern Beaches Hospital road upgrade project

Issue raised

The environmental impact statement and Appendix S (Technical working paper: Biodiversity development assessment report) refer to existing underpasses, for example Table 5-10 of the environmental impact statement refers to “retention of the existing fauna underpass north of Aquatic Drive constructed as part of the Northern Beaches Hospital road upgrade project” (see page 5-49). It is unclear if any monitoring of these existing fauna underpasses has previously been carried out, or if the existing underpasses are currently being monitored to determine their effectiveness and if so, which native species have been recorded using the underpasses. The submissions report needs to provide details on the existing underpasses, their existing use by native fauna and any existing monitoring results and findings.

Response

As part of the Northern Beaches Hospital road upgrade project, a fauna underpass was constructed under Wakehurst Parkway about 100 metres north of Aquatic Drive. The dimensions of the underpass are 2.4 metres wide, 1.8 metres high and about 37 metres in length. Fauna furniture has been included as part of the underpass and consists of refuge poles and timber railings. Another fauna underpass constructed as part of the Northern Beaches Hospital road upgrade project, but outside of the construction footprint for the Beaches Link and Gore Hill Freeway Connection project, is located on Aquatic Drive about 50 metres east of Wakehurst Parkway. This underpass has similar dimensions to the underpass on Wakehurst Parkway.

As part of the project, the underpass under Wakehurst Parkway about 100 metres north of Aquatic Drive would have a new shared user bridge constructed adjacent and offset from the eastern end of the structure (refer to Figure 5-9 of the environmental impact statement). This may effectively lengthen the underpass by about four metres, although a 1.5 metre gap is provided between the new shared user bridge and the eastern end of the structure. Notwithstanding, it is not anticipated to affect the effectiveness of the fauna underpass as the 1.5 metre gap would assist with maintaining natural light penetration. The fauna underpass located on Aquatic Drive would not be affected by the project.

Further detail on the fauna underpasses constructed as part of the Northern Beaches Hospital road upgrade project and the associated wildlife connectivity objectives can be found in the *Wildlife Connectivity and Road Risk Minimisation Strategy* (Biosis, 2020). This strategy was prepared in consultation with OEH (now Environment, Energy and Science Group) in accordance with the Northern Beaches Hospital road upgrade project approval conditions.

Monitoring of use of the fauna underpasses was not required for the Northern Beaches Hospital road upgrade project. However, monitoring and maintenance actions were included within Section 5 and Table 7 of *Wildlife Connectivity and Road Risk Minimisation Strategy* (Biosis, 2020). This included maintenance inspections of connectivity structures and fauna fencing, roadkill monitoring and monitoring the success of revegetation and rehabilitation works. Copies of the ecological monitoring reports for Northern Beaches Hospital road upgrade project can be found at: roads-waterways.transport.nsw.gov.au/projects/northern-beaches-hospital/project-documents.html

B4.9.2 Height of fauna underpasses

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) notes the underpasses would consist of concrete box culverts and the underpasses would be designed to convey surface water flows as well as facilitate fauna crossings and would include a raised bench on one side of the base of the culvert, to allow for the dry passage of animals during periods of high flow, designed to be dry in a 1 in 10 year Average Recurrence Interval (ARI) and that the dimensions and specifications of fauna underpasses would be refined during further design development (see Section 5.4.4, page 220 of Appendix S (Technical working paper: Biodiversity development assessment report)).

Table 5.16 in Appendix S (Technical working paper: Biodiversity development assessment report) indicates for the fauna underpasses at chainages 2925 and 3230 that the box culvert will be about 1.8 metres high and three metres wide (page 221) while fauna underpass at chainage 4390 will be about 2.4 metres high and three metres wide (page 221). It is unclear why one underpass is proposed to be 2.4 metres high and not the other two. The submissions report should address this.

Response

Further investigations and development of the design has occurred following the exhibition of the environmental impact statement to refine the location and type of fauna crossings provided by the project. This included investigating opportunities to optimise their location of the underpasses along Wakehurst Parkway and their dimensions, and to determine if any of the combined drainage/fauna underpasses could become dedicated fauna underpasses.

The refinements to the fauna underpasses are described in Section A4.4 of this submissions report and summarised in Section B4.9.4 below.

It is noted that following the exhibition of the environmental impact statement and as part of the ongoing design development, the chainages used for the project have been amended to ensure consistency throughout the project (see Section B4.9.4 below for further details). As part of the further design refinement, the previously combined drainage/fauna underpass about 620 metres south of Aquatic Drive (new chainage 12475, previously known as chainage 4390 in the environmental impact statement) has been refined to become a dedicated fauna underpass. This would mean that this underpass, which would be 2.4 metres in height, would remain dry which would improve its use in providing fauna passage. In addition, the combined drainage/fauna underpass about 725 metres north of Kirkwood Street (new chainage 10970, previously known as chainage 2925) has been resized to 2.4 metres in height.

Due to the above design refinements, the fauna underpass at chainage 11290 would be the only underpass 1.8 metres in height. Increasing the vertical alignment of the upgraded and realigned Wakehurst Parkway to accommodate a greater height for the fauna underpass at chainage 11290 would result in additional property impacts, potential impacts to Garigal National Park and Manly Warringah War Memorial State Park, and additional vegetation clearing. Opportunities to increase the height of the fauna underpass at chainage 11290 without increasing the vertical alignment of the project would require the drop inlet excavation to be increased which is not desirable from a connectivity perspective. An excessive drop inlet structure may obstruct views for fauna using the underpass of the horizon or habitat on either side of the structure.

The heights of all the fauna underpasses are considered adequate for the target species identified in Section B4.8.1, including the Swamp Wallaby, which is likely to be the largest species to potentially use the proposed fauna underpasses (refer to Section B4.9.3). As noted in Section

B4.7.1, fauna usage of underpasses of similar dimensions and lengths to that proposed for the project has been detected on multiple sections of the Pacific Highway Upgrade and other roads.

B4.9.3 Use of fauna underpasses by Swamp Wallabies

Issue raised

Table 5.16 of Appendix S (Technical working paper: Biodiversity development assessment report) indicates that all three underpasses may be used by large terrestrial mammals such as the Swamp Wallaby (*Wallabia bicolor*). The submissions report needs to clarify if the Swamp Wallaby is the largest animal to potentially use the fauna underpasses.

Response

The Swamp Wallaby (*Wallabia bicolor*) has frequently been recorded in the locality and also as roadkill on the Wakehurst Parkway as discussed in Section 5.4.4 of Appendix S (Technical working paper: Biodiversity development assessment report). The Swamp Wallaby is likely to be the largest species to potentially use the proposed fauna underpasses. The heights of all the fauna underpasses are considered adequate for the target species, including the Swamp Wallaby.

A search of BioNet records of macropod species in May 2021 for the area surrounding Wakehurst Parkway indicate a single Eastern Grey Kangaroo (*Macropus giganteus*) historically recorded from 2013, about 1.3 kilometres east of the Wakehurst Parkway (wildlifemapping.org/views/map). No other large macropod has been recorded in an area with connected bushland to the site, nor have any been recorded in roadkill data for the Wakehurst Parkway. It is unlikely Eastern Grey Kangaroos would utilise the underpasses as they are not considered present in surrounding habitats.

B4.9.4 Dimensions of fauna underpasses and dry passage

Issue raised

The height, width and length of the underpass structures should be appropriate for all species that would potentially use the underpasses. The Queensland *Fauna Sensitive Road Design Manual Volume 2* states 3 metre x 3 metre box culverts are generally considered suitable to accommodate a wide variety of terrestrial fauna species (including macropods, Koalas and flightless birds) but to encourage the passage of a variety of small to large fauna species, a minimum vertical clearance of three to five metres is considered necessary (Chapter 6, pages 43-44 of the manual).

The submissions report should clarify if large terrestrial mammals are intended to use the raised bench for dry passage. Details are required on the height of the raised bench and whether the underpass height is adequate to incorporate the raised bench plus allow for the dry passage of large terrestrial mammals. The Queensland *Fauna Sensitive Road Design Manual Volume 2* states for macropods “dry passage at all times within the culvert must be provided” (Chapter 6, page 45) and “koalas require a dry passage” (Chapter 6, page 44).

Response

As noted in the response above in Section B4.9.2, further development of the design has resulted in refinements to the proposed fauna underpass design for the project. The design refinements have allowed for further optimisation of two structures to increase their functionality as fauna underpasses. Further information is provided in Section A4.4.

A summary of the proposed refined fauna underpasses is included below in Table B4-6 and Figure B4-3 to Figure B4-5 of this submission report. The final dimensions of the underpasses would be confirmed during further design development in accordance with revised environmental

management measure B2 (refer to Table D2-1 of this submissions report). It is noted that following the exhibition of the environmental impact statement and as part of the ongoing design development, the chainages used for the project have been amended to ensure consistency throughout the project. For reference, both the current design chainage and the environmental impact statement chainage has been included in Table B4-6 below.

Table B4-6 Proposed refined fauna underpass type, location, and dimensions

Revised design chainage	Environmental impact statement chainage	Location	Fauna underpass type	Indicative dimensions and specifications
Ch 10970	**Ch 2915** (was 2925)	About **715 m** (was 725 m) north of Kirkwood Street	Combined drainage/fauna	• **2.4 m** (was 1.8m) high x 3 m wide x 35 m long • Ledge or similar for dry fauna passage
Ch 11290	Ch 3230	About 1000 m north of Kirkwood Street	Combined drainage/fauna	• 1.8 m high x 3 m wide x 45 m long • Ledge or similar for dry fauna passage
Ch 12475	**Ch 4405** (was 4390)	About **605 m** (was 620) south of Aquatic Drive	**Dedicated** (was combined drainage/fauna)	• 2.4 m high x 3m wide x 28 m long

Note: Changes from the environmental impact statement are indicated in bold text and grey shading within the table

The need for dry passage in combined drainage/fauna underpasses is discussed in Section 5.4.4 of Appendix S (Technical working paper: Biodiversity development assessment report) and is a requirement of the *Wildlife Connectivity Guidelines: Managing Wildlife Connectivity of Road Projects* (Draft) (Roads and Maritime Services, 2011c).

The requirements for dry passage outlined in Section 5.4.4 of Appendix S (Technical working paper: Biodiversity development assessment report) noted that combined drainage/fauna underpasses would be designed to be dry in a 1 in 10-year Average Recurrence Interval (ARI) storm event. However, following further design investigation as part of this submissions report and consultation with project teams from Pacific Highway upgrade projects, the dry passage criteria for the combined drainage/fauna underpasses has been refined to be:

- Must provide dry fauna passage during a one in 1-year ARI three-day storm event, or must not have wet sections that retain water for longer than three days
- Include a dry ledge or similar with a minimum ledge width of 1.2 metres.

The above dry passage criteria are consistent with recent Pacific Highway upgrade projects including Woolgoolga to Ballina. In addition, it is anticipated that the combined drainage/fauna underpasses would be dry most of the time as the structure is located in a drainage line that experiences ephemeral flows only.

The height of the dry ledge in the combined drainage/fauna underpasses would be determined during further design development carried out in accordance with revised environmental management measure B2 (refer to Table D2-1 of this submissions report) and would be subject to detailed drainage and hydrological design. However, it is anticipated the dry ledge would be adequate to allow use by the Swamp Wallaby as the largest species likely to use the proposed fauna underpasses.

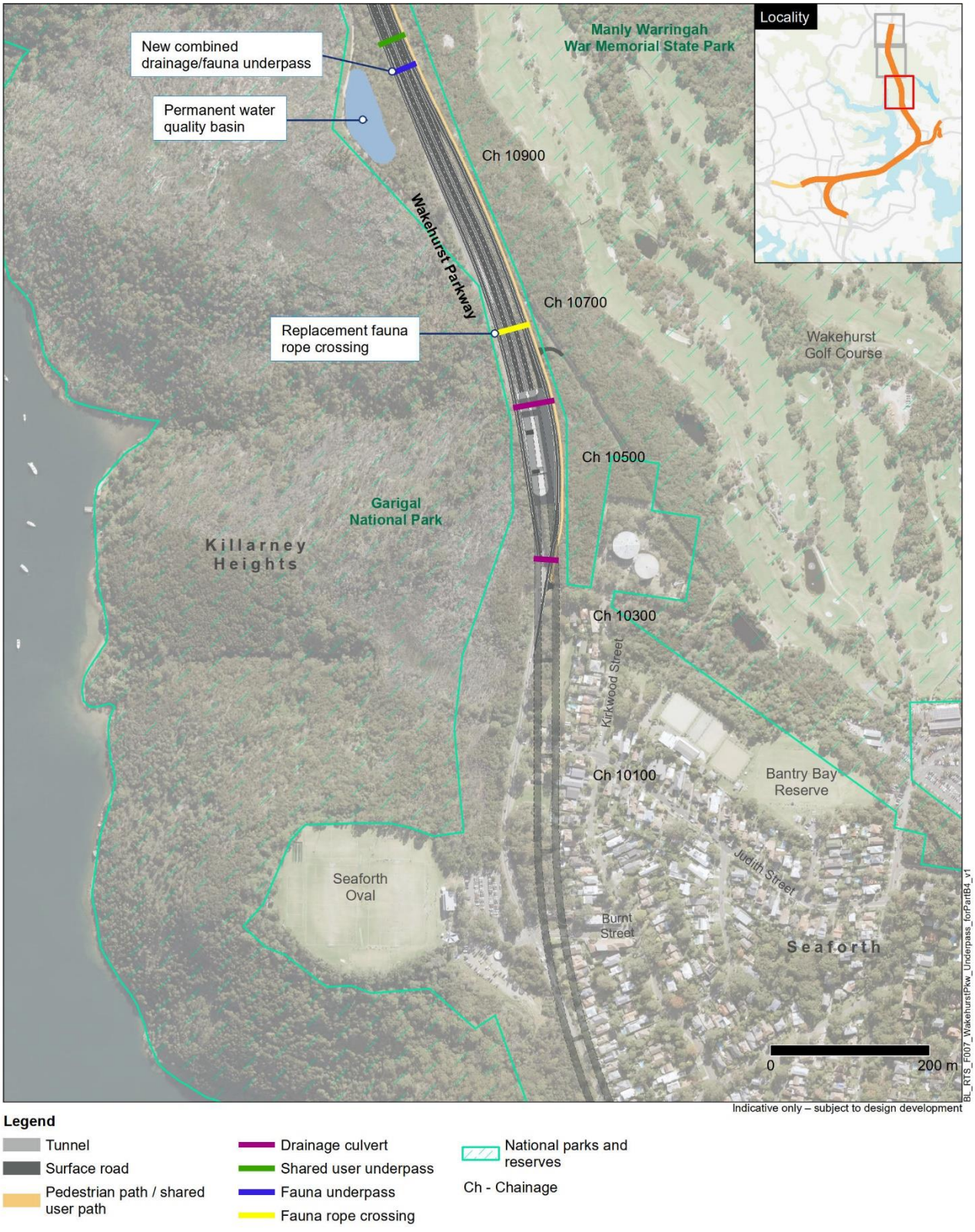


Figure B4-3 Refined fauna crossings, drainage culverts and shared user underpasses at Wakehurst Parkway (map 1)

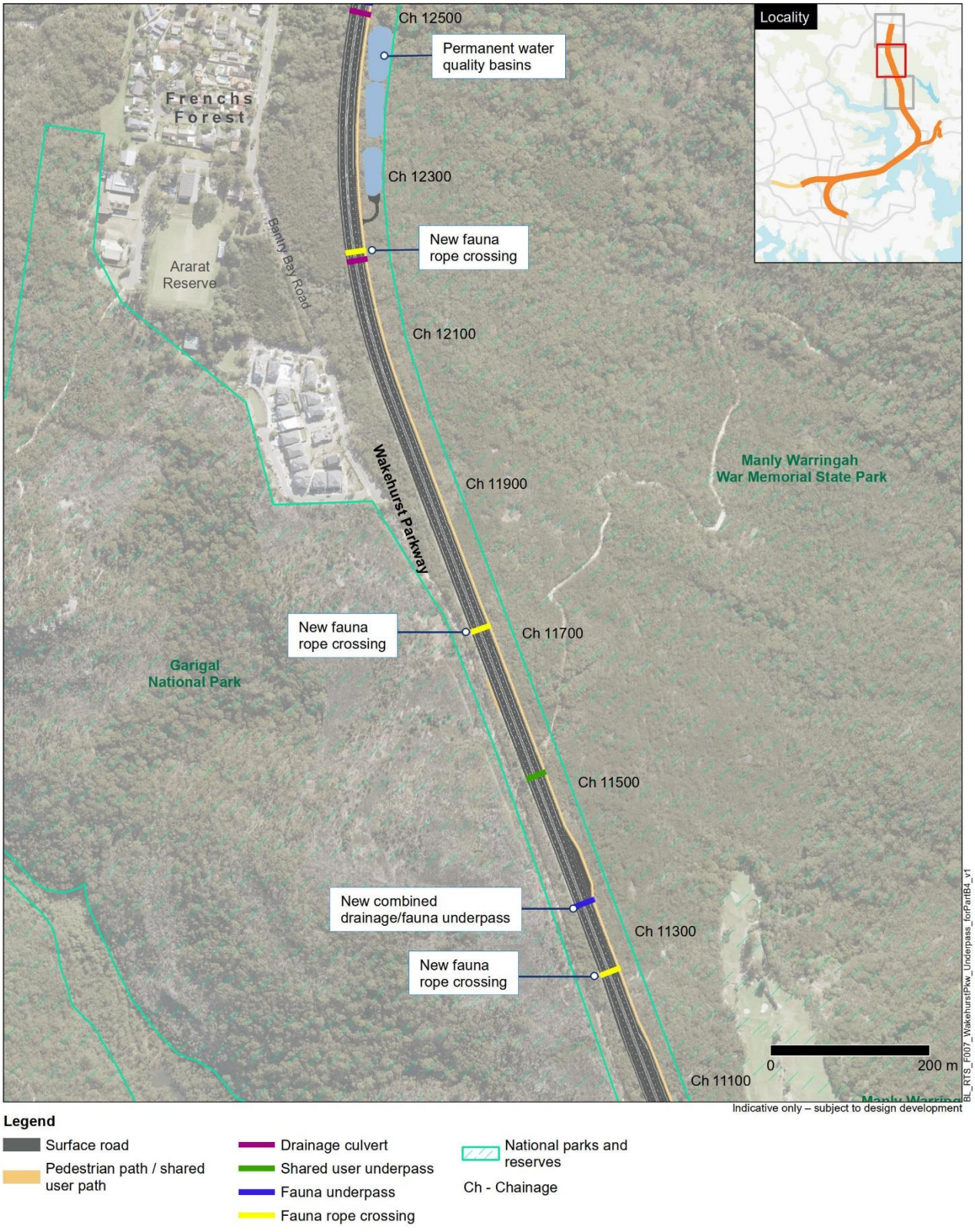


Figure B4-4 Refined fauna crossings, drainage culverts and shared user underpasses at Wakehurst Parkway (map 2)

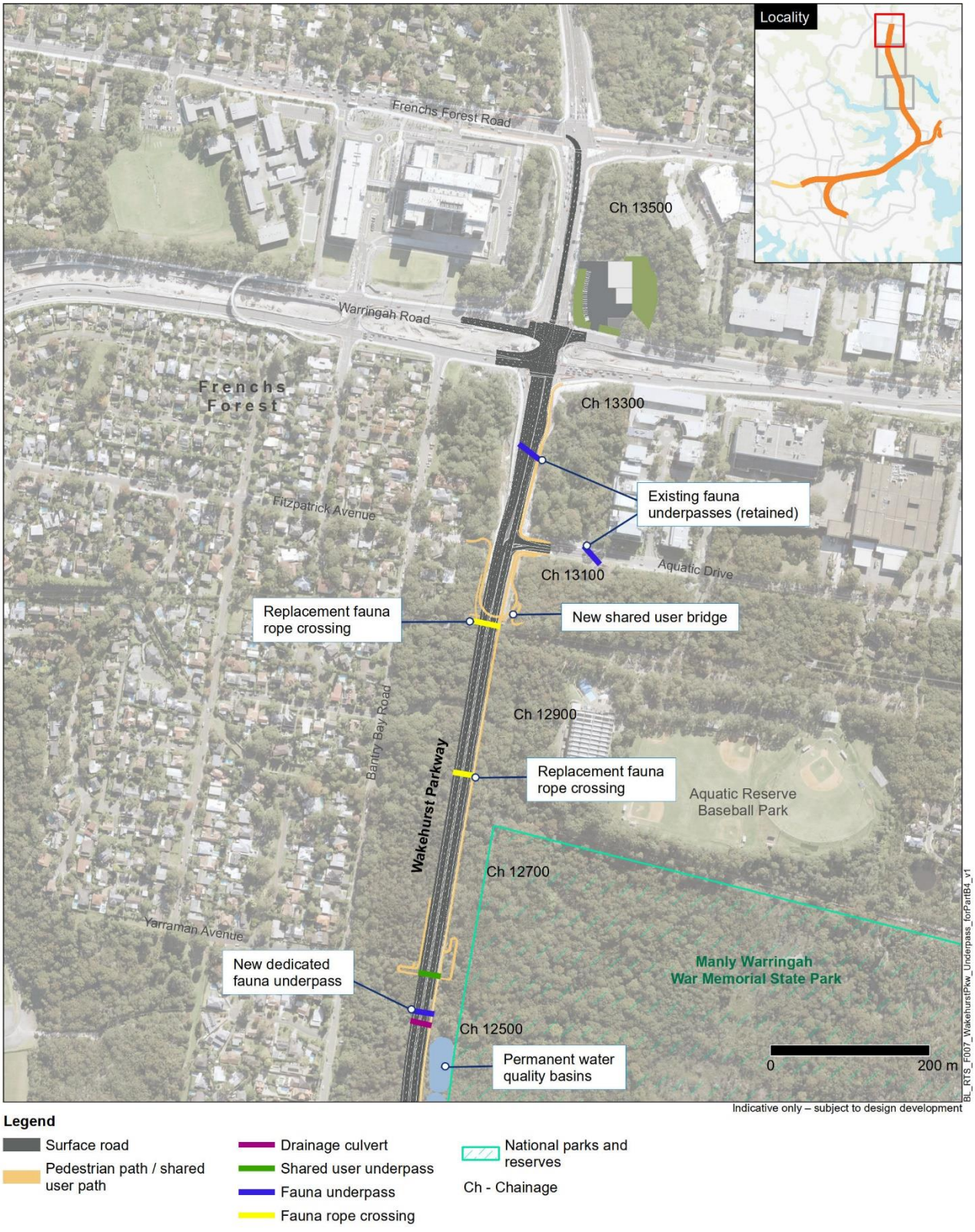


Figure B4-5 Refined fauna crossings, drainage culverts and shared user underpasses at Wakehurst Parkway (map 3)

B4.9.5 Length of fauna underpasses

Issue raised

The submissions report needs to include details on the proposed length of the underpasses and evidence of known use of such underpasses of these lengths by native fauna.

Response

The indicative lengths of the proposed new fauna underpasses are provided above in Table B4-6 above. Discussion on the adequacy of the proposed fauna underpasses (including adequacy of indicative lengths) is provided in Section B4.7.1, considering results of other monitoring programs from other projects which demonstrate use of fauna underpasses by native fauna.

B4.9.6 Design of fauna underpasses

Issue raised

The environmental impact statement includes an example of a fauna underpass (see Figure 6-22 of the environmental impact statement). Environment, Energy and Science Group considers additional fauna habitat needs to be included in and around the fauna underpass to make it more fauna friendly for multiple species including arboreal mammals, invertebrates, reptiles and amphibians. The fauna underpass shown in Figure 6-22 of the environmental impact statement could be improved by including for example:

- An earth floor/'natural floors'
- The placement of logs, rocks, leaf litter on the floor of the underpass for ground-dwelling species refuge
- Enough space for larger animals to pass through the underpass
- The openings should lead directly into habitat (not concrete), ie revegetate the entrances to the underpass/culvert crossings with suitable habitat including palatable vegetation.

The underpass entrances should lead to natural habitat on both sides and fauna should have the ability to view habitat on the other side of the road from the culvert entrances (Queensland Fauna Sensitive Road Design - Chapter 6 of Vol 2, page 45).

Response

The recommendations from Environment, Energy and Science Group in Figure 6-22 of the environment impact statement are noted. It should be noted that Figure 6-22 was included for illustrative purposes to assist the community and stakeholders understand what a typical fauna underpass could look like.

As previously discussed, the connectivity measures will consider measures to facilitate the crossing of native fauna species including the Eastern Pygmy-possum, Red-crowned Toadlet, Southern Brown Bandicoot and Rosenberg's Goanna), in accordance with revised environmental management measure B2 (refer to Table D2-1 of this submissions report). This would include appropriate substrate and fauna furniture considerations. It is also noted that the Connectivity measures will be designed during further design development in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c). The guidelines include discussion regarding the provision of timber railings (fauna furniture).

Further discussion on landscaping treatments, including fauna furniture, is provided in Section B4.9.7 below.

B4.9.7 Fauna underpass landscaping treatments

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) states "landscaping near the fauna underpasses would be integral to their effectiveness and use by fauna species. Planting of trees and shrubs at fauna underpass approaches would provide connectivity between underpasses and adjacent fauna habitat that has been retained within the subject land. Consideration should be given to planting of feed species for target species, such as banksias for Eastern Pygmy-possum outside of any fauna fencing. Landscaping treatments within underpasses could include the placement of mulch or gravel, rocks and ground timber that offer protection and refuge to some fauna species" (page 222).

The addition of an earth floor is necessary to assist wildlife use of the underpass structures. According to the Queensland *Fauna Sensitive Road Design Manual Volume 2* amphibians are unlikely to pass through culverts with a concrete base (Chapter 6, page 39). There is a need to account for the inclusion of an earth floor when calculating the appropriate height of the underpass and details needs to be provided how an earth floor will be included if the underpasses are also to be designed to convey surface water flows.

It is recommended the response to submissions includes details on the fauna habitat/fauna furniture that is to be placed within the culverts and near the underpass entrances to facilitate fauna movement for each native fauna species that may potentially use the underpasses.

Response

Specifications of fauna underpasses would be refined during further design development, and will be designed in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) as outlined in revised environmental management measure B2 (refer to Table D2-1 of this submissions report). Connectivity measures will consider measures to facilitate the crossing of native fauna species including the Eastern Pygmy-possum, Red-crowned Toadlet, Southern Brown Bandicoot and Rosenberg's Goanna).

Two of the proposed fauna underpasses are combined drainage/fauna underpass structures as discussed in Table B4-6 and need to also convey runoff as part of the project's drainage design. As such, providing an earth floor as proposed by Environment, Energy and Science Group is not feasible for those underpasses. However, it is likely that sediment and leaf litter would naturally accrete during operation of the project with levels fluctuating based on intensity of the runoff flow. Discussion on the inclusion of a raised bench within the fauna underpasses to facilitate dry passage is discussed in Section B4.9.4 above. Monitoring of fauna underpasses on Pacific Highway upgrade projects for amphibian use has identified frogs using combined drainage/fauna underpasses on the Frederickton to Eungai Pacific Highway upgrade project (Niche Environment and Heritage, 2020) with most records of frogs using box culverts being associated with wet conditions (Sandpiper Ecological Surveys, 2016).

The dedicated fauna underpass at chainage 12475 would be designed to achieve dry passage which would include a natural substrate, such as soil or mulch, as a base consistent with recommendation within the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) (refer to refer to Table D2-1 of this submissions report). Sandy loam would be preferred if soil is to be used to prevent the generation of a mud substrate.

The use of timber railings (or fauna furniture) is discussed within *Wildlife Connectivity Guidelines: Managing Wildlife Connectivity of Road Projects* (Draft) (Roads and Maritime Services, 2011c) and would facilitate the use of the underpass by targeted arboreal fauna detailed in Section B4.8 above.

It should be noted that fauna furniture would be more readily applied to the dedicated structure at chainage 12475; the two combined drainage/fauna underpasses would only include fauna furniture where it wouldn't affect the hydrological performance. As discussed above, specifications of fauna underpasses would be refined during further design development. This would include detailing what fauna furniture would be included.

Landscaping to increase the use of the underpasses by fauna species would be provided at the approaches to fauna underpasses to increase effectiveness as noted by Environment, Energy and Science Group and described in Section 5.4.4 of Appendix S (Technical working paper: Biodiversity development assessment report). The landscaping treatments (ie tree and shrub species) to be planted nearby the fauna underpasses will be documented in the urban design and landscape plan that will be developed for the project in accordance with environmental management measure V1 (refer to Table D2-1 of this submissions report).

B4.9.8 Incorporation of appropriate fauna habitat/fauna furniture within fauna underpasses

Issue raised

A condition of approval should be included which requires the underpasses to incorporate appropriate fauna habitat/fauna furniture within the culverts and near the entrance to the underpasses to facilitate fauna movement:

- The fauna underpasses must incorporate appropriate fauna habitat/fauna furniture within the culverts and near the underpass entrances to facilitate fauna movement for all native species (threatened and no threatened) that will potentially use the underpasses.

Response

The recommendation from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Connectivity measures will be designed during further design development in accordance with the *Wildlife Connectivity Guidelines: Managing Wildlife Connectivity of Road Projects* (Draft) (Roads and Maritime Services, 2011c) and consider measures to facilitate the crossing of native fauna species including the Eastern Pygmy-possum, Red-crowned Toadlet, Southern Brown Bandicoot and Rosenberg's Goanna, as outlined in revised environmental management measure B2 (refer to Table D2-1 of this submissions report). The *Wildlife Connectivity Guidelines: Managing Wildlife Connectivity of Road Projects* (Draft) (Roads and Maritime Services, 2011c) considers the provision of fauna furniture, as discussed in the response above in Section B4.9.7 above.

B4.10 Culverts for drainage purposes

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) indicates in addition to the specific fauna-crossing structures, a number of culverts would be constructed for drainage purposes and these may offer opportunities for smaller fauna species to cross beneath Wakehurst Parkway. It indicates these culverts do not specifically provide for fauna passage and may be inundated following rain but smaller terrestrial mammals, reptiles and amphibians may use these culverts on occasion (page 222). Details are required on the number of drainage culverts that are proposed to be installed and their height and width. A plan showing their location and the proposed fauna crossings would be useful.

The submissions report needs to clarify whether fauna furniture will be included in the drainage culverts to assist fauna passage and address whether any existing culverts of a similar height, width and length are known to facilitate fauna passage. The use of the drainage culverts by native fauna cannot be relied on and should not be considered as a mitigation measure to assist with fauna connectivity.

Response

Drainage culverts for the upgrade and realignment of Wakehurst Parkway typically range in size from 300 millimetres to 1200 millimetres diameter pipe culverts ranging in length between 30 to 50 metres. Larger existing pipe culverts constructed as part of the Northern Beaches Hospital road upgrade project on the Wakehurst Parkway would be retained as part of the project and are 750 millimetres in diameter.

It is also noted that three shared user underpasses are also proposed along Wakehurst Parkway as part of the project and are 3.6 metres wide by 2.7 metres high and range in length between 40 to 50 metres.

The location of the drainage culverts and the shared user underpasses along the Wakehurst Parkway are shown on Figure B4-3 to Figure B4-5 above. As they are not designed specifically for fauna connectivity, they would not include fauna furniture or any other feature to encourage fauna use. Notwithstanding, drainage culverts and shared user underpasses could be utilised by a range of fauna species for incidental crossings. As discussed in Section B4.7.1 above, there is evidence of a range of fauna species utilising similar-sized culverts on other Transport for NSW projects.

The proposed fauna underpasses and rope canopy bridges are considered adequate in number and type to facilitate fauna crossings for target species and would be designed to encourage their use irrespective of other proposed drainage and shared user underpass structures delivered by the project.

B4.11 Fauna fencing

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) indicates the Red-crowned Toadlet and Eastern Pygmy Possum are 'Threatened fauna species at highest risk of injury or mortality' during vegetation clearing and other construction activities and it refers to vehicle strike (Section 5.1.4 of Appendix S (Technical working paper: Biodiversity development assessment report) and Section 19.5.2 of the environmental impact statement). The submissions report needs to clarify if:

- Vehicle strike is also an issue for the Red-crowned Toadlet during the operation of the project
- The Red-crowned Toadlet and Eastern Pygmy Possum would be at highest risk of injury or mortality due to vehicle strike during the operation of the project.

If the fauna exclusion fencing, underpass guidance fencing and also the underpass structures are to be designed to target the Red-crowned Toadlet and Eastern Pygmy Possum, these small and specialised fauna would require considerable species-specific engineering solutions and a condition of approval should be included to this effect. Neither the Red-crowned Toadlet nor Eastern Pygmy Possum would respond to a standard chain-mail flop-top fence.

Response

A review of road strike data in the Northern Beaches local government area found Eastern Pygmy-possum recorded on the roadside of the Wakehurst Parkway, with an additional sighting as roadkill

on Morgan Road, Belrose and another in the residential area of Powderworks Road in Elanora Heights beneath the Warriewood Escarpment (SMEC, 2011). As such, this species is at risk of road strike during operation of the project.

The Red-crowned Toadlet is a slow-moving species that is unlikely to be able to evade vehicles quickly as noted in Table 5.18 of Appendix S (Technical working paper: Biodiversity development assessment report). It has a home range of around 50 metres from potential breeding habitat, though also thought to disperse outside the breeding season for distances greater than 100 metres (NSW DPIE (EES), 2017b). Potential habitat for the species is within 50 metres of the project on Wakehurst Parkway. A review of road strike records (wildlifemapping.org/views/data and SMEC, 2011) and BioNet records found only one road strike record of the species within NSW. This record was from Lisarow, on the Central Coast in 1998. Despite the low incidence of road strike, the species is likely difficult to detect during any survey of road strike or opportunistically (Santos, Carvalho and Mira, 2011). Due to proximity of potential habitat to the project it is assumed that it could be subject to road strike during operation of the project despite difficulties understanding the risk level of road strike. The project would include measures to minimise risk of road strike of Red-crowned Toadlet in the vicinity of potential breeding/dispersal habitat.

The recommendation from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Fauna exclusion fencing will be designed to exclude small fauna species from the road corridor in accordance with revised environmental management measure B3 (refer to Table D2-1 of this submissions report), with design to be finalised during further design development and based on best available knowledge from other Transport for NSW projects. This will include consideration of excluding small fauna species such as the Eastern Pygmy-possum and the Red-crowned Toadlet, as follows:

> Fauna exclusion fencing ~~**would**~~ **will** be designed to exclude small fauna species from the road corridor**,** such as Eastern Pygmy-possum**,** and will be installed for the full extent of the Wakehurst Parkway within the construction footprint. **In addition, frog fencing will be added to the fauna exclusion fencing within identified Red-crowned toadlet habitat.** The design specifications of the fauna exclusion fence will be developed during further design development including the need for access gates to manage any fauna on the **road side** ~~**roadside**~~ of the fauna exclusion fence based on best available knowledge from other Transport for NSW projects**, and in consultation with NSW National Parks and Wildlife Service and Northern Beaches Council**.

Frog fence design examples targeting Green-thighed Frog (*Litoria brevipalmata*) and Wallum Sedge Frog (*Litoria olongburenisis*) from recent Pacific Highway upgrade projects could be applicable for use in managing Red-crowned Toadlet, and would be considered during further design development. These designs include neoprene rubber sheeting with a length of pressed steel or aluminium attached horizontally at the top of the rubber. The rubber sheeting extends flat on the ground on the habitat side of the frog fencing and the lip of the pressed steel or aluminium is located on the habitat side of the frog fencing. Frog fences are typically installed as close as possible to the road and located between the road and associated drainage. Rubber sheeting is black or a similar dark colour to be less visible and blend into the surrounding environment.

Specifications for Brush-tailed Phascogale (*Phascogale tapoatafa*) fencing, similar to that previously employed on the Oxley Highway to Kempsey Pacific Highway upgrade project could be utilised for Eastern Pygmy-possum. Phascogale fencing is attached to standard fauna exclusion fencing at the base and includes a vermin proof mesh installed at ground and running up the fence. A steel or

aluminium sheet is also included to the top of the fauna exclusion fence to deter climbing. As noted above, the design specifications of the fauna exclusion fence will be developed during further design development.

B4.12 Underpass guidance fencing

B4.12.1 Fauna exclusion fencing and underpass guidance fencing

Issue raised

It is assumed the environmental impact statement uses the term “fauna exclusion fencing” to imply “underpass guidance fencing”, but the two should be considered specifically. The latter has a different purpose and often requires significantly different design, materials, etc. For guidance fencing Transport for NSW needs to provide a scaled diagram of the alignment which identifies where the fence is proposed and where it is proposed to end – the fencing should not push wildlife into a new roadkill hotspot. Also, the fencing design needs to address how it links to the underpass structures. Fencing above the underpass is not useful in directing animals into the underpass. Instead, guidance fencing is required which links with the wall base of the culvert structure, so that the native fauna move seamlessly into the crossing structure.

Response

The aim of fauna exclusion fencing is to prevent road strike and funnel fauna through the proposed fauna underpasses. As discussed in Section B4.7.1 above, there is evidence to suggest fauna exclusion fencing on other Transport for NSW projects funnel fauna through underpasses and exclude fauna from the road, thereby preventing road strike. Fauna exclusion fencing is proposed along the length of the Wakehurst Parkway, tying into the existing fauna exclusion fencing for the Northern Beaches Hospital road upgrade project to the north and ending before Seaforth Oval and Kirkwood Street to the southwest and southeast, respectively.

The design specifications of the fauna exclusion fence will be developed during further design development in accordance with revised environmental management measure B3 (refer to Table D2-1 of this submissions report) based on best available knowledge from other Transport for NSW projects (eg Pacific Highway upgrade projects). In addition, to minimise impacts to fauna during construction of project in the vicinity of the fauna fencing installed as part of the Northern Beaches Hospital road upgrade project, new environmental management measure B39 (refer to Table D2-1 of this submissions report) has been developed:

> Removal of the existing fauna fencing installed as part of the Northern Beaches Hospital road upgrade project will be avoided where possible in overlapping construction areas. Where this is not possible, temporary fauna fencing will be installed during construction to ensure fauna are guided to existing underpasses and away from construction areas and/or live traffic.

In developing the design specifications of the fauna exclusion fence, further design development would include integrating fauna crossing structures with fauna exclusion fencing to guide animals towards the crossing structures and prevent access to the road. Retaining walls may be used as a barrier if they are of sufficient height and designed to avoid animals climbing the wall. In addition, at the ends of the fauna exclusion fencing, a ‘return area’ would be provided to guide animals back into habitat rather than onto the road.

The recommendation by Environment, Energy and Science Group that fencing is required to link with the wall base of the culvert structure, so that the native fauna move seamlessly into the crossing structure is not supported. The design of culvert wingwalls would typically not facilitate standard fauna exclusion fence design to tie into the fauna underpass structure. Culvert wingwalls taper as they extend from the culvert and tying a standard fauna exclusion fence into this would

conflict with the purpose of the exclusion fence and could allow animals to enter the road corridor. As such, fauna exclusion fencing is typically extended over the culvert headwall.

B4.12.2 Fire fighter access through fauna fencing and fauna escape routes in case of fire

Issue raised

The National Parks and Wildlife Service identified that the fauna fencing would need to consider fire fighter access with a lockable pedestrian gate every 100 metres so that fire fighters could establish escape routes for this area during fire operations.

The project should address whether the proposed crossing structures provide an adequate escape route for native fauna to prevent native fauna being trapped by the fence during a fire and whether enough crossings and spacing between the crossings has been provided.

Response

Discussion on the firefighting requirements and involvement of NSW National Parks and Wildlife Service in the design of the fauna exclusion fencing is provided in Section B4.24.7 of this submissions report. Fauna exclusion fencing specifications would be developed during further design development in consultation with NSW National Parks and Wildlife Service, in accordance with revised environmental management measure B3 (refer to Table D2-1 of this submissions report).

The proposed fauna underpasses would provide escape routes for fauna in the event of a fire. In addition, the three shared user underpasses discussed in Section B4.10 would also offer an alternative escape route in the event of a fire. Given the above and their location along Wakehurst Parkway (refer to Figure B4-3 to Figure B4-5 above), it is considered that there is sufficient spacing to maximise the opportunity for fauna to escape a fire.

B4.13 Fauna rope canopy bridges

B4.13.1 Number of new and replacement fauna rope canopy crossings

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) states “three new rope bridges would be provided to facilitate the safe crossing of arboreal fauna above the road and three existing rope bridges would be replaced to allow for the widened road as part of the project” (page 221). It is unclear if the proposed replacement of the three existing fauna rope canopy bridges would be in addition to the three new proposed rope crossings canopy bridges (ie would the project result in six rope bridge crossings in total). The submissions report needs to confirm this.

Response

New and replacement fauna crossings at the Wakehurst Parkway are described in Chapter 5 (Project description) of the environmental impact statement (refer to Section 5.2.11 and Table 5-10). Three new rope canopy crossing structures are proposed as part of the project in addition to the project replacing three existing structures. Details on the rope canopy crossing structures are provided in Table B4-7 below and are shown on Figure 5-7 to Figure 5-9 of the environmental impact statement and Figure 5-5 of Appendix S (Technical working paper: Biodiversity development assessment report), which also identifies the difference between a new and replacement structure. The locations of the rope canopy crossings along with the refined fauna underpasses discussed above in Section B4.9 are also shown on Figure B4-3 to Figure B4-5 of this submissions report.

Table B4-7 New and replacement rope canopy crossing structures at the Wakehurst Parkway

Structure	Number	General location/Comment
New rope crossing structures	3	• Wakehurst Parkway about 910 metres north of Kirkwood Street • Wakehurst Parkway about 1370 metres north of Kirkwood Street • Wakehurst Parkway about 885 metres south of Aquatic Drive.
Replacement of existing rope crossing structures	3	• Wakehurst Parkway about 330 metres north of Kirkwood Street • Wakehurst Parkway about 110 metres south of Aquatic Drive – provided as part of Northern Beaches Hospital road upgrade project • Wakehurst Parkway about 200 metres south of Aquatic Drive – provided as part of Northern Beaches Hospital road upgrade project.

B4.13.2 Selection of fauna rope crossing locations

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) indicates the rope crossing locations would also be refined during further design development and microsited for optimum usage by fauna. The submissions report needs to clarify if the selected locations for the crossings are based on existing road kill data, monitoring data, suitable habitat availability for target species etc. The submissions report should provide details on this and whether three new rope bridges is an adequate number of crossings and whether the distance between the crossings is appropriate.

Response

As discussed in the response above, three existing rope crossings would be replaced and lengthened to accommodate the widened road and three additional rope crossings would be installed as part of the project. This totals six rope crossings over a length of about three kilometres of the upgraded and realigned Wakehurst Parkway. The new and replacement rope crossings range from about 135 metres to 650 metres apart along the alignment, averaging 465 metres.

Arboreal fauna roadkill species have been recorded across the entire length of the Wakehurst Parkway within the subject land (construction footprint) with no obvious clusters evident (refer to Figure B4-1). The most commonly recorded arboreal roadkill species on Wakehurst Parkway are Common Brushtail and Ringtail Possums (SMEC, 2015; AMBS, 2006). The targeted native species for rope bridges include Eastern Pygmy-possum, Common Brushtail Possum, Common Ringtail Possum, Sugar Glider and Feathertail Glider. Habitat for these species is present adjacent to the entire length of Wakehurst Parkway within the subject land (construction footprint) and most of these species have been recorded adjacent to Wakehurst Parkway or in connected bushland either side (NSW DPIE (EES), 2017a).

Proposed new rope crossing locations have considered:

- The even spread of roadkill recorded along Wakehurst Parkway

- The occurrence/distribution of target species and species habitat adjacent to Wakehurst Parkway
- The need to provide sufficient coverage of the full length of the upgraded and realigned section of Wakehurst Parkway
- Design and engineering constraints such as road alignment and topography
- Location of existing rope crossing locations.

Other Transport for NSW road upgrade projects typically space rope crossings further apart than the proposed spacing for the project. For example, rope crossings on the 25.8 kilometre Frederickton to Eungai Pacific Highway upgrade contained three rope crossings, placed 6.6 kilometres and seven kilometres apart. The Woolgoolga to Ballina Pacific Highway upgrade (Woolgoolga to Glenugie – Sections 1 and 2) contained two rope crossings about six kilometres apart. With an average distance between crossings of 465 metres for the project, the density is considered relatively high, and appropriate to enable ample opportunity for arboreal fauna to cross the upgraded and realigned Wakehurst Parkway. As such, Transport for NSW considers that the number of rope crossings provided by the project to be adequate.

Additionally, and as discussed in Section B4.7.1 above, arboreal fauna species are also known to utilise fauna underpasses (Sandpiper Ecological Surveys 2020, Sandpiper Ecological Surveys, 2019). The proposed fauna underpasses as part of the project would be designed with consideration of arboreal fauna species (refer to Section B4.9 above) and would provide additional crossing opportunities along Wakehurst Parkway.

B4.14 Maintenance of underpasses, fencing and rope crossings

B4.14.1 Ongoing maintenance requirements of fauna crossings and fencing

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) states “maintenance of any fencing and underpasses is critical to the efficacy of these measures and would need to be detailed in an Operational Environmental Management Plan or existing Environmental Management System that incorporates the project” (page 221). Details need to be provided on the ongoing maintenance including regular inspection of the fauna exclusion fencing along its entire length, replacement of fauna furniture, removal or replacement of vegetation near the underpass entrances.

Response

The maintenance requirements for fauna crossings and fauna exclusion fencing will be developed during further design development and incorporated into an Operational Environmental Management Plan or existing Environmental Management System as relevant. It is noted that environmental management measure B2 stated maintenance requirements will be developed for underpasses and rope crossings. The omission of fauna exclusion fencing was unintentional and has been included in the revised environmental management measure B2 (refer to Table D2-1 of this submissions report):

> Connectivity measures will be designed during further design development in accordance with the *Wildlife Connectivity Guidelines: Managing Wildlife Connectivity of Road Projects* (Draft) (Roads and Maritime Services, 2011c)**, taking into account best available knowledge** and consider measures to facilitate the crossing of native fauna species including the Eastern Pygmy-possum, Red-crowned Toadlet, Southern Brown Bandicoot and Rosenberg’s Goanna.

Maintenance requirements for ~~**underpasses and rope**~~ **fauna** crossings **and fauna exclusion fencing** will be developed during further design development and incorporated into an Operational Environmental Management Plan or existing Environmental Management System as relevant.

Based on typical maintenance requirements and inspections from other Transport for NSW projects which include similar fauna connectivity measures, it is likely the maintenance requirements for the project would include:

- Routine visual inspections of fauna underpasses and rope canopy crossings annually, following a severe weather event
- Detailed condition assessments of fauna underpasses and rope crossings on a seven to 10 year cycle
- Routine visual inspections of fauna exclusion fencing annually, following a severe weather event or record of roadkill
- Detailed condition assessments of fauna exclusion fencing on a five year cycle.

Where inspections or condition assessments require, maintenance of defects would be carried out as soon as practicable.

Landscaping associated with fauna underpasses would typically be inspected every one to two months for the first twelve months following revegetation increasing to every six months for the second and third year. Any corrective actions identified would be carried out as required.

In addition to above, incidental maintenance observations would be recorded during the proposed ecological monitoring program as detailed in Section B4.15 of this submissions report.

B4.14.2 Responsibility and funding to maintain fauna crossings and fencing

Issue raised

The submissions report needs to identify who would be responsible for maintaining and funding the future maintenance of the underpasses, fencing, rope crossings in perpetuity, and provide details on the funding source. The maintenance of the fauna fencing and fauna crossings in perpetuity should be included as a condition of approval.

Response

The recommendation from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

As described in the response above, maintenance requirements for fauna crossings and fauna exclusion fencing will be developed during further design development and incorporated into an Operational Environmental Management Plan or existing Environmental Management System as relevant, in accordance with revised environmental management measure B2 (refer to Table D2-1 of this submissions report). The road operator would be responsible for maintaining and funding the future maintenance as required.

B4.15 Monitoring

Issue raised

Environment, Energy and Science Group recommends a long-term monitoring program to be carried out to evaluate the effectiveness of the fauna crossings. The monitoring program should be prepared in consultation with Environment, Energy and Science Group, the Greater Sydney Local Land Services and Northern Beaches Council and a condition of consent should be included to this effect.

If monitoring data is not currently available for the existing underpasses and rope crossings, monitoring should commence immediately at the existing crossings to obtain baseline data prior to designing and constructing the proposed fauna crossings.

The monitoring of existing and new crossings should continue during the operation of the crossings and consider:

- Target species
- The duration of monitoring and the frequency
- How effective are the wildlife crossing structures at increasing population viability
- The number of species using the crossings and the rate of their detection
- The local species abundance in the habitat within the vicinity of the crossings
- Photographic monitoring; monitoring of scats, hair and tracks; roadkill data.

The findings of the monitoring should be provided in an annual report to Department of Planning, Industry and Environment, Environment, Energy and Science Group and the Greater Sydney Local Land Services and published in scientific literature and made available online.

Response

An ecological monitoring program would be developed in consultation with Environment, Energy and Science Group and Northern Beaches Council to determine the effectiveness of the proposed fauna connectivity measures and exclusion fencing, as discussed in Section B4.7.2 above. The program would include pre-construction baseline monitoring and construction/post-construction monitoring of targeted fauna species and key performance criteria that trigger the need for corrective actions.

Accordingly, a new environmental management measure B44 has been developed as follows (refer to Table D2-1 of this submissions report):

> Monitoring will occur during pre-construction, construction and post-construction phases of the project to determine the effectiveness of the proposed fauna connectivity measures and exclusion fencing to be provided as part of the project.
>
> Pre-construction baseline monitoring will commence prior to project construction works impacting fauna habitat adjacent to the Wakehurst Parkway and include adequate sampling of threatened and protected targeted fauna species in line with relevant guidelines.
>
> A construction/post-construction ecological monitoring program will be developed prior to construction in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Group) and Northern Beaches Council. The program will include monitoring of targeted fauna species, threatened or protected species, and pest species, in addition to key performance criteria that trigger the need for and feasibility of potential corrective actions. The program will consider the pre-construction baseline monitoring results

and ecological monitoring data collected for the Northern Beaches Hospital road upgrade project where relevant.

Post-construction monitoring will extend for 10 years after the opening of the project.

Environment, Energy and Science Group's recommendation of including consultation with the Greater Sydney Local Land Services is not considered necessary as ecological monitoring would be more relevant to the work of Environment, Energy and Science Group rather than Greater Sydney Local Land Services.

B4.16 Impacts on groundwater dependent ecosystems

B4.16.1 Groundwater dependent ecosystem 'locality'

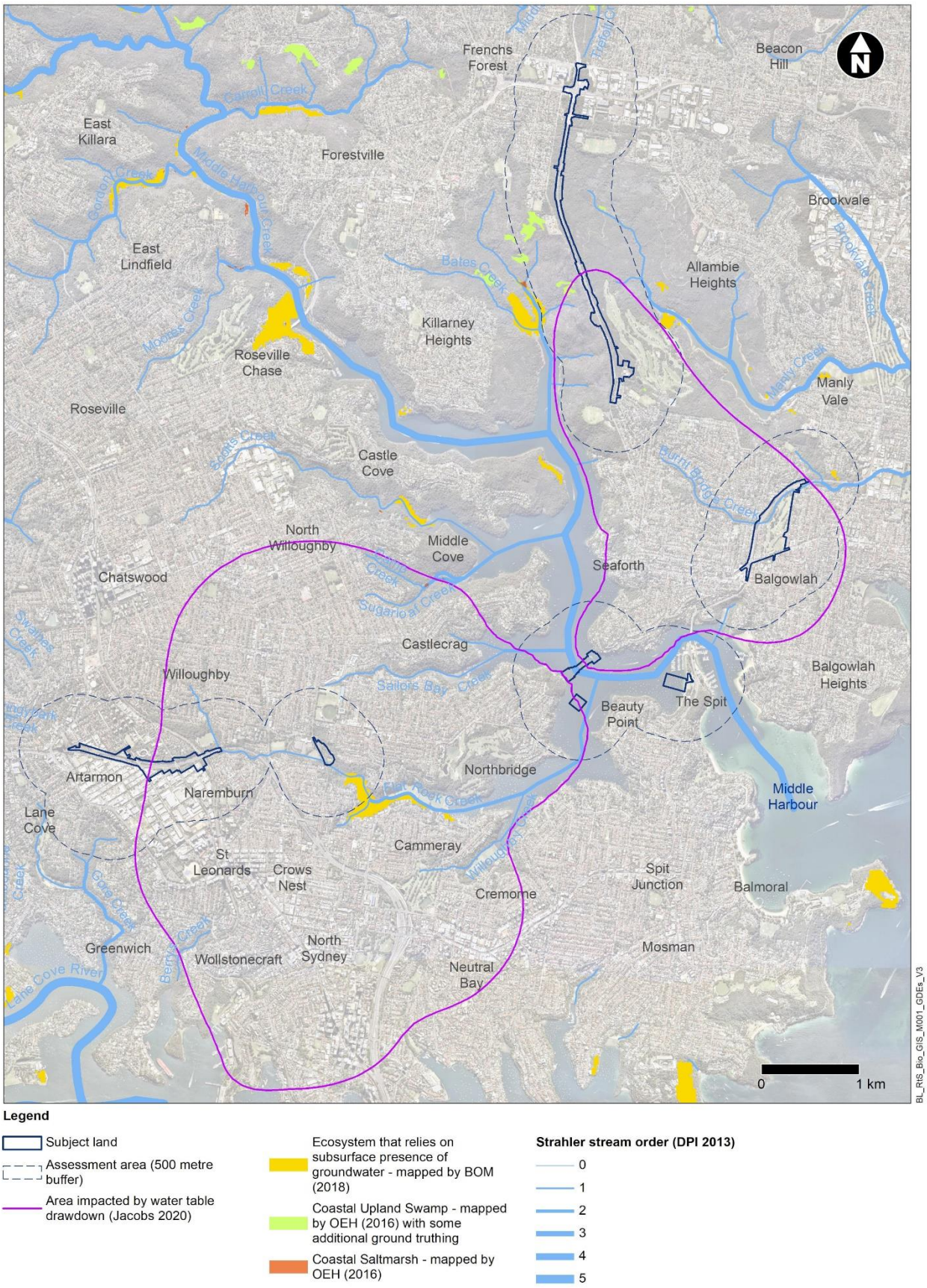
Issue raised

The term "locality" is not defined in Appendix S (Technical working paper: Biodiversity development assessment report), though used throughout in different contexts. It is not explained how the extent of the "locality" was determined for the purposes of identifying groundwater dependent ecosystems that need to be considered for potential impacts of the project.

Response

The term 'locality' is used to describe the assessment area (ie within 500 metres of the subject land). The assessment area used in the biodiversity assessment is defined in Section 2.2.2 and shown in Figure 2-1 of Appendix S (Technical working paper: Biodiversity development assessment report).

However, for the purpose of identifying groundwater dependent ecosystems in Appendix S (Technical working paper: Biodiversity development assessment report), the assessment area/locality not only included all areas within 500 metres of the subject land (construction footprint), but also any additional areas potentially impacted by water table drawdown, based on the drawdown contours included in Section 6.2.2 of Appendix N (Technical working paper: Groundwater). The assessment area/locality for the purposes of the groundwater dependent ecosystems assessment is shown in Figure B4-6 below (which is an updated version of Figure 3-11 from Appendix S (Technical working paper: Biodiversity development assessment report)).



Legend

- Subject land
- Assessment area (500 metre buffer)
- Area impacted by water table drawdown (Jacobs 2020)
- Ecosystem that relies on subsurface presence of groundwater - mapped by BOM (2018)
- Coastal Upland Swamp - mapped by OEH (2016) with some additional ground truthing
- Coastal Saltmarsh - mapped by OEH (2016)

Strahler stream order (DPI 2013)

- 0
- 1
- 2
- 3
- 4
- 5

Figure B4-6 Area of groundwater dependent ecosystem assessment (update to Figure 3-11 of Appendix S (Technical working paper: Biodiversity development assessment report))

B4.16.2 Groundwater dependent ecosystems at Flat Rock Creek Reserve/Munro Reserve

Issue raised

For the Flat Rock Creek Reserve/Munro Reserve, Appendix S (Technical working paper: Biodiversity development assessment report) has omitted to include the following groundwater dependent ecosystems reliant on subsurface presence of groundwater as identified by the Bureau of Meteorology (BOM) (2018): Vegetation classified as Coastal Sandstone Plateau Heath, Estuarine Fringe Forest and Illawarra Gully Wet Forest.

Response

It is acknowledged that the groundwater dependent ecosystems mapped around Flat Rock Creek include small areas of Coastal Sandstone Plateau Heath, Estuarine Fringe Forest and Illawarra Gully Wet Forest. These areas are mapped as very small patches within and along the edges of the larger patches of Coastal Sandstone Gully Forest, Sandstone Riparian Scrub and Coastal Sand Forest mapped at this location as shown in Figure B4-7 below.

As a result of the above, the statement within Section 5.6 of Appendix S (Technical working paper: Biodiversity development assessment report) that states “Other areas mapped as groundwater dependent ecosystems with potential reliance on subsurface groundwater by BOM (2018) are not located within areas of predicted drawdown, and the project would not result in direct or indirect impacts to these areas of vegetation” is incorrect. The assessment discussion and outcomes for Coastal Sandstone Gully Forest, Sandstone Riparian Scrub and Coastal Sand Forest would apply to the small areas of Coastal Sandstone Plateau Heath, Estuarine Fringe Forest and Illawarra Gully Wet Forest. As such, a clarification is included in Table A5-13 of this submissions report.

Further, additional field investigations and groundwater modelling and analysis has been carried out since exhibition of the environmental impact statement, as outlined in Section A5.1.15 of this submissions report. This has included a detailed assessment of impacts on groundwater dependent ecosystems based on the revised groundwater modelling (refer to Annexure B of Appendix E of this submissions report). This detailed assessment has considered the additional small areas of Coastal Sandstone Plateau Heath, Estuarine Fringe Forest and Illawarra Gully Wet Forest. Further information regarding the mapping of and ground truthing of groundwater dependent ecosystems is provided in Section B4.16.3 below.

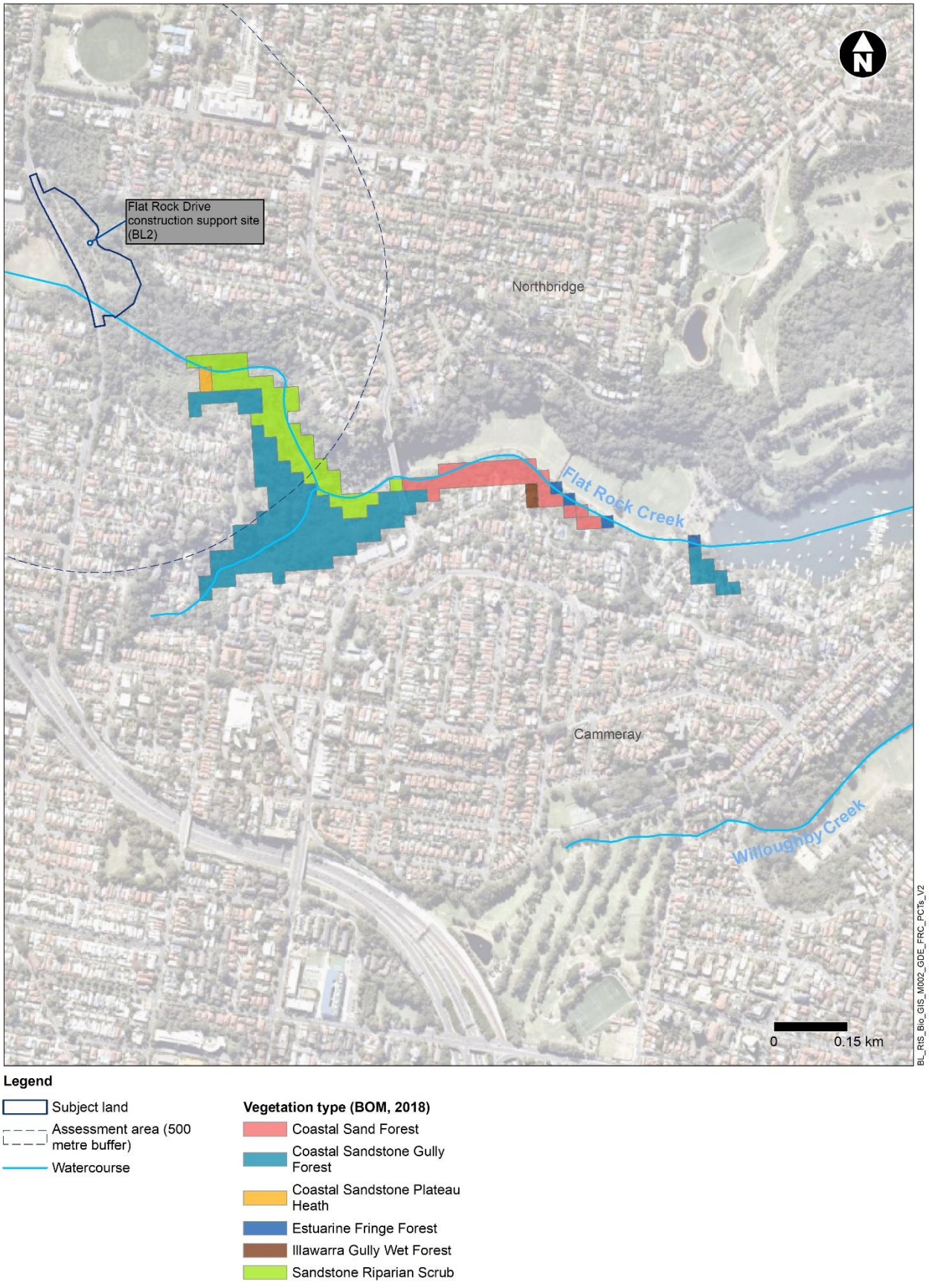


Figure B4-7 Vegetation types of groundwater dependent ecosystems mapped by Bureau of Meteorology (2018) around Flat Rock Creek

B4.16.3 Mapping of groundwater dependent ecosystems

Issue raised

The plant community types (PCTs), and if relevant, Threatened Ecological Communities (TECs), pertaining to the Coastal Sandstone Plateau Heath, Estuarine Fringe Forest and Illawarra Gully Wet Forest groundwater dependent ecosystems at Flat Rock Creek need to be identified, field verified, and their actual extents mapped at a scale at least as large as the PCT maps in Section 3.3 of Appendix S (Technical working paper: Biodiversity development assessment report).

Response

The vegetation mapped as groundwater dependent ecosystems by BOM (2018) around Flat Rock Creek and Quarry Creek was inspected on 16 June 2021 by ecologists. Accessible areas of vegetation were traversed, and eight rapid assessment points were sampled.

The vegetation on the slopes and on top of sandstone cliffs is consistent with PCT 1778: Coastal Sandstone Foreshores Forest, with trees of Blackbutt (*Eucalyptus pilularis*), Smooth-barked Apple (*Angophora costata*) and a midstory of Forest She-oak (*Allocasuarina littoralis*). There are signs of active bush regeneration in most areas of PCT 1778 inspected. The vegetation adjoining Quarry Creek is consistent with PCT 1841 Coastal enriched sandstone moist forest, with a canopy of Blackbutt and a midlayer of Coachwood (*Ceratopetalum apetalum*) and Blackwattle (*Callicoma serratifolia*) with a ferny and mossy ground layer.

The vegetation adjoining Flat Rock Creek at the northern of the area mapped as groundwater dependent ecosystems by BOM (2018) is consistent with PCT 1828 Coastal Sandstone Gallery Rainforest, with a canopy of Coachwood, Blueberry Ash (*Elaeocarpus reticulatus*), Lilly Pilly (*Acmena smithii*) and the exotic species Broad-leaved Privet (*Ligustrum lucidum*). The flats adjoining much of the length of Flat Rock Creek are dominated by exotic species, with Ligustrum spp., Wild Tobacco Bush (*Solanum mauritianum*), Balloon Vine (*Cardiospermum grandiflorum*), Panic Veldt Grass (*Ehrharta erecta*) and Guinea Grass (*Megathyrsus maximus*) all observed to be abundant.

The BOM (2018) mapping of groundwater dependent ecosystems is not representative of the vegetation communities observed within the area. The OEH (2016b) vegetation mapping of the Sydney Metropolitan Catchment Management Authority provides a more accurate representation of the vegetation communities and the extent of disturbance around the mapped groundwater dependent ecosystems; this mapping also corresponds to PCTs in the BioNet Vegetation Information System database.

Figure B4-8 provides mapping of PCTs (OEH, 2016b) and extent of the groundwater dependent ecosystems by BOM (2018) around Flat Rock Creek and Quarry Creek.

While not raised by Environment, Energy and Science Group, for completeness, the areas of Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp TEC) mapped in Garigal National Park to the west of the Wakehurst Parkway section of the subject land were also inspected on 16 June 2021 by ecologists. The area inspected and surrounding areas in Garigal National Park were burnt in 2017, based on review of historical aerial imagery available on Google Earth. The area inspected is characterised by descending sandstone benches and cliffs supporting regenerating shrubland, with a high volume of fallen dead trunks and branches, presumably from fire-killed shrubs. Tree cover and regrowth within the regenerating shrubland appears to be low, although some areas within the area mapped as Coastal Upland Swamp TEC by OEH (2016b) are Eucalypt-dominated heathy forest. Soils are damp and boggy with seepage and minor overland flows observed on the lower benches.

The areas of regenerating shrubland is characterised by a tall shrub layer, mostly comprising dead stems of *Banksia ericifolia*, *Allocasuarina distyla*, and *Hakea teretifolia*; a low shrub layer including *Leptospermum squarrosum*, *Hibbertia linearis*, *Pultenaea tuberculata*, *Platysace linearifolia*, *Epacris microphylla* and *Xanthosia tridentata*; and a ground layer dominated by sedges and herbs, such as *Gonocarpus tetragynus*, *Schoenus apogon*, *Lepyrodia scariosa*, *Empodisma minus*, *Lepidosperma forsythii*, *Entolasia stricta*, and *Actinotus minor*.

The extent of the Coastal Upland Swamp TEC as mapped by OEH (2016b) in the area inspected has been revised following site inspection and aerial photograph interpretation (refer to Figure B4-9). The revised extent is an estimation, given the regenerating stage of the vegetation in this area. The northern patch was not inspected in detail and has not been amended but appears based on aerial photo review to be consistent with a regenerating shrubland structure. It is possible that the boundaries of the Coastal Upland Swamp TEC and adjoining woodland will further shift over time in response to climatic patterns and fire regimes.

To aid stakeholders in understanding updates to the biodiversity assessment which have occurred since the exhibition of the environmental impact statement, and to navigate where this information is included in this submissions report, a clarification has been included in Section A5.1.18 and a Biodiversity development assessment roadmap provided in Appendix F4 of this submissions report. Appendix F5 of this submissions report provides an updated biodiversity assessment to synthesise the updated and supplementary information provided in this submissions report, with Appendix S (Technical working paper: Biodiversity development assessment report).

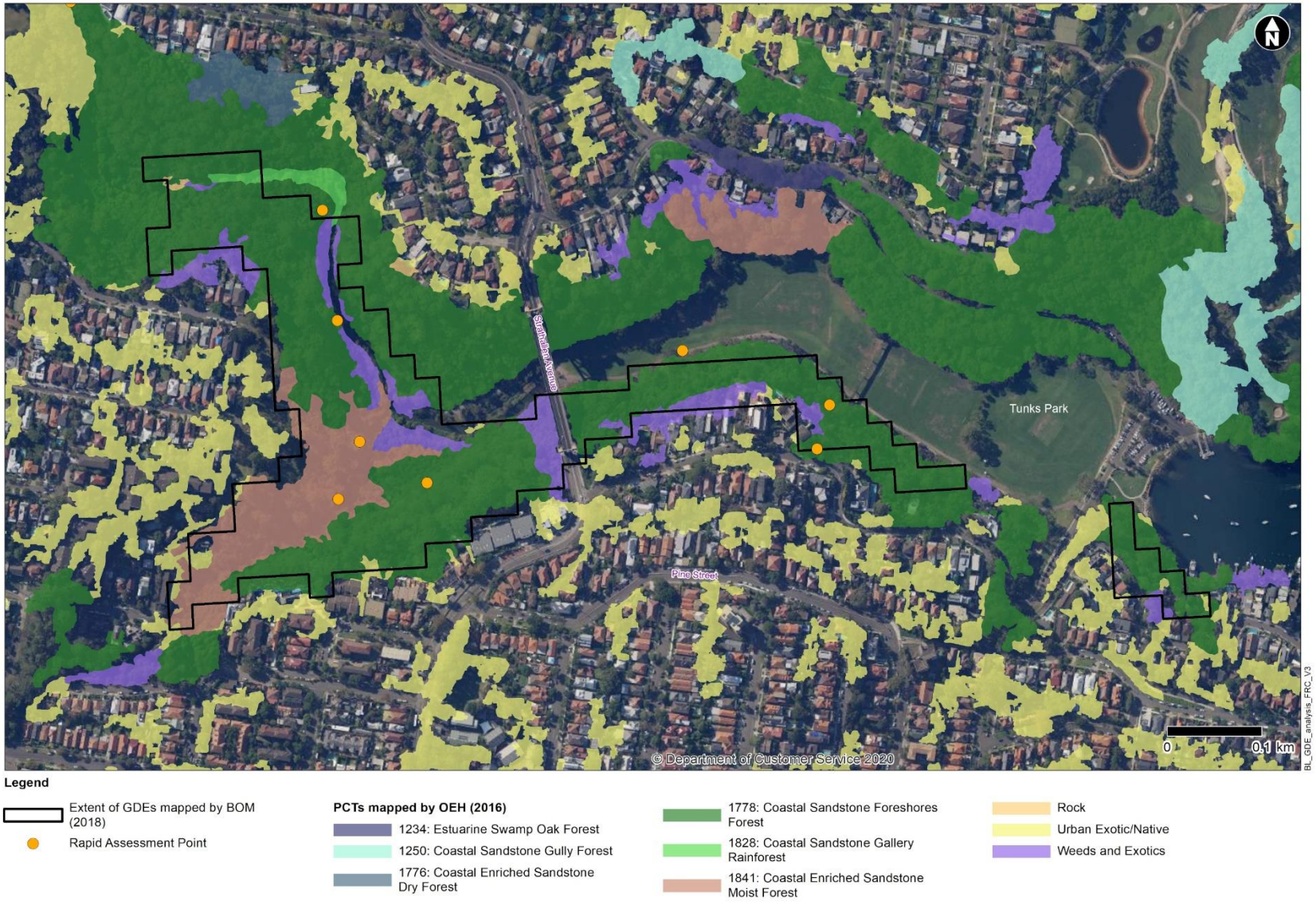


Figure B4-8 Mapping of PCTs (OEH, 2016b) and extent of the groundwater dependent ecosystems by BOM (2018) around Flat Rock Creek and Quarry Creek

Figure B4-9 Revised mapping from OEH (2016b) of the Coastal Upland Swamp TEC west of the Wakehurst Parkway

B4.16.4 High priority groundwater dependent ecosystems

Issue raised

High priority groundwater dependent ecosystems relate specifically to the *Water Sharing Plan for the Greater Sydney Metropolitan Region Groundwater Sources* and list a very limited number of groundwater dependent ecosystems for the purpose of that plan. The absence of such high priority groundwater dependent ecosystems in the locality of the project does not mean that groundwater dependent ecosystems or other water dependent ecosystems of high ecological value do not occur within the impact area.

Response

The methodology used for the assessment of groundwater dependent ecosystems is provided in Section 19.3.4 of the environmental impact assessment and detailed in Section 3.8 of Appendix S (Technical working paper: Biodiversity development assessment report). High priority groundwater dependent ecosystems listed in Appendix 4 of the *Water Sharing Plan for the Greater Sydney Metropolitan Region Groundwater Sources – Background document* (NSW Department of Primary Industries (DPI) (Office of Water), 2011) were reviewed as part of the preparation of Appendix S (Technical working paper: Biodiversity development assessment report) as is standard for the assessment of groundwater dependent ecosystems. However, as noted in Section 3.8 of Appendix S (Technical working paper: Biodiversity development assessment report), the assessment does not assume that only these listed high priority groundwater dependent ecosystems require impact assessment, and also considers other groundwater dependent ecosystems (those mapped by BOM (2018) and Coastal Upland Swamp in the Sydney Basin Bioregion TEC).

B4.16.5 Available spatial information on waterways and water dependent ecosystems

Issue raised

The Bureau of Meteorology 2018 Groundwater Dependent Ecosystem Atlas mapping was the primary source of information used to determine groundwater dependent ecosystems and the locations of groundwater dependent ecosystems. Appendix S (Technical working paper: Biodiversity development assessment report) has not used more recent and more detailed spatial information on waterways and water dependent ecosystems published by Department of Planning, Industry and Environment's Science Division in 2019: 'High Ecological Value Waterways and Water Dependent Ecosystems - GREATER SYDNEY REGION' (available for each individual local government area on SEED via datasets.seed.nsw.gov.au/dataset/hevwater-greater-sydney-region).

Response

As noted by Environment, Energy and Science Group, the assessment of groundwater dependent ecosystems in the environmental impact statement used the *National Atlas of Groundwater Dependent Ecosystems* (BOM, 2018), as described in Section 3.8 of Appendix S (Technical working paper: Biodiversity development assessment report).

The Department of Planning, Industry and Environment's (2019) High Ecological Value Waterways and Water Dependent Ecosystems mapping was specifically developed to assist council's strategic land-use planning functions by identifying high ecological value waterways and water dependent ecosystems, based on definitions, guidelines and policies under the *Environment Protection and Biodiversity Conservation Act 1999*, *Biodiversity Conservation Act 2016*, *Fisheries Management Act 1994* and *Water Management Act 2000*. The assessment carried as part of Appendix S (Technical working paper: Biodiversity development assessment report) also identifies the high ecological

value waterways and water dependent ecosystems using the relevant statutory frameworks and with the benefit of field based assessment to confirm the findings of remotely sensed data.

Notwithstanding, the Department of Planning, Industry and Environment's (2019) High Ecological Value Waterways and Water Dependent Ecosystems mapping for Willoughby and Northern Beaches local government areas was reviewed during preparation of this submissions report. It is noted that the mapping for each area consists of a single layer that combines a number of different datasets. The attachment provided with the Northern Beaches local government area dataset lists 20 different layers, including stream and waterway mapping, groundwater dependent ecosystems (surface and subsurface), water dependent species sightings with a 50 metre buffer applied, coastal wetland and littoral rainforest areas, and water dependent vegetation communities.

The groundwater dependent ecosystems (subsurface) component of the Northern Beaches local government area dataset is based on the *National Atlas of Groundwater Dependent Ecosystems* (BOM, 2018) mapping as well as the Coastal Sands and Sydney Basin groundwater dependent ecosystem layer supplied by Northern Beaches Council that comes from groundwater investigations and assessment made by Water Research Laboratory University of NSW.

The High Ecological Value Waterways and Water Dependent Ecosystems layer overlaps the subject land (construction footprint) as well as the area of modelled water table drawdown. It is likely that this mapping is overly broad to be representative of groundwater dependent ecosystems. Refer to Figure B4-10.

As the High Ecological Value Waterways and Water Dependent Ecosystems mapping also includes the BOM (2018) mapping (used as part of Appendix S (Technical working paper: Biodiversity development assessment report) and is considered to be overly broad and duplicative, further analysis is not considered warranted and unlikely to provide additional value. In addition, during preparation of this submissions report, additional field surveys were carried to verify the extents of groundwater dependent ecosystems around Flat Rock Creek, Quarry Creek and west of the Wakehurst Parkway (refer to response in Section B4.16.3 above).

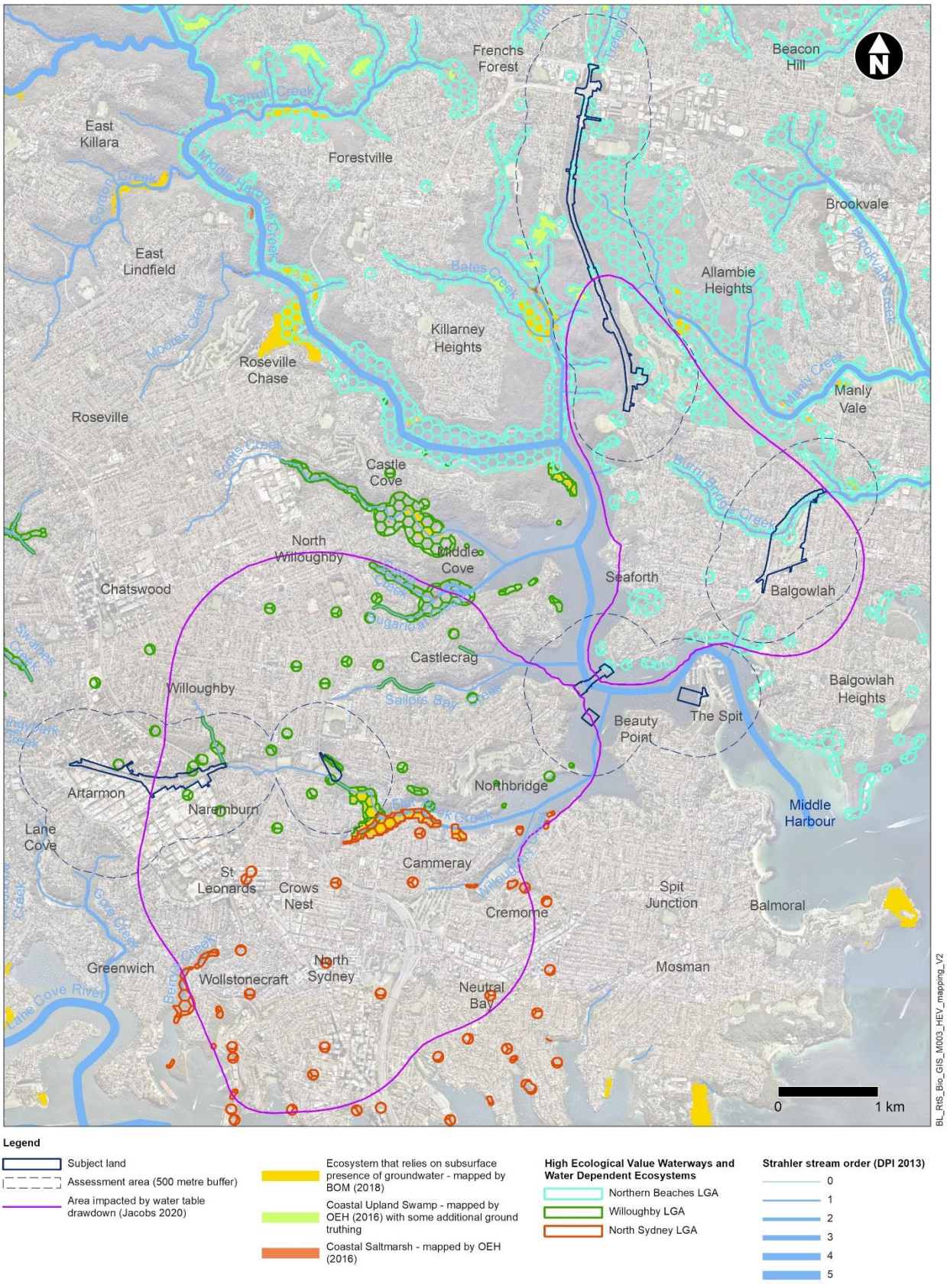


Figure B4-10 Department of Planning, Industry and Environment (2019) High Ecological Value Waterways and Water Dependent Ecosystems mapping in areas of potential groundwater impact

B4.16.6 Groundwater model uncertainty

Issue raised

The Department of Planning, Industry and Environment's groundwater independent peer review highlights the uncertainty in model parameters which directly leads to significant uncertainty in model predictions and does not allow for enough exploration of the range and likelihood of plausible groundwater impacts to enable decision makers to assess risk. The review further makes the point that due to gaps in data and analysis, the actual groundwater impact of the project is difficult to assess. These mean that the predicted impacts upon groundwater dependent ecosystems will also be highly uncertain.

Response

The key groundwater modelling parameters selected in Appendix N (Technical working paper: Groundwater) are based on the professional experience of the consultant groundwater team and accord also with parameter values presented in published literature and used in similar recent approvals for other Sydney tunnelling projects. Further, these same parameters were reviewed by Transport for NSW subject-matter experts and Transport for NSW peer reviewer and are considered appropriate.

While other parameters could have been used, and could lead to different predictions, this is addressed by the uncertainty analysis documented in the environmental impact statement. For the purposes of assessing environmental impacts, the hydraulic conductivity range (and other key variables) considered in the uncertainty analysis is considered appropriate, given the regional nature of groundwater modelling and the emphasis on the bulk properties of the hydrogeological units. Based on feedback from regulatory agencies related to earlier tunnelling projects, and in lieu of site-specific information being readily available at the time, the model was set up to contain a number of conservative assumptions to address these uncertainties. These include:

- Assuming full hydraulic connectivity between the tunnel and the shallow water table beneath the creeks (which means that all groundwater drawdown at tunnel depth would result in baseflow reductions in surface watercourses)
- A requirement for the groundwater model to simulate tunnels in a fully 'drained' state ie with no limitations on groundwater inflow into the tunnel (whereas revised environmental management measure SG16 (refer to Table D2-1 of this submissions report) requires groundwater inflows into the tunnel be limited to 1L/sec/km over any given kilometre of tunnel).

The results of the uncertainty analysis reported in the groundwater modelling report (refer to Annexure F of Appendix N (Technical working paper: Groundwater)) indicated that the risk associated with many of the predicted impacts did not change substantially. Where they did, the uncertainty analysis guided the development of appropriate environmental management measures to address uncertainty and allow for the potential impacts of most concern to be adequately addressed during further design development.

As such, the uncertainty analysis carried out for the environmental impact statement provided an exploration of the effects of a range in key parameter values sufficient for the project approval, noting that further site investigations, modelling, updated impact predictions and implementation of applicable environmental management measures to achieve the design criteria provided in revised environmental management measure SG16 (refer to Table D2-1 of this submissions report) are proposed to be carried out during further design development.

Notwithstanding, and as discussed in Section A5.1.16 of this submissions report, an expanded uncertainty analysis has been prepared since exhibition of the environmental impacts statement and is included as Appendix D of the submissions report. Based on changes to the selected

hydrogeological parameters, the expanded uncertainty analysis indicates the range of environmental impacts that could occur to the following:

- Groundwater supply bores
- Areas of environmental interest for contamination
- Groundwater dependent ecosystems and sensitive environments
- Surface water systems.

Transport for NSW considers the uncertainty analysis prepared as part of the environmental impact statement and expanded as part of the submissions report provides a sufficient exploration of the range and likelihood of plausible groundwater impacts and characterises the potential variability in project outcomes, which have been considered in the context of potential variability to groundwater impacts.

Additionally, it should be noted further investigations and assessment of predicted groundwater baseflow reductions has been carried out since exhibition of the environmental impact statement (refer to Section A5.1.15 of this submissions report). The additional investigations and analysis completed, including revised groundwater drawdown and groundwater baseflow predictions and consequent impacts on freshwater ecology, groundwater dependent ecosystem, water quality impacts and social considerations in Flat Rock Creek, Quarry Creek and Burnt Bridge Creek, are provided in Appendix E of this submissions report and discussed in the responses provided below as required.

B4.16.7 Groundwater model baseflow

Issue raised

The Department of Planning, Industry and Environment's groundwater independent peer review notes that estimates of baseflow (ie groundwater which feeds a watercourse) are based on single water levels and therefore have high uncertainty.

Response

Transport for NSW acknowledge that collecting additional groundwater level monitoring data and carrying out further investigations to assess hydraulic parameters would reduce the uncertainty in parameter values assigned in the prediction models. Transport for NSW have therefore committed to carrying out additional groundwater level monitoring (refer environmental management measure SG1 of Table D2-1 of this submissions report) as well as additional geotechnical investigations during further design and model development. Data from these additional investigations and monitoring would be used to improve model calibration and reduce uncertainty in the predictions of impacts.

While the outcomes of these additional investigations and monitoring will be useful in future project phases, the following aspects of the groundwater modelling carried out for purposes of the environmental impact statement minimised the uncertainty in the predicted groundwater impacts:

- The bulk rock (unfractured to slightly fractured Hawkesbury Sandstone) hydraulic parameters assigned to the model are similar to the bulk hydraulic parameters assigned to previous groundwater models developed for tunnelling projects within Sydney. Groundwater inflows observed during construction and operation of tunnels are consistent with the model predicted tunnel inflows for the project and previous tunnelling projects in Sydney
- Transport for NSW has committed to implementing tunnel design measures to limit inflows to less than 1 L/s/km across any given kilometre (refer to revised environmental management measure SG16 in Table D2-1 of this submissions report). Therefore, actual inflows along

discrete, highly permeable segments of the tunnel during operation are unlikely to significantly exceed the predicted groundwater inflows, and groundwater-related impacts are subsequently expected to be consistent with (or less than) those predicted in the environmental impact statement.

Transport for NSW considers that modelling has been designed to meet Class 2 confidence level classification requirements of the *Australian Groundwater Modelling Guidelines* (Barnett et al., 2012). Furthermore, the Transport for NSW groundwater peer reviewer concluded that the model calibration is suitable to meet the modelling objectives and is fit for purpose, given the expected risk.

B4.16.8 Groundwater baseflow reduction impacts on groundwater dependent species

Issue raised

Baseflow reduction during operation is identified as significant yet it is stated in Appendix S (Technical working paper: Biodiversity development assessment report), page 230, that it is "unlikely to result in a complete loss of aquatic habitat. Pools would be retained in these waterways and there would still be high flows immediately after rainfall events. Between rainfall events there would still be some (low) flow along the waterways. Outside of the pool areas, substantially reduced flows between rainfall events would be expected to alter assemblages of freshwater biota in these creeks to generally include only those species that are most tolerant to low flows". The impact to groundwater dependent species is therefore significant.

Appendix S (Technical working paper: Biodiversity development assessment report) notes that the potential operational impacts to Flat Rock Creek are likely to be offset by the Gore Hill Freeway operational wastewater treatment plant discharges to Flat Rock Creek. The impact of the quantity and quality of this water on groundwater dependent ecosystems would need to be determined. Consultation on this aspect should be carried out with the NSW Environment Protection Authority and also Department of Planning, Industry and Environment's Environment Protection Science Branch.

Response

A clarification has been provided (refer to Section A5.1.15 of this submissions report) regarding the various different components of streamflow, of which groundwater baseflow is one part. Further investigations and assessment has been carried out since exhibition of the environmental impact statement, including revised groundwater modelling and assessment of potential impacts to freshwater ecology, groundwater dependent ecosystems, surface water quality and social considerations in Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer to Appendix E of this submissions report). Annexure A of Appendix E of this submissions report contains a detailed report on the impacts to freshwater ecology resulting from revised groundwater modelling. Annexure B of Appendix E of this submissions report presents an assessment of the potential impact on groundwater dependent ecosystems.

When the environmental impact statement was being prepared there was limited information available on the creeks in the project area. This included whether their streambeds were lined (and therefore disconnected from underlying groundwater aquifers) or unlined (and therefore connected and contributing water to underlying groundwater aquifers) and the rate of groundwater discharge between them. Due to this and limits on other information, conservative assumptions were necessary to be made in the groundwater model.

To aid stakeholders in understanding updates to the biodiversity assessment which have occurred since the exhibition of the environmental impact statement, and to navigate where this information is included in this submissions report, a clarification has been included in Section A5.1.18 and a Biodiversity development assessment roadmap provided in Appendix F4 of this submissions report.

Predicted baseflow reductions and water quality of Flat Rock Creek

Based on investigations and revised groundwater modelling described in Appendix E of this submissions report, there is the potential for baseflow reductions at Flat Rock Creek of 526 kL/day (30 per cent reduction) after 100 years of operation. The predicted potential maximum discharge quantity to Flat Rock Creek from the Gore Hill Freeway wastewater treatment plant during operation is 1425 kL/day as outlined in Table 6-1 of Appendix O (Technical working paper: Surface water quality and hydrology). Based on this, the project discharges to Flat Rock Creek during operation would offset the predicted reduction in groundwater baseflow.

Streamflow measurements at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek were made in May 2018 following a period of two weeks without rain and during the 2017 to 2019 drought period (BOM, 2021), as discussed in Section 2.3 of Annexure F of Appendix N (Technical working paper: Groundwater). Based on these streamflow measurements and additional groundwater analysis contained in Appendix E of this submissions report, groundwater baseflow in the upstream section of Flat Rock Creek comprises a very small proportion of streamflow. Therefore, any changes to groundwater baseflow as a result of predicted drawdown in these areas is unlikely to influence surface water quality. Water quality at the weir in Flat Rock Creek and downstream is estuarine and generally poorer in quality and also comprises a greater proportion of groundwater baseflow.

Groundwater quality reported in Appendix O (Technical working paper: Surface water quality and hydrology) documented that groundwater bores in the area exhibit elevated concentrations of metals and nutrients, which together with runoff are the likely cause of the poor water quality observed. The predicted reduction in groundwater baseflow in this downstream section of Flat Rock Creek may also result in a reduction of poor quality groundwater entering surface water which, over time, may result in a reduction of metal and nutrient concentrations in Flat Rock Creek. Additionally, Flat Rock Creek would receive treated wastewater during the operation of the project that would be of a better quality than is currently observed. As a result, it would be expected that this could lead to improved water quality over the 100 year period of operation assessed in this section of the creek.

Impacts to freshwater ecology

Flat Rock Creek is considered to be freshwater upstream of its confluence with Quarry Creek and estuarine downstream. Flat Rock Creek is generally unlined although much of the middle section of the creek is lined with concrete, as is the far downstream area flowing to an underground weir at Tunks Park. Flat Rock Creek includes a mixture of shallow and deep pools and cascade/riffle zones in its upper and middle reaches before reaching the estuarine section. During site inspections associated with the additional groundwater analysis contained in Appendix E of this submissions report, there were many stormwater outlets observed along the length of Flat Rock Creek.

The Riparian, Channel, and Environmental (RCE) scores for all of Flat Rock Creek were generally high. Wherever it is not underground or concrete lined, much of Flat Rock Creek has evidence of active bush regeneration and is dominated by native trees and shrubs. Hence the riparian condition of much of the creek is either quasi-natural or only partly modified.

The freshwater section of Flat Rock Creek is lacking in numbers or variety of assemblages of macroinvertebrates, non-existent assemblages of native fish and generally very few, if any, native macrophytes. The AUSRIVAS results obtained during field survey suggest the freshwater ecology of the creeks was generally partially or severely impaired and affected by severe pollution. Sensitive macroinvertebrate groups such as *Ephemeroptera, Trichoptera* and *Plecoptera* were absent, despite the riparian habitat of many parts of all of the creeks being in reasonable, if not good

condition. Hence, although much of the freshwater reaches of Flat Rock Creek appear to look healthy, the freshwater ecology can be considered to be generally poor.

The revised groundwater modelling has estimated baseflow would be reduced by as much as 30 per cent after 100 years. Notwithstanding this, additional information about the relative contribution of baseflow to total streamflow suggests that for the most part, baseflow only represents a small proportion of total streamflow and reductions in streamflow would generally be less. Also, given there is significant stormwater discharges and an operational discharge of good quality water from the wastewater treatment plant during operation, there would be a net increase in flow in this creek regardless of predicted groundwater drawdown.

Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report) considered that there would still be some (low) flow along the entirety of the creeks between rainfall events and additional studies have confirmed this would be the case after the effects of the project on groundwater baseflow are considered. The additional survey completed in May 2021 indicates the presence of pool habitats in most reaches of the creeks and that even in periods of low flow in dry periods in summer, it would be expected that many of these pools would be deep enough to retain water and hence freshwater habitat. Notwithstanding the finding that assemblages of aquatic macroinvertebrates and fish are generally depauperate in the creeks, even in extremely dry times, some pools would be deep enough to provide refuge for aquatic macroinvertebrates, albeit only those species that are most tolerant to low flows.

Based on the evidence that changes to baseflow caused by groundwater drawdown would not substantially alter the streamflow flow regime after 100 years to the extent that it would alter instream habitat to already depauperate assemblages of aquatic macroinvertebrates, fish and macrophytes, it was concluded that the project would not significantly impact the freshwater ecology of Flat Rock Creek.

Impacts to groundwater dependent ecosystems

No direct impacts on groundwater dependent ecosystems would occur as a result of the project, as stated in Section 19.5.4 of the environmental impact statement. Some areas of groundwater dependent ecosystems adjoining Flat Rock Creek (refer to Figure B4-8) would be subject to groundwater drawdown impacts, with potential groundwater drawdown of up to four metres predicted at the end of construction and 11 metres after 100 years of operation.

Further assessment has been carried out of potential impacts to groundwater dependent ecosystems due to predicted groundwater drawdown and reductions in baseflow at Flat Rock Creek 100 years after the project starts operation (refer to Annexure B of Appendix E of this submissions report). This assessment considered groundwater dependent vegetation communities adjacent to the upper mid reaches of Flat Rock Creek. These vegetation communities were surveyed on 16 June 2021 by ecologists and assessed as being a low ecological value groundwater dependent ecosystem (refer to Section 3.4.1 of Annexure B of Appendix E of this submissions report).

Vegetation growing on the upper slopes of the sandstone ridges next to Flat Rock Creek are likely to be supported by perched aquifers that have formed as part of the stratification and fracturing in the Hawkesbury sandstone, as discussed in Section 4.2 of Annexure B of Appendix E of this submissions report. Drawdown in the regional aquifer is likely to have minor impacts on vegetation health, so the magnitude of risk is small given that the vegetation community is not solely dependent on groundwater. The small alluvial aquifer of Flat Rock Creek and at the Quarry Creek confluence would be recharged by releases from the project water treatment plant into Flat Rock Creek at Artarmon, which would sustain vegetation communities dependent on groundwater in the shallow alluvium.

Mitigation measures

Environment, Energy and Science Group's suggestion on further consultation is noted. Accordingly, environmental management measure SG6 has been revised to include consultation with Environment, Energy and Science Group who can delegate to the Environment Protection Science Branch as required. However, consultation with NSW Environment Protection Authority is not considered required due to the feedback from NSW Environment Protection Authority in their submission to the environmental impact statement and Transport for NSW's response (refer to Section B1.2.6 of this submissions report). As such, the revised environmental management measure SG6 (refer to Table D2-1 of this submissions report) states:

> **Following completion of environmental management measure SG2, a**~~A~~ focused study will be carried out **in consultation Department of Planning, Industry and Environment (Environment, Energy and Science Group)** to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems. The study will consider how existing site features affect the interaction between surface water and groundwater along the affected reaches of these watercourses, and the hydraulic connectivity in the underlying geology. Where ~~unacceptable~~ ecological impacts are predicted **to be worse than that presented as part of the environmental impact statement/submissions report**, feasible and reasonable mitigation measures to address the impacts will be identified **in consultation with a suitably qualified and experienced specialist**, incorporated into the detailed design, and implemented during construction. The mitigation measures considered will include tunnel linings.

B4.16.9 Baseflow reduction modelling and assessment of baseflow reduction

Issue raised

Environment, Energy and Science Group does not consider acceptable statements such as for Burnt Bridge Creek, for example, that "reductions in flow are unlikely to result in a complete loss of aquatic habitat", and further modelling and assessment is required. Given that the environmental impact statement does not provide predictions of baseflow reductions during extended dry periods or drought it is essential that predictions of baseflow reduction should be based on extended timeseries modelling so that flow frequency curves pre and post construction can be assessed on an ecological impact basis for all of the relevant flow facets.

Response

Additional field investigations and groundwater modelling and analysis has been carried out since exhibition of the environmental impact statement, as outlined in Section A5.1.15 (and Section B4.16.8) of this submissions report. This has included revised predictions of groundwater drawdown as well as impacts associated with freshwater ecology, groundwater dependent ecosystems, surface water quality and social considerations at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer to Appendix E of this submissions report).

Additional field survey of Burnt Bridge Creek was carried out to assess the nature of the creek's streambed and the potential for interaction between surface waters and groundwater. This information was used in the revised groundwater modelling. Revised predicted reductions in groundwater baseflow after 100 years of operation of 60 per cent in Burnt Bridge Creek are detailed in Table 3-3 of Appendix E of this submissions report, compared to a reduction of 96 per cent predicted in Table 6-10 of Appendix N (Technical working paper: Groundwater). Less baseflow reduction is predicted with the revised groundwater modelling because it includes the presence of creek linings observed during the field survey. The revised predicted reductions in baseflow has been expressed as a proportion of streamflow in Table 3-4 of Appendix E of this submissions report.

The revised predicted reduction in baseflow at Burnt Bridge Creek after 100 years of operation would result in an about one per cent reduction in streamflow based on streamflow measurements made in May 2018 during the 2017 to 2019 drought period.

Despite the predicted reduction in impact along Burnt Bridge Creek, following completion of revised environmental management measure SG2 (refer to Table D2-1 of this submissions report) a focussed study will be carried out in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Branch) to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems, as required by revised environmental management measure SG6 (refer to Table D2-1 of this submissions report). The study will consider how existing site features affect the interaction between surface water and groundwater along the affected reaches of these watercourses, and the hydraulic connectivity in the underlying geology. Where unacceptable ecological impacts are predicted to be worse than that presented as part of the environmental impact statement/submissions report, feasible and reasonable mitigation measures to address the impacts will be identified in consultation with a suitably qualified and experienced specialist, incorporated into the detailed design, and implemented during construction. The mitigation measures considered will include tunnel linings.

Any additional impact assessment or analysis required will be carried out in accordance with the conditions of approval for the project.

B4.16.10 Terminology used in reference to groundwater drawdown

Issue raised

Appendix N (Technical working paper: Groundwater) refers to and provides modelled estimates of both ‘water table drawdown’ and ‘maximum drawdown’, but these terms are neither defined nor the difference between them explained.

Response

For the purposes of the groundwater assessment in Appendix N (Technical working paper: Groundwater), ‘water table drawdown’ is the simulated water table drawdown, which occurs near the ground surface, whereas ‘maximum drawdown’ refers to the simulated drawdown at depth, at the proposed tunnel elevation.

The Hawkesbury Sandstone is stratified, and the vertical hydraulic conductivity is assumed to be lower than the horizontal hydraulic conductivity for most modelled layers. Therefore, the ‘maximum drawdown’ simulated at depth is almost always higher than the near-surface ‘water table drawdown’ because the relatively lower permeability in the vertical direction minimises the upward propagation of drawdown effects to the shallow layers.

B4.16.11 Quantum of water table drawdown

Issue raised

Throughout Appendix N (Technical working paper: Groundwater) there appears to be contradictory values of the quantum of water table drawdown for a given location, eg, at Flat Rock Creek, under the same scenario (project only or cumulative) and time frame (at end of construction or end of 100 years of operation). For example, estimates in Table 6-8 of “up to 25” metres for project only and cumulative in 2128 do match those in Table 6-10, but do not match those in eg Tables 6-9 and 6-10. This also occurs in Appendix S (Technical working paper: Biodiversity development assessment report), eg on page 237 it states “About 10.50 hectares of Coastal Sandstone Gully Forest,

Sandstone Riparian Scrub and Coastal Sand Forest is within the area of predicted water table drawdown. The area adjoins Flat Rock Creek and is mapped as having moderate to high potential for groundwater interaction. Water table drawdown beneath this vegetation is predicted to be up to four metres by 2028, and up to 11 metres by 2128 (Jacobs, 2020b)", whereas on page D-36 it says "The drawdown beneath Flat Rock Creek has also been estimated to be up to 28 metres". Clarification is required.

Response

Appendix N (Technical working paper: Groundwater) summarises predicted drawdown levels for different environmental features/receivers as follows:

- Table 6-8 summarises drawdown levels for areas of environmental interest for contamination within 500 metres of the project during operation
- Table 6-9 summarises drawdown levels for groundwater dependent ecosystems and sensitive environments during operation
- Table 6-10 summarises drawdown levels at watercourses after 100 years of operation.

Whist some of the features/receivers discussed in Table 6-8, Table 6-9 and Table 6-10 of Appendix N (Technical working paper: Groundwater) are similar in name (such as Flat Rock Gully Reserve, vegetation at Flat Rock Creek and Flat Rock Creek), they are geographically independent of one another and are therefore predicted to experience different levels of groundwater drawdown.

The locations of the watercourses, groundwater dependent ecosystems and sensitive environments are identified in Figure 5-1 of Appendix N (Technical working paper: Groundwater). The locations of areas of environmental interest for contamination within 500 metres of the project are identified in Figure 5-18 of Appendix N (Technical working paper: Groundwater). Figure 6-1 to Figure 6-9 of Appendix N displays the predicted drawdown levels for a range of operational scenarios with respect to the environmental features/receivers discussed above.

Similarly, Appendix S (Technical working paper: Biodiversity development assessment report) also refers to different environmental features/receivers throughout the document. Therefore, whilst the environmental features/receivers may be similar in name they are independent of one another and are predicted to experience different drawdown levels.

B4.16.12 Groundwater drawdown at Flat Rock Creek

Issue raised

"The level of groundwater dependency of Coastal Sandstone Gully Forest, Sandstone Riparian Scrub and Coastal Sand Forest is unknown; however, it is likely that it is able to draw on surface water in Flat Rock Creek and soil moisture to prevent drying out of the community, except in dry periods where there is no recharge from rainfall or surface runoff" (page 237 of Appendix S (Technical working paper: Biodiversity development assessment report)). It is important to note that:

1) A drawdown of four and 11 metres would result in significant impact to community composition and structure – a drawdown of this magnitude would mean that tree roots will be unable to access groundwater
2) A significant baseflow reduction has been identified in Flat Rock Creek - therefore it is unlikely that this community (and others) would be "able to draw on surface water in Flat Rock Creek and soil moisture to prevent drying out of the community".

Response

Additional field investigations and groundwater modelling and analysis has been carried out since exhibition of the environmental impact statement, as outlined in Section A5.1.15 of this submissions report. This has included revised predictions of groundwater drawdown and well as impacts associated with freshwater ecology, groundwater dependent ecosystems, surface water quality and social considerations at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer to Appendix E of this submissions report). A detailed assessment of impacts on groundwater dependent ecosystems based on the revised groundwater modelling is provided in Annexure B of Appendix E of this submissions report.

The revised prediction of groundwater drawdown at Flat Rock Creek ranges between about one metre (near the confluence with Quarry Creek) to about five metres at the northern extent of the mapped groundwater dependent ecosystem, Sandstone Riparian Scrub (refer to Figure 3-1 of Appendix E of this submissions report).The predicted baseflow reduction at Flat Rock Creek is 43.6 kL/day (20 per cent reduction) at the end of construction and 526 kL/day (30 per cent reduction) after 100 years of operation based on conservative assumptions used in the groundwater model. The predicted combined discharge quantity to Flat Rock Creek from the Flat Rock Drive construction support site (BL2) and the Punch Street construction support site (BL3) during construction is 1019 kL/day as outlined in Table 5-3 of Appendix O (Technical working paper: Surface water quality and hydrology). The predicted maximum potential discharge quantity to Flat Rock Creek from the Gore Hill Freeway wastewater treatment plant during operation is 1425 kL/day as outlined in Table 6-1 of Appendix O (Technical working paper: Surface water quality and hydrology). Based on this, the project discharges to Flat Rock Creek during both construction and operation would offset the reduction in baseflow.

The revised assessments of impacts to groundwater dependent ecosystems at Flat Rock Creek confirmed that about 10.5 hectares of Coastal Sandstone Gully Forest, Sandstone Riparian Scrub, and Coastal Sand Forest is within the area subject to groundwater drawdown around Flat Rock Creek, as detailed in Section 4.2 of Annexure B of Appendix E of this submissions report. Vegetation growing on the upper slopes of the sandstone ridges are likely to be supported by perched aquifers that are isolated from the regional water table. These are constrained by the stratification and fracturing in the Hawkesbury Sandstone. Drawdown in the regional aquifer is therefore likely to have minor spatial impacts on vegetation health, so the magnitude of risk is small given that the vegetation community is not solely dependent on regional groundwater. Drawdown beneath this vegetation is modelled to be less than five metres at the upstream end of Flat Rock Creek, and less than one metre downstream of the Quarry Creek confluence. The Coastal Sandstone Gully Forest in the upstream reaches of Quarry Creek would be subject to between five and 11 metres of groundwater drawdown based on the conservative assumptions built into the groundwater model.

Most of the water in Flat Rock Creek and Quarry Creek is derived from surface runoff and stormwater discharge, so would not be affected by predicted groundwater drawdown. Predicted drawdown beneath the groundwater dependent ecosystems along Flat Rock Creek is not expected to affect these vegetation communities because they are likely supported by rainfall and shallow, perched aquifers and overall, they are considered to be at a low level of risk, as discussed in Section B4.16.8 above and Section 4.2 of Annexure B of Appendix E of this submissions report.

The small alluvial aquifer of Flat Rock Creek and at the Quarry Creek confluence would be recharged by the releases from the project operational water treatment plant discharge. This would sustain vegetation communities dependent on groundwater in the shallow alluvium.

B4.16.13 Groundwater drawdown at Quarry Creek and Burnt Bridge Creek

Issue raised

The drawdown beneath Quarry Creek is estimated to be up to eight metres. The drawdown beneath Burnt Bridge Creek is estimated to be up to five metres (see page 36 of Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report)). These drawdown estimates would result in substantial impacts to any communities that rely on groundwater for survival.

Response

As outlined in Section A5.1.15 of this submissions report, additional field investigations and groundwater modelling and analysis has been carried out since exhibition of the environmental impact statement. This has included revised predictions of groundwater drawdown and well as impacts associated with freshwater ecology, groundwater dependent ecosystems, surface water quality and social considerations at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer Appendix E of this submissions report). A detailed assessment of impacts on groundwater dependent ecosystems based on the revised groundwater modelling is provided in Annexure B of Appendix E of this submissions report.

The revised prediction of groundwater drawdown at Quarry Creek ranges between one metre (near the confluence with Flat Rock Creek) to about 11 metres at the western extent of the mapped groundwater dependent ecosystem, Coastal Sandstone Gully Forest (refer to Figure 3-1 of Appendix E of this submissions report).

The predicted baseflow reduction at Quarry Creek is 4.1 kL/day (23 per cent reduction) at the end of construction and a maximum reduction of 11.0 kL/day (63 per cent reduction) after 100 years of operation based on conservative assumptions used in the groundwater model. There are no planned construction or operational project discharges of tunnel inflows to Quarry Creek, however it is noted that Quarry Creek drains into the Flat Rock Creek catchment.

Burnt Bridge Creek has a maximum reduction of 16.7 kL/day (79 per cent reduction) at the end of construction and a maximum reduction of 20.0 kL/day (60 per cent reduction) after 100 years of operation based on conservative assumptions used in the groundwater model.

During construction, tunnel inflows would be collected, treated and discharged into Burnt Bridge Creek. The predicted discharge quantity to Burnt Bridge Creek from the Balgowlah Golf Course construction support site (BL10) during construction is 428 kL/day, as outlined in Table 5-3 of Appendix O (Technical working paper: Surface water quality and hydrology). Based on this, the project discharges to Burnt Bridge Creek during construction would offset the reduction in baseflow. There are no planned operational project discharges to Burnt Bridge Creek.

As stated in sections above, the revised assessment of impacts to groundwater dependent ecosystems at Flat Rock Creek and Quarry Creek confirmed that about 10.5 hectares of Coastal Sandstone Gully Forest, Sandstone Riparian Scrub, and Coastal Sand Forest is within the area subject to groundwater drawdown (refer to Section 4.2 of Annexure B of Appendix E of this submissions report). Vegetation growing on the upper slopes of the sandstone ridges are likely to be supported by perched aquifers that have formed as part of the stratification and fracturing in the Hawkesbury sandstone. Drawdown in the regional aquifer is likely to have minor impacts on vegetation health, so the magnitude of risk would be small given that the vegetation community is not solely dependent on groundwater.

Most of the water in Flat Rock Creek and Quarry Creek is derived from surface runoff and stormwater discharge, so would not be affected by predicted groundwater drawdown. The predicted

drawdown beneath the Coastal Sandstone Gully Forest, Sandstone Riparian Scrub and Coastal Sand Forest along Flat Rock Creek and Quarry Creek is not expected to affect these vegetation communities because they are likely supported by rainfall and shallow, perched aquifers and overall, they are considered to be at a low level of risk.

Burnt Bridge Creek was not identified as being groundwater dependent in the *National Atlas of Groundwater Dependent Ecosystems* (BOM, 2018), however it does receive some of its contribution from groundwater. None of the riparian zones of Burnt Bridge Creek are dependent, either entirely or in part, on the presence of groundwater for their health and/or survival. Revised predicted reductions in groundwater baseflow after 100 years of operation of 60 per cent in Burnt Bridge Creek are detailed in Table 3-3 of Appendix E of this submissions report, compared to a reduction of 96 per cent predicted in Table 6-10 of Appendix N (Technical working paper: Groundwater). Less baseflow reduction is predicted with the revised groundwater modelling because it includes the presence of creek linings observed during the field survey. The revised predicted reductions in baseflow has been expressed as a proportion of streamflow in Table 3-4 of Appendix E of this submissions report. The revised predicted reduction in baseflow at Burnt Bridge Creek after 100 years of operation would result in an about one per cent reduction in streamflow based on streamflow measurements made in May 2018 during the 2017 to 2019 drought period.

The revised assessment of groundwater impacts in Appendix E of this submissions report concluded that the small reduction in streamflow (about one per cent) is unlikely to have a significant impact, given the level of disturbance already apparent in Burnt Bridge Creek.

B4.16.14 Groundwater dependence of Coastal Upland Swamp

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report), page 237, notes that the extent of groundwater dependence of Coastal Upland Swamp (as well as other vegetation identified as groundwater dependent), or their connectivity to other areas of groundwater, is not known and therefore the impacts from water table drawdown are uncertain. Given this uncertainty how can potential impacts be identified as unlikely? A drawdown of even one metre can result in species composition changes for wetlands that are dependent on the surface expression of water.

Response

As outlined in Section A5.1.15 of this submissions report, additional field investigations and groundwater modelling and analysis has been carried out since exhibition of the environmental impact statement. This has included revised predictions of groundwater drawdown and well as impacts associated with freshwater ecology, groundwater dependent ecosystems, surface water quality and social considerations at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer Appendix E of this submissions report). A detailed assessment of impacts on groundwater dependent ecosystems based on the revised groundwater modelling is provided in Annexure B of Appendix E of this submissions report.

There are two areas of Coastal Upland Swamp TEC in the vicinity of the project that have been considered as part of the groundwater dependent ecosystem impact assessment as stated in Section 5.6 of Appendix S (Technical working paper: Biodiversity development assessment report). The first area consists of two patches 95 metres west of the Wakehurst Parkway in Garigal National Park and the second area consists of one small patch north of Bantry Bay Oval, about 135 metres to the south-east of the construction footprint.

As discussed in the NSW Scientific Committee – final determination for the Coastal Upland Swamp TEC and the 'Context statement for the Sydney Basin bioregion' (Herron et al., 2018), it is likely that the community is also reliant on surface flows (rainfall and run-on) in addition to perched aquifers for seepage moisture to maintain adequate soil moisture.

Groundwater drawdown beneath the section of Coastal Upland Swamp TEC west of Wakehurst Parkway is modelled to be between zero and one metre by 2128. The groundwater dependence of this swamp is uncertain, as the water level is around 10 metres below ground level. The water table beneath this swamp may be affected by drawdown, but it is likely that the swamp also receives water from surface runoff and subsurface drainage from upslope perched aquifers, and that the availability of this water to support the swamp would not be affected.

Groundwater drawdown beneath the section of Coastal Upland Swamp TEC north of Bantry Bay Oval is around three metres. The regional water level is about 50 metres below ground level, so this swamp is likely to be connected to perched water tables, rather than the regional aquifer. Perched aquifers are predominantly fed by localised rainwater, or from downward drainage from upslope aquifers. It is unlikely that this section of upland swamp will be affected by drawdown from the project.

The drawdown impact (if experienced) would be reduced following implementation of a number of environmental management measures (refer to Table D2-1 of this submissions report), including:

- Groundwater modelling will be updated with ongoing groundwater monitoring to refine inflow predictions and detailed design to consider these predictions and include designed tunnel linings where required (refer to revised environmental management measure SG2)
- Measures will be implemented during tunnel construction to ensure that groundwater inflows into each tunnel during the operation phase do not exceed 1L/s/km across any given kilometre (refer to revised environmental management measure SG16).

B4.16.15 Groundwater drawdown adaptive management actions

Issue raised

In relation to environmental management measure SG6, other than the possible lining of parts of the tunnel, it is unaddressed as to what adaptive management actions might be put in place if the monitoring and modelling show a greater impact than is acceptable.

Response

It should be noted that to date tunnel linings have not been assumed in tunnel inflow modelling, with the exception of a 125 metre section on either side of Middle Harbour. Where tunnel inflows are predicted to exceed 1L/s/km across any given kilometre, appropriate waterproofing measures will be implemented in accordance with revised environmental management measure SG16 (refer to Table D2-1 of this submissions report). In addition to tunnel linings, potential measures to reduce groundwater inflows and water table drawdown could include pre-excavation pressure grouting and/or post grouting to reduce bulk hydraulic conductivity as discussed in Section 7.1 of Appendix N (Technical working paper: Groundwater). Pre-excavation pressure grouting involves grouting from the ground surface prior to tunnel excavation, whilst post grouting involves grouting post tunnel excavation (within one month of excavation).

It should be noted that if surface grouting measures to limit groundwater inflows and water table drawdown are required, they (in addition to investigative works to inform the surface grouting process) would be required above the proposed Beaches Link tunnel alignment and therefore potentially outside of the construction footprint (as presented in Chapter 6 (Construction work) of the environmental impact statement). If surface grouting measures (and associated investigative works)

are required to be carried out outside of the construction footprint, then, consistent with the process described in Section 28.3 of the environmental impact statement, they would be reviewed for consistency with the approval. This consistency review would be carried out to consider whether the process would result in:

- Any inconsistency with the conditions of approval
- Any inconsistency with the objectives and operation of the project as described in the environmental impact statement
- A change to the approved project that may require a modification of the approval.

Any potential environmental or social impacts of a greater scale or impact on previously unaffected receivers than that considered by the environmental impact statement or the submissions and preferred infrastructure report. If these criteria are not met, approval for a modification would be sought from the NSW Minister of Planning and Public Spaces in accordance with the requirements of Division 5.2 of the *Environmental Planning and Assessment Act 1979*.

B4.16.16 Acceptability of impacts on biota

Issue raised

Table 6.1 (page 244) of Appendix S (Technical working paper: Biodiversity development assessment report) includes the mitigation measure for water table drawdown impact on groundwater dependent ecosystems that:

“A focussed study will be carried out to confirm potential baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to groundwater drawdown, and whether this might have an increased effect on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems. The study will consider how existing site features affect the interaction between surface water and groundwater along the affected reaches of these watercourses, and the hydraulic connectivity in the underlying geology. Where unacceptable ecological impacts are predicted, feasible and reasonable mitigation measures to address the impacts will be identified.”

There is no consideration as to what “acceptable” impacts on biota might be.

Response

As outlined in Section A5.1.15 of this submissions report, additional field investigations and groundwater modelling and analysis has been carried out since exhibition of the environmental impact statement. This has included revised predictions of groundwater drawdown and well as impacts associated with freshwater ecology, groundwater dependent ecosystems, surface water quality and social considerations at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer Appendix E of this submissions report). These investigations and analysis are consistent with the additional studies specified in revised environmental management measure SG6 (refer to Table D2-1 of this submissions report). However, on the basis of the findings to date, including additional field surveys and analysis completed for the environmental impact statement and more recently, and that the level of conservatism in the assumptions underpinning the groundwater model, it is considered highly unlikely that subsequent assessment required by revised environmental management measure SG6 (refer to Table D2-1 of this submissions report) would identify impacts worse than currently predicted.

Detailed field investigations confirmed the presence of pool habitats in most reaches of the creeks, even in periods of low flow eg in dry periods in summer (refer to Annexure A of Appendix E of this submissions report). This is consistent with findings reported in the environmental impact statement (refer to Annexure D of Appendix S (Technical working paper: Biodiversity development assessment

report)). Considering the revised predictions of groundwater baseflow, it would be expected that many of these pools would be deep enough to retain water and hence aquatic habitat between rainfall events.

Therefore, it is considered that revised predictions of changes to groundwater baseflow caused by the project would not substantially alter the flow regime in any of the creeks to the extent that it would affect instream habitat and therefore that the project would not significantly impact the aquatic ecology of Flat Rock Creek, Quarry Creek or Burnt Bridge Creek. As there are no sensitive species present, there would be no impact on aquatic communities in these creeks.

Regarding potential impacts on groundwater dependent ecosystems, the assessment in Annexure B of Appendix E of this submissions report was carried out in accordance with the framework outlined in the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems*, *Volume 1 – The conceptual framework* (Serov et al, 2012), which combines the ecological value of an ecosystem with the level of risk to determine appropriate management actions.

For ecosystems associated with Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (risk categories H, G and G respectively), the recommended management actions include protecting hotspots (if any) and monitoring ecological condition. As there are no areas of high biodiversity value that could be considered hotspots in any of the creeks affected by baseflow reductions, there are no sections that require protection.

For Coastal Sandstone Gully Forest, Sandstone Riparian Scrub, Coastal Sand Forest, Coastal Sandstone Plateau Heath, Estuarine Fringe Forest and Illawarra Gully Wet Forest groundwater dependent ecosystems, (risk category D), the recommended management actions include the protection of hotspots, ongoing monitoring, and adaptive management. There is a very low risk that these ecosystems would be impacted by groundwater drawdown, particularly the vegetation growing close to the creeks where flow is supplemented by discharges from the wastewater treatment plant during construction and operation. Vegetation communities on the sandstone slopes of Flat Rock Gully are likely to be buffered against the impacts of groundwater drawdown by shallow perched aquifers. These aquifers are recharged by rainfall and surface runoff, and in the upper slopes of the gully may be disconnected to the deeper regional aquifer. Given the highly disturbed condition of the vegetation community, it would be difficult to attribute any decline in vegetation condition to a decline in groundwater level.

Given the above, environmental management measure SG6 has been revised (refer to Table D2-1 of this submissions report) with consideration to the additional investigation and analysis carried out as part of Appendix E of this submissions report, as follows:

> **Following completion of environmental management measure SG2, a**~~A~~ focused study will be carried out **in consultation Department of Planning, Industry and Environment (Environment, Energy and Science Group)** to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems. The study will consider how existing site features affect the interaction between surface water and groundwater along the affected reaches of these watercourses, and the hydraulic connectivity in the underlying geology. Where ~~unacceptable~~ ecological impacts are predicted **to be worse than that presented as part of the environmental impact statement/submissions report**, feasible and reasonable mitigation measures to address the impacts will be identified **in consultation with a suitably qualified and experienced specialist**, incorporated into the detailed design, and implemented during construction. The mitigation measures considered will include tunnel linings.

B4.16.17 Mitigation of groundwater impacts

Issue raised

It is important to note that due to the lag time of groundwater systems unacceptable impacts may be impossible to avoid after groundwater monitoring thresholds have been reached (Currell, 2016), so it is often not possible to manage adverse groundwater impacts through monitoring alone. The Department of Planning, Industry and Environment's independent groundwater peer review clearly states that the modelling provides no evidence that adverse groundwater impacts can be mitigated through monitoring and adaptive management.

Response

The modelling carried out in the environmental impact statement was not intended to generate evidence of the effectiveness of the environmental management measures. Rather, the intent of the modelling was to estimate the potential effects on groundwater and the likely key environmental issues and risks sufficient to achieve planning approval. The groundwater modelling was designed to meet Class 2 requirements of the *Australian Groundwater Modelling Guidelines* (Barnett et al., 2012) and conservative assumptions were made during its development taking into account experience from other recent major tunnel infrastructure projects in Sydney and direction received from the Department of Planning, Industry and Environment. This coupled with a lack of comprehensive, site-specific geotechnical information available at the time, resulted in a number of conservative assumptions needing to be made such that the predictions made are likely to be overestimates.

The environmental management measures are adequate to address the potential impacts and uncertainties as identified by the assessment and analysis carried out. A focussed study will be carried out to confirm potential groundwater drawdown and associated baseflow reductions at local creeks in accordance with revised environmental management measure SG6 (refer to Table D2-1 of this submissions report). This will allow for the incorporation of additional design details and hydrogeological information which are currently not available, which in turn would give greater confidence in understanding the potential groundwater impacts and proactively identify whether design measures are required to minimise any potential impacts. The focussed study will be informed by further groundwater modelling required by revised environmental management measure SG2 in addition to the implementation of revised environmental management SG16, which requires groundwater inflows during the operation phase to not exceed 1 L/s/km across any given kilometre of tunnel (refer to Table D2-1 of this submissions report).

As outlined in Section A5.1.15 of this submissions report, additional field investigations and groundwater modelling and analysis has been carried out since exhibition of the environmental impact statement. This has included revised predictions of groundwater drawdown and well as impacts associated with freshwater ecology, groundwater dependent ecosystems, surface water quality and social considerations at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer Appendix E of this submissions report). A detailed assessment of impacts on freshwater ecology and groundwater dependent ecosystems based on the revised groundwater modelling is provided in Annexure A and B respectively of Appendix E of this submissions report. These investigations and analysis are consistent with the additional studies specified in revised environmental management measure SG6 (refer to Table D2-1 of this submissions report).

However, on the basis of the findings to date, including additional field surveys and analysis completed for the environmental impact statement and more recently, and that the level of conservatism in the assumptions underpinning the groundwater model, it is considered highly unlikely that subsequent assessment required by revised environmental management measure SG6 (refer to Table D2-1 of this submissions report) would identify impacts worse than currently

predicted. Transport for NSW are confident that the proposed mitigation approach is sufficient to manage the likely environmental risks on groundwater systems associated with the project.

B4.16.18 Revision of environmental impact assessment technical papers

Issue raised

Despite the large uncertainties, groundwater impacts are proposed to be managed primarily through further monitoring and modelling, with some adaptive (or reactive) management. However, an adaptive management strategy is considered “not applicable” (Appendix S (Technical working paper: Biodiversity development assessment report), page 12). Section 9.3 of the Biodiversity Assessment Method (BAM) (supported by further detail in section 2.7 of the BAM Operational Manual Stage 2) includes requirements that Appendix S (Technical working paper: Biodiversity development assessment report) must: document mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency and responsibility for implementing each measure; identify any measures for which there is risk of failure; evaluate the risk and consequence; and document any adaptive management strategy.

The Environment, Energy and Science Group recommend that:

- Appendix N (Technical working paper: Groundwater) be revised in line with the recommendations of the Department of Planning, Industry and Environment’s independent groundwater peer review
- Appendix S (Technical working paper: Biodiversity development assessment report) also be updated and resubmitted.

Response

As discussed in the response above, the overall findings of the additional investigation and analysis carried out as part of Appendix E of this submissions report are generally consistent with statements contained in the relevant chapters of the environmental impact statement and no additional environmental management measures are considered necessary to address the predicted impacts from groundwater baseflow reductions. Transport for NSW are confident that the proposed mitigation approach is sufficient to manage the likely environmental risks on groundwater systems associated with the project.

The recommendation by Environment, Energy and Science Group to revise Appendix N (Technical working paper: Groundwater) and revise and resubmit Appendix S (Technical working paper: Biodiversity development assessment report) based on issues raised in their submission on the environmental impact statement is noted. It is noted that Appendix N (Technical working paper: Groundwater) and Appendix S (Technical working paper: Biodiversity development assessment report) have been prepared to meet the requirements of the Secretary’s environmental assessment requirements and the *Biodiversity Assessment Method* (OEH, 2017a) for the biodiversity development assessment report. Discussion on how the *Biodiversity Assessment Method* (OEH, 2017a) requirements have been addressed is provided in Section 1.9 of Appendix S (Technical working paper: Biodiversity development assessment report) and the report has been certified by an accredited person under Section 6.15 of the *Biodiversity Conservation Act 2016*.

Additional requests for information and comments on potential groundwater impacts are addressed within Section B4.16 and Appendix E of this submissions report. In addition, to aid stakeholders in understanding updates to the biodiversity assessment which have occurred since the exhibition of the environmental impact statement, and to navigate where this information is included in this submissions report, a clarification has been included in Section A5.1.18 and a Biodiversity development assessment roadmap provided in Appendix F4 of this submissions report.

Appendix F5 of this submissions report provides an updated biodiversity assessment to synthesise the updated and supplementary information provided in this submissions report, with Appendix S (Technical working paper: Biodiversity development assessment report).

B4.16.19 Monitoring and adaptive management measures

Issue raised

The Environment, Energy and Science Group recommends that:

- Both monitoring and adaptive management measures be developed in consultation with the ground and surface water scientists of Department of Regional NSW (from former Department of Primary Industries - Water) and the Environment, Energy and Science Group. The plan should consider possible scenarios and also be consistent with the advice in Section 2.7 (Management of uncertain impacts) of the *Biodiversity Assessment Method Operational Manual – Stage* 2 (NSW DPIE, 2019a) and include:
  - Relevant baseline data, collected prior to impacts, of variables to be used to monitor changes
  - Seasonal changes or relevant impacts to be measured
  - Monitoring techniques, intensity and based on best practice (eg published peer-reviewed guidelines). Monitoring should enable the proponent to determine if measures are being implemented as planned and provide an early warning of measures that are ineffective and/or the uncertain impact is being realised
  - Frequency and type of reporting
  - Completion and performance criteria which adhere to SMART principles and are ecologically based, that can be used as triggers for management intervention actions
  - Information that will be necessary to measure the impact over time and consideration given to how these results could be used to inform ongoing (or future) operations.

Response

As outlined above, additional field investigations and groundwater modelling and analysis has been carried out since exhibition of the environmental impact statement and is included in Appendix E of this submissions report. These investigations and analysis are consistent with the additional studies specified in revised environmental management measure SG6 (refer to Table D2-1 of this submissions report).

As recommended by Environment, Energy and Science Group, environmental management measure SG6 (refer to Table D2-1 of this submissions report) has been revised to require consultation with Environment, Energy and Science Group during the carrying out of the focussed study to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems. However, on the basis of the findings to date, including additional field surveys and analysis completed for the environmental impact statement and more recently, and that the level of conservatism in the assumptions underpinning the groundwater model, it is considered highly unlikely that subsequent assessment required by revised environmental management measure SG6 (refer to Table D2-1 of this submissions report) would identify impacts worse than currently predicted.

Further, the overall findings of the additional studies are generally consistent with statements contained in the relevant chapters of the environmental impact statement and no additional management or mitigation measures, such as monitoring programs, are considered necessary to address the predicted impacts from groundwater baseflow reductions.

As such, Transport for NSW are confident that the proposed mitigation approach is sufficient to manage the likely environmental risks on groundwater systems associated with the project.

B4.17 Red-crowned Toadlet

B4.17.1 Impact of nitrogen loading on Red-crowned Toadlet

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) notes the project would result in an increase in total annual nitrogen loading of 188 kilograms per year for the overall combined Wakehurst Parkway catchments and the increase in nitrogen downstream of the proposed water quality basin at chainage 4250, above the identified potential breeding habitat for Red-crowned Toadlet, would be 44 kilograms per year (page 231 of Appendix S). It is unclear if the Red-crowned Toadlet and/or its habitat could potentially be impacted by a potential increase in total nitrogen load. The submissions report should clarify this.

Response

Potential habitat of the Red-crowned Toadlet is in two drainage lines adjacent to the Wakehurst Parkway, as shown in Figure 3-8 (map c) of Appendix S (Technical working paper: Biodiversity development assessment report). The relevant project area above the Red-crowned Toadlet habitat would be managed by the proposed water quality basin at chainage 12335 (identified as chainage 4250 in the environmental impact statement. It is noted that the chainage control point for the design has changed during further design development since the environmental impact statement, however the proposed water quality basin location remains the same as that shown in Figure 5-8 of the environmental impact statement and Figure B4-4 of this submissions report).

The water quality modelling results for the proposed water quality basin at chainage 12335 (chainage 4250 in the environmental impact statement) are provided in Table 6-7 of Appendix O (Technical working paper: Surface water quality and hydrology). The results are consistent with the overall results for the Wakehurst Parkway in that there is an overall beneficial water quality outcome due to a reduction in annual total suspended solid and total phosphorous loads, although there is an increase in total annual nitrogen loading as indicated by Environment, Energy and Science Group. However, for water quality basin 12335 the increase in total annual nitrogen loading is at a lesser scale than results for the overall Wakehurst Parkway catchments. The results for the proposed basin are:

- A 38 per cent reduction in total nitrogen (with the project and proposed control) compared to the project target of 45 per cent annual average pollutant load reduction for total nitrogen
- An increase in total nitrogen of 44 kilograms per year compared to 36 kilograms per year for the existing condition.

It should be noted that the results above are estimated immediately at the outlet of the basin and modelling has assumed that the exfiltration rate for the basin is zero. As such, the results are conservative as dilution is likely to occur further downstream and should a small exfiltration exist, it is likely the results would reduce further.

Landscaping of disturbed areas (as well as vegetated swales) will be carried in accordance with the urban design and landscape plan as required by environmental management measure V1 (refer to

Table D2-1 of this submissions report). The plan would include identification of vegetation species composition, planting layout and densities in accordance with relevant Transport for NSW guidelines, including controls to minimise weed infestation and spread. Landscaping would be carried out progressively and would contain a mixture of grasses, shrubs and trees and would consist of both established and juvenile species. By implementing a responsive and responsible urban design and landscape plan incorporating these measures, nitrogen can be effectively captured or diluted before entering ephemeral streams, reducing the risk of increased weeds.

It is also noted that SMEC (2015) recorded the Red-crowned Toadlet just east of Wakehurst Parkway near Aquatic Drive. At this location the existing nitrogen levels are 163 kilograms per year. This indicates that the Red-crowned Toadlet tolerates considerably higher total nitrogen levels than are modelled to be discharged from the water quality basin at chainage 12335. Therefore, it is unlikely that the species would be impacted by the predicted increase in total nitrogen levels.

B4.17.2 Managing the spread of weeds

Issue raised

The ephemeral streams which occur near the Wakehurst Parkway and flow in either a west and east direction could be a potential conduit for the spread of weeds (Figure 5.2 of Appendix S (Technical working paper: Biodiversity development assessment report)). Management measures are required to minimise the risk of introduction and spread of weeds (Section 5.2.4 of Appendix S (Technical working paper: Biodiversity development assessment report)) along these streams, especially as Appendix S (Technical working paper: Biodiversity development assessment report) states “these first-order ephemeral streams are likely to provide sheltering, foraging and breeding habitat for the Red-crowned Toadlet” (Sections 3.6.2.4.1 and 5.4.5.2.1).

Response

Potential biodiversity impacts from the spread of weeds, pathogens and disease are discussed in Section 19.5.1 of the environmental impact statement and detailed in Section 5.2.4 of Appendix S (Technical working paper: Biodiversity development assessment report).

During construction, weed species will be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority (RTA), 2011a), as required by environmental management measure B25 (refer to Table D2-1 of this submissions report). Pathogens will be managed in accordance with *Guide 7: Pathogen management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a), per revised environmental management measure B26 (refer to Table D2-1 of this submissions report). The use of Transport for NSW’s *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) will ensure best management practice is applied to minimising and managing the spread of weeds, pathogens and disease.

With regard to operational impacts, landscaping of disturbed areas (as well as vegetated swales) will be carried in accordance with the urban design and landscape plan as required by environmental management measure V1 (refer to Table D2-1 of this submissions report). The plan would include identification of vegetation species composition, planting layout and densities in accordance with relevant Transport for NSW guidelines, including controls to minimise weed infestation and spread.

B4.18 Nest boxes

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) refers to the temporary installation of nest boxes in trees within the subject land to survey small to medium sized arboreal mammals. It notes twelve nest boxes were installed in native vegetation communities near the Wakehurst Parkway, in the northern extent of the subject land, for a period of 12 weeks and were checked for fauna presence and to identify the presence of any arboreal fauna species (Section 2.6.2.2.10, page 39 of Appendix S (Technical working paper: Biodiversity development assessment report)). Appendix S (Technical working paper: Biodiversity development assessment report) does not indicate what the results were from the nest box installation and if any native fauna were found to use the nest boxes and if so what species and whether there is a need to permanently install nest boxes.

Response

Nest boxes were installed as a survey method to target Eastern Pygmy-possums as detailed in Section 2.6.2.2.10 and Table 2.6 of Appendix S (Technical working paper: Biodiversity development assessment report). No Eastern Pygmy-possums were identified in the boxes. Twelve nest boxes were set for a period of 12 weeks and checked once, then again on collection. Upon collection, one nest box contained a small amount of nesting material associated with a small mammal (uncertain species).

The project would impact two hollow-bearing trees as discussed in Section 19.5.2 of the environmental impact statement. A nest box program would not be implemented as part of the project due to minimal impacts to hollows. Notwithstanding, native vegetation impacts, including fauna habitat loss, will be offset through the provision of credits under the Biodiversity Assessment Method requirements (refer to Section 19.6.1 of the environmental impact statement).

B4.19 Pre-clearance fauna surveys and relocation of native fauna

B4.19.1 Pre-clearing surveys of human made structures for threatened bats/microbats

Issue raised

Environmental management measure B23 indicates that surveys (for non-threatened species) will include human made structures that have been identified as potentially providing habitat for microbats and are subject to demolition or modification, it is unclear if pre-clearing surveys are proposed to be carried out for threatened bats/microbats of the human made structures. Clarification is required on this.

Response

The observation by Environment, Energy and Science Group is noted. It is the intention to also carry out pre-clearing surveys for threatened bats/microbats of the human made structures. Accordingly, to provide clarity on this issue, environmental management measure B14 has been revised as follows (also refer to Table D2-1 of this submissions report):

> Pre-clearing surveys for threatened fauna species will be carried out in accordance with *Guide 1: Pre-clearing Process* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a). This will include inspections of hollows and dead timber for Eastern Pygmy-possum. **Surveys will also include human made structures that have been identified as potentially providing habitat for microbats and are subject to demolition or modification**

B4.19.2 Pre-clearance fauna surveys

Issue raised

The Environment, Energy and Science Group recommends pre-clearance fauna surveys are carried out by a qualified ecologist prior to removing:

- Native and non-native/invasive/ exotic trees to determine the presence of resident native fauna using nests, dreys or hollows
- Hollow bearing logs, rocky habitat boulders, crevices and ledges
- Human made structures within the construction footprint
- Any other habitat.

Any resident native fauna potentially impacted by the removal of trees and other habitat should be relocated to an appropriate nearby location and in a sensitive manner under the supervision of a qualified ecologist/licensed wildlife handler.

Evidence of the pre-clearing surveys and inspections for fauna and any relocation of fauna must be provided to the satisfaction of the Certifying Authority.

Response

Pre-clearing surveys for threatened fauna species and non-threatened fauna species will be carried out in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) as required by environmental management measures B14 and B23 (refer to Table D2-1 of this submissions report). In addition, vegetation removal will be carried out in accordance with *Guide 4: Clearing of Vegetation and Removal of Bushrock* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) as required by environmental management measure B11 (refer to Table D2-1 of this submissions report). This includes a staged clearing process, whereby habitat removal is carried out in separate stages. This further minimises the risk of direct impact to fauna by providing them an opportunity to vacate areas and relocate naturally.

The use qualified and suitable experienced ecologists in the above processes is required by Transport for NSW's *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a). In addition, it also requires use of a licensed wildlife carer or ecologist to carry out any fauna handling in accordance with *Guide 9: Fauna Handling* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) (refer to environmental management measure B22 in Table D2-1 of this submissions report).

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project. If required by the conditions of approval, records from the pre-clearing surveys discussed above would be provided to the Department of Planning, Industry and Environment as the approval authority.

B4.20 Tree removal and replacement

B4.20.1 Removal of invasive/exotic tree species

Issue raised

Appendix W (Technical working paper: Arboricultural impact assessment) indicates 3009 trees would be directly impacted by construction and removed, and of these 135 have high retention value and 1508 have moderate retention value. In addition, it notes another 500 trees have the potential to be impacted. Any invasive/exotic tree species within the assessment area should be

removed as part of the project, including invasive exotic species which are not directly impacted by the project, particularly if they adjoin Garigal National Park, bushland reserves/remnant vegetation.

Response

Appendix W (Technical working paper: Arboricultural impact assessment) identifies trees that would be removed for construction purposes, not environmental purposes. Transport for NSW understands that local councils have different requirements for management of invasive species for environmental purposes and therefore suggest that this issue is a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project, along with consideration of amenity and replacement issues.

Management and control of noxious weeds within the construction footprint would be detailed in the flora and fauna management plan described in Section D1 of this submissions report and will be carried out in accordance with environmental management measure B25 and revised environmental management measure B26 (refer to Table D2-1 of this submissions report), as well as the relevant requirements of the *Biosecurity Act 2015*. This includes the requirements of Schedule 1 of the *Biosecurity Act 2015*, namely the duty to prevent, eliminate or minimise any biosecurity risk posed or likely to be posed by weeds on roadsides.

B4.20.2 Replacement tree ratio

Issue raised

The Environment, Energy and Science Group supports the replacement trees consisting of local native provenance species from the vegetation community that once occurred in the locality (rather than plant exotic or non-local native trees). The Environment, Energy and Science Group recommends the removed trees are replaced at a ratio greater than 1:1 for trees that are not covered by a biodiversity offset strategy to mitigate the local urban heat island effect and improve local biodiversity over time.

Response

The recommendation from Environment, Energy and Science Group is noted. Where mature amenity trees (ie trees that are over three metres in height that do not classify for offset under the NSW Biodiversity Offsets Scheme) are removed as a result of the establishment of construction support sites, Transport for NSW have committed to replacing these in accordance with the revised environmental management measure V13 provided below (refer to Table D2-1 of this submissions report):

> Where **mature** amenity trees **(other than trees offset under the NSW Biodiversity Offsets Scheme, established under Part 6 of the *Biodiversity Conservation Act 2016*)** are removed as a result of ~~the establishment of~~ construction ~~support sites~~, they will be replaced at a ratio ~~equal to or greater than~~ **of 2**~~1~~:1. The replacement trees will consist of local native provenance species from the vegetation community that once occurred in the locality (rather than plant exotic or non-local native trees) where available and subject to the urban design and landscape plan. Where replacement trees cannot be accommodated within the operational footprint of the project, consultation will be carried out with ~~the~~ adjacent **government** landowner**s** and **the** relevant local council (where appropriate) to determine if they can accommodate the replacement tree(s).

B4.20.3 Number of trees to be removed

Issue raised

In order to achieve a net increase in trees, details need to be provided on the number of trees to be removed. It is recommended details are also provided on the tree species, and whether the trees to be removed are exotic, non-local natives or local native species.

Response

The number of trees to be removed based on the current level of design development is detailed in Table 3-1 of Appendix W (Technical working paper: Arboricultural impact assessment). In total, 3009 trees are to be removed and a further 500 may potentially be impacted. Details on the species to be removed and those potentially impacted are included in Annexures C, E, G, I and K of Appendix W (Technical working paper: Arboricultural impact assessment). As outlined in the response above, Transport for NSW have committed to replacing mature amenity trees at a ratio of 2:1 (ie a net increase), in accordance with revised environmental management measure V13 (refer to Table D2-1 of this submissions report).

B4.20.4 Seed collection

Issue raised

Appendix W (Technical working paper: Arboricultural impact assessment) states “Seasonal seed collection should be carried out where appropriate for reuse in landscaping and hydromulching”. Environment, Energy and Science Group recommends seed from native plants to be removed is collected prior to clearing and is used in revegetation across the project area, including planting along the Wakehurst Parkway as the road adjoins Garigal National Park and Manly Dam Reserve (Manly Warringah War Memorial State Park), rehabilitation of Burnt Bridge Creek riparian corridor etc.

It is important seed collection commences early in the project so that local native provenance plant species are available to be planted, and the trees are advanced and established in size to improve the urban tree canopy and local biodiversity. Environment, Energy and Science Group recommends a condition of approval is included to this effect.

Response

The recommendation from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Notwithstanding, vegetation will be re-established in the construction footprint, where feasible, in accordance with *Guide 3: Re-establishment of Native Vegetation* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) as required by environmental management measure B13 (refer to Table D2-1 of this submissions report). *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) discusses native seed collection (see Step 2 of the management requirements). Furthermore, replacement trees to be used as part of landscaping works will consist of local native provenance species from the vegetation community that once occurred in the locality in accordance with revised environmental management measure V13 (refer to Table D2-1 of this submissions report).

B4.21 Reuse of removed trees

B4.21.1 Reuse of native trees in landscaped/rehabilitated areas

Issue raised

The environmental impact statement notes site establishment would include vegetation clearing, chipping and mulching where required (Section 6.3.2 of the environmental impact statement) and Section 4.6.1 of Appendix W (Technical working paper: Arboricultural impact assessment) states “all native trees to be removed should be mulched and chipped for reuse on site in landscaping works”. Rather than chip and mulch the removed trees, it is recommended the project also reuses native trees that are removed including hollows and tree trunks (greater than approximately 25-30 centimetres in diameter and 3 metres in length) and root balls and these are used by the project in landscape/rehabilitated areas, including the rehabilitation of Burnt Bridge Creek riparian corridor to enhance habitat.

The environmental impact statement indicates two hollow-bearing trees would also be removed as part of construction works along the Wakehurst Parkway. One has a hollow diameter of 0.10 to 0.15 metres, and the other has a hollow diameter more than 0.20 metres (Section 19.5.2 of the environmental impact statement). Environment, Energy and Science Group recommends the hollows are salvaged and reused.

Response

The recommendation from Environment, Energy and Science Group is noted. Where reasonable and feasible, salvaged logs will be reused on site and/or reused as part of the fauna connectivity structures proposed. The logs would be reused in consideration of *Guide 5: Re-use of woody debris and bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) as required by revised environmental management measure WM8 (refer to Table D2-1 of this submissions report). In applying revised environmental management measure WM8, salvaged logs could be used to landscape/rehabilitated area, including the rehabilitation of Burnt Bridge Creek riparian corridor to enhance habitat in accordance with new environmental management measure B40 (refer to Table D2-1 of this submissions report).

B4.21.2 Provision of removed native trees to local restoration/rehabilitation groups

Issue raised

As it would not be possible for the project to reuse all removed native trees, Environment, Energy and Science Group recommends a condition of approval is included that the proponent consults with local community restoration/rehabilitation groups, Landcare groups, and surrounding reserve managers including the National Parks and Wildlife Service (NPWS) and councils etc prior to any clearing commencing to determine if the removed trees can be re-used by others in habitat enhancement and rehabilitation work. This detail including consultation with the community groups and their responses should be documented in the construction environmental management Plan/Flora and Fauna Management Plan.

It is suggested the project includes following condition:

- The Proponent must identify where it is practicable to reuse any of the native trees that are to be removed as part of this project, including tree hollows and tree trunks (greater than 25-30 centimetres in diameter and three metres in length), and root balls to enhance habitat. If the removed native trees are not able to be entirely re-used by the project, the proponent must consult with local community restoration/rehabilitation groups, Landcare groups and surrounding reserve managers including the National Parks and Wildlife Service (NPWS) and Councils prior

to removing any native trees to determine if the removed trees can be reused in habitat enhancement and rehabilitation work. This detail including consultation with the community groups and their responses must be documented in the CEMP.

Response

The recommendation from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Notwithstanding, Transport for NSW has revised environment management measure WM8 as below in consideration of Environment, Energy and Science Group's recommendation (refer to Table D2-1 of this submissions report):

Where reasonable and feasible, salvaged logs from the clearing process will be reused on site and/or reused as part of the fauna connectivity structures with consideration of the *Guide 5: Re-use of woody debris and bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). **Prior to clearing, local community restoration/rehabilitation groups, Landcare groups, relevant councils and National Parks and Wildlife Service will be consulted with to determine if there is an interest in the reuse of suitable timber and root balls not used by the project for habitat enhancement and rehabilitation work. If there is an interest, Transport for NSW will facilitate collection of native trees (greater than 25-30 centimetres in diameter and three metres in length) and root balls where reasonable and feasible.**

B4.22 Revegetation and replanting

B4.22.1 Use of local provenance native species for revegetation

Issue raised

Environment, Energy and Science Group recommends that any landscaping/planting associated with the surface works for the Beaches link component and the Gore Hill Freeway Connection component of the project (including the screen planting, restoration of areas disturbed during construction, revegetation of the disturbed area of Burnt Bridge Creek etc) uses a diversity of local provenance native species from the relevant native vegetation community (or communities) that occurs, or once occurred in the locality of the proposed surface works rather than use exotic species or non-local native species.

Response

The strategic urban design framework for the project (refer to Section D1.3 of this submission report) includes the requirement to utilise endemic species as appropriate in the landscape design (refer to Sections 3.3.2 and 3.3.6 of Appendix V (Technical working paper: Urban design, landscape character and visual impact)). The urban design and landscape plan will be further developed during further design development and implemented in line with the strategic urban design framework, in accordance with environmental management measure V1 (refer to Table D2-1 of this submissions report). It is also noted that an urban design requirement for Burnt Bridge Creek is to restore riparian corridor vegetation where required through appropriate selection of endemic riparian species (refer to Section 4.8.5 of Appendix V (Technical working paper: Urban design, landscape character and visual impact)).

In accordance with revised environmental management measure V13 (refer to Table D2-1 of this submissions report), where mature amenity trees (other than trees offset under the NSW Biodiversity Offsets Scheme) are removed as a result of the establishment of construction support sites, replacement trees will consist of local native provenance species from the vegetation

community that once occurred in the locality (rather than plant exotic or non-local native trees) where available and subject to the urban design and landscape plan.

Further discussion on revegetation of Burnt Bridge Creek is provided in Section B6.2.2 of this submissions report.

B4.22.2 Details regarding number and species of replacement trees

Issue raised

Details need to be provided on where the replacement trees are proposed to be planted and the number of replacement trees and the species. Trees should preferably be of an advanced size to assist in improving the urban tree canopy and local biodiversity.

Response

The urban design principles for landscape treatments are to '*provide new and reinstated landscapes that are appropriate to the local conditions, consistent with the existing varied character of the project, provide opportunities to increase canopy cover wherever possible and provides improved public realm amenity'*. Further detail is provided in Section 3.4.9 of Appendix V (Technical working paper: Urban design, landscape character and visual impact), which outlines the key objectives of landscaping and revegetation. These do not include quantitative targets, rather an objective to retain or reinstate vegetation.

Details on the location of, number of and species of replacement trees would be developed during further design development and specified in the urban design and landscape plan that will be developed for the project in accordance with environmental management measure V1 (refer to Table D2-1 of this submissions report). This will confirm the extents of disturbed areas within the construction footprint, which will enable the number of trees requiring replacement to be more accurately quantified. In addition, landscaping would be carried out progressively and would contain a mixture of grasses, shrubs and trees to ensure that biodiversity is maintained. Vegetation selected would consist of both established and juvenile species, further promoting urban tree canopy.

Where mature amenity trees (other than trees offset under the NSW Biodiversity Offsets Scheme) are removed as a result of the construction, trees will be replaced at a ratio of 2:1 and replacement trees will consist of local native provenance species from the vegetation community that once occurred in the locality where available (in accordance with revised environmental management measure V13, refer to Table D2-1 of this submissions report).

B4.22.3 Recommended conditions of approval regarding revegetation and replanting

Issue raised

Environment, Energy and Science Group recommends the following as conditions of approval:

- Any planting for the project shall use a diversity of local provenance native trees, shrubs and groundcover species (rather than exotic species or non-local native species) from the relevant native vegetation community (or communities) that occurs or once occurred in proximity to the surface works
- Trees removed by the project must be replaced at a ratio greater than 1:1 for trees that are not covered by a biodiversity offset strategy
- Tree planting shall use advanced and established trees with a minimum plant container pot size of 100 litres, or greater for tree species which are commercially available. Other tree species which are not commercially available may be sourced as juvenile sized trees or pre-grown from provenance seed.

- Enough area/space is provided to allow the trees to grow to maturity
- A Landscape Plan is to be prepared and implemented by an appropriately qualified bush regenerator and include details on:
  a) Seed collection – the location of all native seed sources should be identified
  b) The type, species, size, quantity and location of replacement trees and the plan demonstrates replacement trees plantings will deliver a net increase in trees for trees that are not covered by a biodiversity offset strategy
  c) The species, quantity and location of shrubs and groundcover plantings
  d) The native vegetation community (or communities) that once occurred in the areas to be planted and the plan demonstrates that the plant species consist of local provenance
  e) The quantity and location of plantings
  f) The pot size of the trees to be planted
  g) The area/space required to allow the planted trees to grow to maturity.

Response

The recommendation from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

As outlined in responses above, the strategic urban design framework for the project includes the requirement to utilise endemic species as appropriate in the landscape design (refer to Sections 3.3.2 and 3.3.6 of Appendix V (Technical working paper: Urban design, landscape character and visual impact) and Section D1.3 of this submission report). Where mature amenity trees (other than trees offset under the NSW Biodiversity Offsets Scheme) are removed as a result of the construction, trees will be replaced at a ratio of 2:1 and replacement trees will consist of local native provenance species from the vegetation community that once occurred in the locality where available (in accordance with revised environmental management measure V13, refer to Table D2-1 of this submissions report).

Vegetation will be re-established in the construction footprint, where feasible, in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) as required by environmental management measure B13 (refer to Table D2-1 of this submissions report). *Guide 3: Re-establishment of native vegetation* includes consideration of plant spacing, including that it should reflect local conditions and is dense enough to ensure plants achieve a timely coverage of the ground.

An urban design and landscape plan will be developed during further design development in line with the strategic urban design framework for the project as required by environmental management measure V1 requires (refer to Table D2-1 of this submissions report). The actual number trees, extent of planting locations and species to be replaced would be developed during further design development and specified in the urban design and landscape plan.

Landscaping would be carried out progressively and would contain a mixture of grasses, shrubs and trees to ensure that biodiversity is maintained. Vegetation selected would consist of both established and juvenile species, further promoting urban tree canopy.

B4.23 Balgowlah Golf Course stormwater harvesting dam

Issue raised

Details are required as to whether Balgowlah Golf Course stormwater harvesting dam provides potential habitat for native fauna including native aquatic fauna/foraging habitat for threatened flora etc.

The Environment, Energy and Science Group requested that if the Balgowlah Golf Course stormwater harvesting dam provides potential habitat for native fauna then a Construction Flora and Fauna Management Plan should include a dewatering/fauna relocation plan. The Environment, Energy and Science Group requested the following as a condition of approval:

A dewatering plan will be developed by a suitably qualified and experienced ecologist prior to dewatering Balgowlah Golf Course stormwater harvesting dam. The plan will include details on:

- The native fauna species known to inhabit and/or use the dam which require transfer from the dam
- The methodology proposed to transfer the fauna
- The location and suitability of the proposed relocation sites
- Any potential impacts of relocating the fauna to the relocation sites
- The need for a suitably qualified ecologist to be present during the dam dewatering.

Response

Impacts to freshwater ecology are considered in Annexure D (Freshwater ecology impact assessment) of Appendix S (Technical working paper: Biodiversity development assessment report). Section 3.1.3 of Annexure D describes the Balgowlah Golf Course stormwater harvesting dam as a four megalitre pond/dam that is used to irrigate Balgowlah Golf Course. It was completed in 2013.

Balgowlah Golf Course was also identified as potentially offering foraging, nesting and roosting habitat to bats, birds and arboreal mammals, including Grey-headed Flying-fox, in Section 3.7.1 of Appendix S (Technical working paper: Biodiversity development assessment report). An additional field survey of the existing stormwater harvesting dam in the Balgowlah Golf Course was carried out for the project on 22 June 2021 by ecologists from Arcadis to assess habitat potential of the dam. It was noted that the dam includes rubber matting base overlain with soft sediment and rock. Sparsely emergent aquatic vegetation (eg *Persicaria* sp. and *Juncus* sp.) occurs near the dam banks and filamentous green algae were recorded within the dam. Rocks, exotic grasses, and exotic herbs and forbs occur on the dam banks.

The dam provides habitat for common aquatic fauna adapted to highly modified aquatic environments such as eels, Mosquitofish (*Gambusia holbrooki*) and turtles. Aquatic birds (eg ducks) could forage in the dam though there is minimal habitat for nesting. The dam could also provide foraging habitat for microbats. Given its recent construction and disconnection from natural watercourses it is unlikely to provide potential habitat for native fish or threatened fauna species.

The stormwater harvesting dam at Balgowlah Golf Course could provide a water source for terrestrial fauna. However, it is noted that there are also pools in the adjacent section of Burnt Bridge Creek (refer to Section 3.1.3 of Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report) and other large freshwater waterbodies that could be used by more mobile fauna species, such as bats and birds, at Many Dam to the north and Manly Golf Club to the east.

Following exhibition of the environmental impact statement, consultation with Northern Beaches Council has occurred and it has now been confirmed that there is an ongoing need for the stormwater harvesting scheme. As such, a suitable alternate location and size for the stormwater harvesting dam will be determined as part of the dedicated consultation and follow on design process associated with the final layout of the new and improved public open space and recreation facilities at Balgowlah. The project has also been refined such that the new dam would be installed and commissioned before the existing dam is decommissioned (refer to Section A4.8 of this submissions report for further details on this refinement). The above as resulted in environmental management measure WQ1 being revised as follows (refer to Table D2-1 of this submissions report):

> The ~~need~~ **final design** for a stormwater harvesting water quality basin at Balgowlah **to replace the existing Balgowlah Golf Course stormwater dam will be developed** ~~assessed and determined~~ during further design development **in consultation with Northern Beaches Council**. ~~If the stormwater harvesting water quality basin is considered to be required, a~~ **A** suitable alternate location **and size for the basin** ~~and future use~~ will be determined as part of the dedicated consultation **and follow on design** process **associated with** the final layout of the new and improved public open space and recreation facilities at Balgowlah.
>
> **The new stormwater harvesting basin at Balgowlah will be constructed and operational prior to the decommissioning of the existing Balgowlah Golf Course stormwater dam.**

Given that a replacement stormwater harvesting dam would be provided prior to the existing dam being decommissioned, and considering the presence of the alternative freshwater waterbodies nearby, any temporary disturbance on terrestrial fauna due to nearby construction activities and/or the replacement of the stormwater harvesting dam would not be expected to be significant. In addition, it is expected that potential impacts to common native aquatic fauna would be negligible as comparable habitat will be established prior to the existing dam being decommissioned.

The recommendation for a dewatering/fauna relocation plan from Environment, Energy and Science Group is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Notwithstanding, the dewatering of the Balgowlah Golf Course stormwater harvesting dam will be carried out in accordance with *Technical Guideline: Environmental Management of Construction Site Dewatering* (RTA, 2011b) as required by environmental management measure B8 (refer to Table D2-1 of this submissions report). Dewatering of the dam will be carried out with consideration of native aquatic fauna species and fish species and appropriate measures will be implemented to relocate native aquatic fauna as required. Any exotic fauna encountered during dewatering activities will be captured, humanely euthanised and disposed of in accordance with the *Waste Classification Guidelines* (NSW Environment Protection Authority (EPA), 2014b) in accordance with new environmental management measure B42 (refer to Table D2-1 of this submissions report).

This above measure will be supported by the implementation of a flora and fauna management plan, as described in Section D1 of this submissions report, which would include details on dewatering management.

B4.24 Garigal National Park

B4.24.1 Guidelines for developments adjoining land managed by the Office of Environment and Heritage

Issue raised

As surface works associated with this project (the upgrade and realignment of Wakehurst Parkway) adjoin Garigal National Park, the project should be consistent with the *Guidelines for developments adjoining land managed by the Office of Environment and Heritage* (OEH, 2013) where relevant.

Response

The environmental impact statement considered the *Guidelines for developments adjoining land and water managed by the Office of Environment and Heritage* (OEH, 2013), as outlined in Table 20-8 of the environmental impact statement. It should be noted the 2013 guideline has been superseded by the *Developments adjacent to NPWS lands: Guidelines for consent and planning authorities* (National Parks and Wildlife Service (NPWS), 2020) since the development of the environmental impact statement. Notwithstanding, the requirements of both versions are similar. The outcome of the assessment carried out in Table 20-8 of the environmental impact statement is provided in Table B4-8, with updates to reflect the changes between the 2013 guideline and 2020 guideline.

Table B4-8 Issues to be considered for projects adjacent to National Parks and Wildlife Services land

Issues to be considered for projects adjoining Office of Environment and Heritage land	Where addressed in the environmental impact statement
Erosion and sediment control	An assessment of the project's impact on soil and land resources, with particular emphasis on soil erosion and sediment transport, is provided in Chapter 16 (Geology, soils and groundwater) of the environmental impact statement. Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement assesses the potential impacts on surface water with regard to erosion, siltation, and bank stability. Impacts from scour and erosion on geomorphology are also discussed.
Stormwater runoff	Minimising the effects of proposed stormwater and wastewater management on natural hydrological attributes and on the existing capacity of stormwater systems is described in Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement.
Wastewater	The effects of proposed stormwater and wastewater management on surface water quality are assessed in Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement. Information on wastewater discharge, including volumes and rates of discharge, are also discussed.
Management implications relating to pests, weeds, and edge effects	Impacts to terrestrial flora, including edge effects, spread of weeds and pathogens is discussed in Chapter 19 (Biodiversity) of the environmental impact statement.

Issues to be considered for projects adjoining Office of Environment and Heritage land	Where addressed in the environmental impact statement
Fire and the location of asset protection zones	An assessment of bushfire risks relating to construction and operation is presented in Chapter 23 (Hazards and risks) of the environmental impact statement.
Boundary encroachments and access through NPWS land	The project would not encroach on or require access though National Parks and Wildlife Services land.
Visual, odour, noise, vibration, air quality and amenity impacts	Consideration of these impacts is provided in Chapter 8 (Construction traffic and transport), Chapter 9 (Operational traffic and transport), Chapter 10 (Construction noise and vibration), Chapter 11 (Operational noise and vibration), Chapter 12 (Air quality), Chapter 21 (Socio-economics) and Chapter 22 (Urban design and visual amenity) of the environmental impact statement. Possible noise, vibration, dust and light spill impacts to native fauna species are discussed in Chapter 19 (Biodiversity) of the environmental impact statement.
Threats to ecological connectivity and groundwater-dependent ecosystems	Habitat connectivity is addressed in Chapter 19 (Biodiversity) of the environmental impact statement. Impacts to groundwater dependent ecosystems are considered in Chapter 16 (Geology, soils and groundwater) and Chapter 19 (Biodiversity) of the environmental impact statement.
Cultural heritage	Impacts to non-Aboriginal heritage are assessed in Chapter 14 (Non-Aboriginal heritage) of the environmental impact statement and impacts to Aboriginal heritage are assessed in Chapter 15 (Aboriginal heritage) of the environmental impact statement.
Access to parks	Consideration of construction traffic impacts is provided in Chapter 8 (Construction traffic and transport) of the environmental impact statement and consideration of operational traffic impacts is provided in Chapter 9 (Operational traffic and transport) of the environmental impact statement.

B4.24.2 Avoidance of impacts to Garigal National Park

Issue raised

The environmental impact statement notes “widening of Wakehurst Parkway, is facilitated mostly on the eastern side to avoid impacts on the Garigal National Park” (Section 22.5.1 of the environmental impact statement). It is important the project avoids impacts on the National Park and this includes additional edge effects, the introduction and spread of weeds, soil disturbance, soil erosion and sediment deposition (Sections 5.2.1 and 5.2.2 of Appendix S (Technical working paper: Biodiversity assessment report)).

Response

Potential impacts to Garigal National Park have been assessed in Chapter 20 (Land use and property) of the environmental impact statement through the application of *Guidelines for developments adjoining land and water managed by the Office of Environment and Heritage* (OEH, 2013) and as summarised in Section B4.24.1 above (and updated for the NPWS (2020) guideline).

The project would require the clearing of vegetation in road reserve areas along the Wakehurst Parkway. No vegetation would be cleared in Garigal National Park. Potential impacts associated with increases in habitat fragmentation (edge effects) and indirect impacts to native vegetation as a result of the project are discussed in Section 19.5.1 of the environmental impact statement. The project would result in indirect impacts to areas of native vegetation adjoining the construction footprint along Wakehurst Parkway, mainly due to fragmentation of vegetation and creation of new edges, which may result in edge effects. However, this vegetation is already situated adjacent to an existing cleared edge of Wakehurst Parkway and is subject to ongoing disturbance and edge effects.

Construction activities may facilitate the introduction or spread of exotic grasses and other weed species as acknowledged in Section 19.5.1 of the environmental impact statement. Areas along the Wakehurst Parkway would be particularly susceptible to weed establishment due to earthworks being carried out to widen the road.

A number of environmental management measures have been proposed to minimise and/or manage these impacts including (refer Table D2-1 of this submissions report):

- The clearing of native vegetation and fauna habitat at Wakehurst Parkway will be further minimised during further design development and construction planning to the extent reasonably practicable (refer to revised environmental management measure B6)
- The spread of weed species along Wakehurst Parkway will be managed in accordance with *Guide 6: Weed Management* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) (refer to environmental management measure B25).

Potential erosion and sedimentation impacts will be managed in accordance with the principles and requirements in *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004), *Managing Urban Stormwater: Soils and Construction - Volume 2D Main Road Construction* (Department of Environment and Climate Change (DECC), 2008) and relevant guidelines, procedures and specifications of Transport for NSW as required by environmental management measure SG9 (refer to Table D2-1 of this submissions report).

B4.24.3 Spread of weeds

Issue raised

Drainage lines/ephemeral streams near the Wakehurst Parkway which flow to the west and east provide a potential conduit to spread weeds into the National Park and Manly Warringah War Memorial State Park. Section 5.2.4 of Appendix S (Technical working paper: Biodiversity development assessment report) states management measures are required to minimise the risk of introduction and spread of weeds. The environmental management measures need to be in place prior to construction commencing, and regularly maintained during construction and operation of the project. It is suggested the drainage lines are monitored prior to construction commencing, during and following construction to assess if weed invasion impacts have occurred as a result of the project.

Response

As noted above in Section B4.17, potential biodiversity impacts from the spread of weeds, pathogens and disease are discussed in Section 19.5.1 of the environmental impact statement and detailed in Section 5.2.4 of Appendix S (Technical working paper: Biodiversity development assessment report).

Weed species will be managed in accordance with *Guide 6: Weed Management* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) as required by environmental management measure B25, whereas pathogens will be managed in accordance with *Guide 7: Pathogen Management* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) as required by revised environmental management measure B26 (refer to Table D2-1 of this submissions report). The use of Transport for NSW's *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) will ensure best management practice is applied to minimising and managing the spread of weeds, pathogens and disease.

These above measures would be supported by the implementation of a flora and fauna management plan as described in Section D1 of this submissions report. The flora and fauna management plan would include weed management measures and monitoring and inspection requirements.

With regard to operational impacts, landscaping of disturbed areas (as well as vegetated swales) will be carried in accordance with the urban design and landscape plan as required by environmental management measure V1 (refer to Table D2-1 of this submissions report). The plan would include identification of vegetation species composition, planting layout and densities in accordance with relevant Transport for NSW guidelines, including controls to minimise weed infestation and spread.

B4.24.4 Monitoring programs to facilitate positive outcomes of fauna crossings

Issue raised

The National Parks and Wildlife Service considers there are opportunities for monitoring programs and also pest control activities to facilitate positive outcomes of the fauna crossings.

Response

As discussed in Section B4.15 above, an ecological monitoring program will be developed in consultation with Environment, Energy and Science Group and Northern Beaches Council to determine the effectiveness of the proposed fauna connectivity measures and exclusion fencing, which is reflected by the new environmental management measure B44 (refer to Table D2-1 of this submissions report). The need for pest control activities would be considered during the development of the program and could include relevant performance indicators and corrective actions.

B4.24.5 Potential impacts to groundwater dependent systems

Issue raised

In relation to potential impacts to groundwater dependent systems as a result of groundwater drawdown, in addition to the mitigation measures in the environmental impact statement, it is suggested monitoring of the wetlands and peripheral areas is carried out to assess for fauna and flora changes and mitigation/offset type actions such as weed invasion, feral pest control/bush regeneration/natural heritage enhancement activities.

Response

Discussion on the potential impacts associated the Coastal Upland Swamp TEC within Garigal National Park is provide in Section B4.16.14.

Groundwater drawdown beneath the section of Coastal Upland Swamp TEC west of Wakehurst Parkway and within Garigal National Park is modelled to be between zero and one metre by the year 2128. The groundwater dependence of this swamp is uncertain, as the water level is around 10 metres below ground level. The water table beneath this swamp may be affected by drawdown, but it is likely that the swamp also receives water from surface runoff and subsurface drainage from upslope perched aquifers, and that the availability of this water to support the swamp would not be affected.

The drawdown impact (if experienced) would be reduced following implementation of revised environmental management measures SG2 and SG16 (refer to Table D2-1 of this submissions report). As noted in Section B4.16.19 and the detailed assessment of impacts on groundwater dependent ecosystems based on the revised groundwater modelling (refer to Annexure B of Appendix E of this submissions report), no additional management or mitigation measures, such as monitoring programs, are considered necessary to address the predicted impacts from groundwater baseflow reductions as a result of the project.

B4.24.6 Ongoing monitoring and pest control

Issue raised

Ongoing monitoring and pest control is recommended to check and enhance survival of threatened species – such as the Southern Brown Bandicoots and Southern Myotis, two species that may be affected by the road crossing. Such studies may establish a base population and to determine if the fauna fencing and underpasses/rope crossings are effective, including the installation of cameras at the crossings and/or a combination of surveys. The submissions report needs to address funding for survey monitoring and fox control (ie to mitigate the impacts of foxes preying on native fauna using the underpass crossings).

Response

As discussed in Section B4.15, an ecological monitoring program will be developed in consultation with Environment, Energy and Science Group and Northern Beaches Council to determine the effectiveness of the proposed fauna connectivity measures and fauna exclusion fencing, which is reflected by the new environmental management measure B44 (refer to Table D2-1 of this submissions report). The program will include construction/post-construction monitoring of targeted fauna species, threatened or protected species, and pest species, in addition to key performance criteria that trigger the need for and feasibility of potential corrective actions. The program will consider the pre-construction baseline monitoring results and ecological monitoring data collected for the Northern Beaches Hospital road upgrade project where relevant.

B4.24.7 Design of fauna fencing

Issue raised

The National Parks and Wildlife Service has an interest in the design of the fauna fencing (fire fighter access, logical mountain bike connection, and Aboriginal site protection). The fauna fencing needs to consider fire fighter access due to its long boundary. The fauna fencing should include for example, a lockable pedestrian gate approximately every 100 metres, with a fire lock so fire fighters can establish escape routes during fire operations.

Access points through the fauna fencing for mountain bikes needs to be considered, providing logical access from Gahnia mountain bike trail in Garigal National Park to Manly Dam mountain bike trails but it should not jeopardise the Bantry Bay Engravings from alternative mountain bike short cuts/unauthorised access to other trails. National Parks and Wildlife Service support the fauna fence being located on the western side of engravings track as this will help protect the engravings.

The Environment, Energy and Science Group considers that any access points through the fauna fencing for fire fighter access and mountain bikes should not jeopardise biodiversity conservation outcomes.

Response

The design specifications of fauna exclusion fencing will be developed during further design development in accordance with environmental management measure B3 (refer to Table D2-1 of this submissions report). In consideration of the comment provided by National Parks and Wildlife Service, environmental management measure B3 has been revised to incorporate consultation with National Parks and Wildlife Service regarding the fauna exclusion fencing design:

> Fauna exclusion fencing **will ~~would~~** be designed to exclude small fauna species from the road corridor**,** such as Eastern Pygmy-possum**,** and will be installed for the full extent of the Wakehurst Parkway within the construction footprint**. In addition, frog fencing will be added to the fauna exclusion fencing within identified Red-crowned Toadlet habitat.** The design specifications of the fauna exclusion fence will be developed during further design development including the need for access gates to manage any fauna on the ~~roadside~~ **road side** of the fauna exclusion fence based on best available knowledge from other Transport for NSW projects**, and in consultation with NSW National Parks and Wildlife Service and Northern Beaches Council**.

Fauna fencing would track as close as practicable to the road formation. Generally, it would traverse the top of cuttings and the toe of embankments. Where fauna and cyclist/pedestrian underpasses are configured as openings in retaining walls the fence would terminate on each side of the opening. Where fauna and cyclist/pedestrian underpasses are configured as openings in a fill embankment, the fence would likely track up the fill embankment and be continuous above the opening. Where pedestrian connections are required to bus stops a suitable gate in the fence would be provided.

Fauna fencing would be located on the eastern side of the Engravings Trail, between the trail and the road. The key link between walking/mountain bike trails in Garigal National Park and Manly Dam mountain bike trails would be the shared user underpasses. For example, the Engravings Trail within the Garigal National Park would connect to the Trig Track within Manly Warringah War Memorial State Park via a new shared user underpass (refer to Section A4.5 of this submissions report for further details regarding further targeted investigations carried out to determine potential impacts on mountain bike trails, and map where these active transport facilities are located). Transport for NSW would continue to engage with relevant mountain biking associations during the detailed design of the project to minimise impacts to these groups.

Transport for NSW agree that biodiversity conservation outcomes should not be jeopardised by access points through the fauna fencing for fire fighter access and mountain bikes.

B4.25 Floodplain risk management

B4.25.1 Management of events up to the probable maximum flood

Issue raised

Environmental management measure F1 (Impact of the project on flood behaviour) should be extended. Currently, the measure aims to minimise flood level increases on residential, commercial

and/or industrial buildings in the 1% Annual Exceedance Probability (AEP) flood event. The measure should also include relevant consideration of:

- All flood events up to and including the Probable Maximum Flood (PMF) and climate change events
- Critical infrastructure and sensitive land uses.

Appendix R (Technical working paper: Flooding) notes the following significant increases in PMF levels:

- About 110 millimetres in existing residential development along the main arm of Flat Rock Creek to the east of the rail corridor
- About 500 millimetres in up to six existing dwellings upstream of the Burnt Bridge Creek Deviation
- About 600 millimetres in six residential properties in Kitchener Street and Balgowlah Road.

These impacts and those under projected climate change should be considered in the intent of the environmental management measure.

Response

The assessment carried out in Appendix R (Technical working paper: Flooding) indicates that the project would generally result in a neutral or beneficial effect on flood behaviour external to the road corridor for design floods up to 1% AEP. There are a few exceptions, but they do not involve inundation above floor level at any buildings. Due to how rarely these events would occur, development controls do not typically aim to protect buildings in the vicinity of watercourses from events of these magnitudes.

Environmental management measure F1 (refer to Table D2-1 of this submissions report) is based on the 1% AEP event as the 1% AEP design flood is considered to be the most relevant design flood, as under development controls, minimum floor levels for properties in the vicinity of watercourses are typically set in relation to the peak levels in the 1% AEP design flood. Where flood levels in the 1% AEP event are predicted to increase at any residential, commercial and/or industrial buildings as a result of operation of the project, a floor level survey will be carried out. If the survey indicates existing buildings would experience above floor inundation during a 1% AEP event as a result of the project, further refinements will be made (as required) to the design of permanent project components to minimise the potential for impacts (refer to environmental management measure F1 in Table D2-1 of this submissions report).

Updated figures from Appendix R (Technical working paper: Flooding) including insets at a larger scale and building outlines are provided in Appendix G of this submissions report to provide clarity as to where the modelled impacts are relative to the existing structures. The assessment indicates that the impacts to properties in floods greater than the 1% AEP design flood are predominantly confined where creeks travel through properties (as opposed to buildings).

As outlined in Section A4.10 of this submissions report, Transport for NSW is obliged to ensure that the impact of the project on flood behaviour during events greater than 1% AEP in magnitude does not result in:

- Adverse impacts on critical infrastructure (such as hospitals) and vulnerable development (such as aged care facilities and schools), and
- Significant increases in the hazardous nature of flooding that would lead to an increased risk to life.

No land uses listed under point a) above are being adversely impacted by the project during events greater than 1% AEP. In regards to point b) above, it is considered that the impacts attributable to the project in the PMF event does not present a significant increase in the hazardous nature of flooding, with the possible exception of six residential dwellings that are located upstream of Burnt Bridge Creek Deviation; the project has the potential to increase peak flood levels by up to about 0.5 metres in these dwellings during more extreme storm events more intense than the 1% AEP event. While floor level survey would be required in order to assess whether the project would significantly increase the flood hazard in the six affected dwellings, it is noted that the depth of above-ground inundation associated with three of the affected dwellings exceeds two metres in a PMF event under present day conditions, as outlined in Section 6.2.1.2 of Appendix R (Technical working paper: Flooding).

Transport for NSW is committed to minimising and/or eliminating adverse impacts in residential developments located upstream of Burnt Bridge Creek deviation. Following exhibition of the environmental impact statement, Transport for NSW is carrying out further refinement of the Reference Design to reduce road levels at the existing creek crossing of Burnt Bridge Creek so that, subject to final detailed design and final flood modelling, the impacts upstream of Burnt Bridge Creek Deviation can be minimised to the greatest extent possible.

Flooding impacts in other areas are considered to be minor or confined to areas where there is no development. Notwithstanding, during further design development, Transport for NSW would include appropriate mitigations within the design to ensure that there would not be an unacceptable increase in flood hazard in existing development and therefore risk to life during floods larger than 1% AEP.

It should also be considered that the final landform and associated flood modelling results downstream of the creek crossing of Burnt Bridge Creek Deviation is not final and subject to further consultation with the community and stakeholders regarding final agreed features associated with the new and improved open space and recreation facilities at Balgowlah. As such, final detailed design, including the modified basin to replace the existing golf course dam, will be subject to further consultation, final detailed design and final flood modelling. The intention would be for the new and improved open space and recreation facilities and basin to be designed to minimise where possible impacts downstream and to the northwest within North Balgowlah, once the final landform of the former Balgowlah Golf Course has been determined.

To reflect Transport for NSW's commitment to not significantly increase flooding hazard, environmental management measure F2 (refer to Table D2-1 of this submissions report) has been revised as follows:

> Impact of the project on flood behaviour during operation will be confirmed during further project development. This will include the consideration of future climate change and a partial blockage of the local stormwater drainage system. **The project will be designed such that the flood hazard in existing residential development during floods larger than 1% AEP would not be significantly increased such that there would be an increased risk to life.**

Further, new environmental management measure F10 has been developed to reflect Transport for NSW's commitment to minimise/eliminate adverse flooding impacts in residential development upstream of the Burnt Bridge Creek Deviation crossing of Burnt Bridge Creek (refer to Table D2-1 of this submissions report):

> Opportunities to minimise and/or eliminate adverse impacts in residential development that is located upstream of the Burnt Bridge Creek Deviation for events greater than the 1% AEP event will be investigated during further design development. This would include refinement

of road levels at the existing creek crossing of Burnt Bridge Creek, and detailed design of the new stormwater basin at Balgowlah.

B4.25.2 Impact of the project on scour potential

Issue raised

Environmental management measure F4 (impact of the project on scour potential) should be extended to include all relevant areas, not only along Wakehurst Parkway and drainage outlets. The project has the potential to cause scour of Burnt Bridge Creek beyond the outlet of the transverse drainage structure, as documented in the environmental impact statement. Figure 6-5 of Appendix O (Technical working paper: Surface water quality and hydrology) shows scour protection at the outlet only, however Part 2 of Appendix R (Technical working paper: Flooding) shows high velocity increases through the Balgowlah Golf Course. The potential use of stormwater detention to mitigate scour impacts should be explicitly included for the Wakehurst Parkway segment.

Response

Details of the proposed design of the project, including surface water drainage infrastructure where applicable, is provided in Section 5.2.6 and Table 5-7 of the environmental impact statement. Specific mention of scour countermeasures is made for the localised adjustment at Burnt Bridge Creek and diversion of the existing stormwater drainage line leading into Flat Rock Creek at Artarmon. As a result, environmental management measure F4 only referred, specifically to Wakehurst Parkway.

Notwithstanding, environmental management measure F4 (refer to Table D2-1 of this submissions report) has been revised as follows to cover all relevant areas which may experience increased risk of scour:

> Measures will be assessed during further design development which are aimed at reducing as far as is practical the risk of increased scour in the receiving drainage lines that are located along the Wakehurst Parkway. **Further design development should include consideration of the resistance of the soil materials to the hydraulic forces likely to be imposed.** Scour countermeasures will also be provided at the outlet of new or upgraded transverse and longitudinal lines**, as well as in other areas where the project would otherwise result in unacceptable increases in scour potential**.

The changes in flow velocity in the Balgowlah Golf Course are principally a function of the change in the topography in the golf course, and are relative to existing flow velocities which are generally not high enough to cause scour of grassed areas. It is difficult to pinpoint exactly where scour countermeasures would be required in the new and improved open space and recreation facilities at Balgowlah as the final landform is not known and is subject to a dedicated consultation process jointly led by Transport for NSW and Northern Beaches Council, which would take place to give the community an opportunity to provide input into the final layout. Survey of the inbank area of the creek is also not available at this stage of the project, so it is not possible to determine with a high degree of confidence the scope of any scour countermeasures.

As noted above, the risk of scour and the need to manage potential scour impacts resulting from the project is addressed by revised environmental management measure F4 (refer to Table D2-1 of this submissions report. Revised environmental management measure F4 does not preclude the use of stormwater detention as recommended by the Environment, Energy and Science Group, or any other countermeasures, assessed as being practical to reduce scour impacts.

B4.25.3 Emergency management response plan

Issue raised

The figures indicate a significant impact (increase in flood levels and duration of inundation) in Sydney Road at Balgowlah Oval that may impact emergency management. This impact has not been discussed in the environmental impact statement and needs detailed consideration. The proponent may be required to prepare an emergency management response plan in consultation with the State Emergency Service (SES) and Council (refer to Secretary's environmental assessment requirement 11.2.h). This may also be necessary in the area of Dickson Avenue and Reserve Road in Artarmon. For locations where emergency management may be affected, the project should provide further detail and confirm the extent of the impact. Emergency management should consider the full range of flooding up to the PMF.

Response

Flooding impacts within the road corridor are assessed in Section 18.6.2 of the environmental impact statement. Sydney Road (at Balgowlah Oval) is located in the Burnt Bridge Creek catchment. Section 18.6.2 of the environmental impact statement identified that the depth of flow in the road corridor would be increased within the Burnt Bridge Creek catchment in storm events during operation of the project. However, it was also noted that improvements to the existing pavement drainage system were not incorporated into the flood models. The aim of the improvements to the existing pavement drainage system is to control runoff during operation of the project.

The impact of the project on flood behaviour during operation will be confirmed during further project development, consistent with revised environmental management measure F2 (refer to Table D2-1 of this submissions report). This will include the consideration of future climate change and a partial blockage of the local stormwater drainage system. The project will be designed such that the flood hazard in existing residential development during floods larger than 1% AEP would not be significantly increased such that there would be an increased risk to life. Provided the mitigation measures described in Table D2-1 are effectively implemented, the project would not have an adverse impact on the NSW State Emergency Service's emergency response arrangements.

Councils and the NSW State Emergency Service are identified as stakeholders in Table 6-1 of Appendix E (Community consultation framework) of the environmental impact statement. Transport for NSW have carried out consultation with Councils and the NSW State Emergency Service during preparation of the environmental impact statement and will continue to do so in the next phases of the project. Flood emergency management measures for construction and operation of the project will be prepared in consultation with the NSW State Emergency Service and relevant councils in accordance with environmental management measure F3 (refer to Table D2-1 of this submissions report).

B4.25.4 Modelling issues and uncertainty

Issue raised

The environmental impact statement claims modelling issues are the likely cause of some flood impacts shown. This uncertainty should be resolved as soon as feasible to ensure any genuine impacts are identified.

Response

Section 6 of Appendix R (Technical working paper: Flooding) assess operational flooding impacts. Appendix R includes two footnotes (on page 49 and 51), which indicate that where the report figures

show impacts at locations remote from the project, these impacts are considered to be artefacts of the hydraulic model. These locations are at such a distance so that the impacts would not be attributable to the project. While it is possible to remove these artificial impacts through further refinement of the hydraulic model, it is not considered to be necessary at this time. The impact of the project on flood behaviour during operation will be confirmed during further project development, consistent with environmental management measure F2 (refer to Table D2-1 of this submissions report).

B4.25.5 Changes in hazard category

Issue raised

Where offsite impacts remain after mitigation measures, then the assessment should consider if there is any significant change in hazard category (H1-H6). This is also relevant where emergency management may be impacted.

Response

In accordance with the requirement of the Secretary's environmental assessment requirements, flood hazard has been assessed using the definitions set out in the *NSW Floodplain Development Manual: The Management of Flood Liable Land* (NSW Government, 2005). The impacts attributable to the project for storm events up to 1% AEP in intensity are minor in nature and therefore would not alter the flood hazard as defined in the *NSW Floodplain Development Manual: The Management of Flood Liable Land* (NSW Government, 2005). Further, the project will be designed such that the flood hazard in existing residential development during floods larger than 1% AEP would not be significantly increased such that there would be an increased risk to life in accordance with revised environmental management measure F2 (refer to Table D2-1 of this submissions report).

As required by the requirement of the Secretary's environmental assessment requirements, Transport for NSW has discussed the impacts that the project would have on flood behaviour with NSW State Emergency Services, and they have not raised any particular concerns in regards to emergency management. Flood emergency management measures for construction and operation of the project will be prepared in consultation with the NSW State Emergency Service and relevant councils in accordance with environmental management measure F3 (refer to Table D2-1 of this submissions report).

B4.25.6 Use of hazard categories to determine suitability of land for site facilities

Issue raised

The environmental impact statement suggests that land located outside areas of high hazard would be suitable for site facilities. The Environment, Energy and Science Group recommends the use of H1-H6 hazard categories, rather than the high/low hazard categories used in the environmental impact statement to ensure the land is suitable for the intended purpose.

Response

As required by the requirement of the Secretary's environmental assessment requirements, flood hazard has been assessed in accordance with the definitions set out in the *NSW Floodplain Development Manual: The Management of Flood Liable Land* (NSW Government, 2005).

B4.25.7 Error in environmental management measure phase

Issue raised

Environmental management measure F9 refers to 'operational' in Chapter 18, yet 'construction sites' are referred to. This should be amended.

Response

The comment provided by Environment, Energy and Science Group is noted. The phase in environmental management measure F9 was incorrectly transcribed as operation and should have referred to construction. This has been included as a clarification in Table A5-13 of this submissions report and the phase corrected to 'construction' in Table D2-1 of this submissions report.

B4.25.8 Resolution of flooding figures

Issue raised

The resolution of the flooding figures provided made it difficult to see the extent of impacts. For future submissions, Transport for NSW could consider providing insets or additional figures to show locations with genuine impacts. For example, the extent of PMF level increases in six residential properties in Kitchener Street and Balgowlah Road and that these are confined to the creek as stated in the technical report following should be visible on the figures.

Response

Transport for NSW considers figures are shown at an appropriate scale, reflect the level of detail shown in other recent projects and show the magnitude of impacts for specific areas. Notwithstanding, the following figures from Appendix R (Technical working paper: Flooding) have been updated to include an inset at a larger scale, and provided in Appendix G of this submissions report:

- Figure 6.4 (Sheet 5) – Impact of Project Operation on Flood Behaviour, 10% AEP (Balgowlah)
- Figure 6.6 (Sheets 3, 4 and 5) - Impact of Project Operation on Flood Behaviour, PMF Event (Flat Rock Reserve, Artarmon and Balgowlah)
- Figure B.6 (Sheets 3 and 5) - Impact of Project Operation on Flood Behaviour, 0.2% AEP (Flat Rock Reserve and Balgowlah).

These figures also include building outlines in the insets to make it clear where the modelled impacts are relative to the existing structures. The assessment indicates that while there would be worsening of flooding impacts at certain locations in floods greater than the 1% AEP design flood, this would predominantly occur where creeks travel through properties (as opposed to buildings).

Impact of the project on flood behaviour during operation will be confirmed during further project development in accordance with revised environmental management measure F2. This will include the consideration of future climate change and a partial blockage of the local stormwater drainage system. The project will be designed such that the flood hazard in existing residential development during floods larger than 1% AEP would not be significantly increased such that there would be an increased risk to life.

Refer to Section B4.25.1 and Section A4.10 of this submissions report for further information regarding additional information on flooding impacts to residential properties upstream of Burnt Bridge Creek, and the project's refinement of environmental management measure F2 and new environmental management F10 (refer to Table D2-1 of this submissions report).

B4.25.9 Future assessment of scour potential

Issue raised

Future assessments of scour potential should not be limited to an assessment of velocity but should consider the resistance of the soil materials to the hydraulic forces in question.

Response

The comment provided by Environment, Energy and Science Group is noted and as discussed in Section B4.25.2 above, environmental management measure F4 has been revised to take resistance of soil materials to hydraulic forces into account (refer to Table D2-1 of this submissions report):

> Measures will be assessed during further design development which are aimed at reducing as far as is practical the risk of increased scour in the receiving drainage lines that are located along the Wakehurst Parkway. **Further design development will include consideration of the resistance of the soil materials to the hydraulic forces likely to be imposed.** Scour countermeasures will also be provided at the outlet of new or upgraded transverse and longitudinal lines**, as well as in other areas where the project would otherwise result in unacceptable increases in scour potential**.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B5 – Department of Primary Industries (Fisheries)

November 2021

B5 Department of Primary Industries (Fisheries)

Contents

B5.1 Creek crossings

Issue raised

Department of Primary Industries (Fisheries) recommends that all creek crossings be designed and constructed in accordance with *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003).

Response

The requirements of *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003) have been broadly considered in the environmental impact statement in describing and assessing temporary and permanent drainage infrastructure for the project, including but not limited to:

- Chapter 6 (Construction work)
- Chapter 17 (Hydrodynamics and water quality)
- Chapter 19 (Biodiversity)
- Appendix O (Technical working paper: Surface water quality and hydrology)
- Appendix S (Technical working paper: Biodiversity development assessment report), particularly Annexure D (Freshwater ecology impact assessment).

Consideration has included the need to ensure fish passage and flow conditions are maintained or impacts minimised where possible. For major drainage works, such as the localised adjustment of Burnt Bridge Creek, the gradient, sinuosity and channel capacity will remain consistent with upstream and downstream sections of the creek. In addition, the adjustment would be designed to include a low flow channel which maintains fish passage during low flows. The design requirements for the localised adjustment of Burnt Bridge Creek have been included in environmental management measure WQ4.

Potential impacts to aquatic habitats and the need to maintain fish passage during instream works in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (Roads and Traffic Authority (RTA), 2011a) and the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW Department of Primary Industries (DPI), 2013) are addressed in environmental management measure B27 (refer to Table D2-1 of this submissions report). *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) references the requirements of *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003).

Notwithstanding the above, and to ensure project-wide consideration of designing waterway crossings to maintain fish passage, a new environmental management measure B40 has been prepared as follows (refer to Table D2-1 of this submissions report):

> Temporary and permanent waterway crossings and instream drainage infrastructure will be designed in accordance with *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003) to ensure fish passage is maintained along the waterway during low flows, where reasonable and feasible. Instream habitat landscaping will favour habitat requirements of native species.

B5.2 Loss of fish habitat

Issue raised

Department of Primary Industries (Fisheries) recommends offsetting the loss of fish habitat at a ratio of 2:1.

Response

Department of Primary Industries (Fisheries)'s recommendation on offsetting is noted. Biodiversity offset requirements are discussed in Section 19.6.1 of the environmental impact statement. In relation to fish habitat, and in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013), the project would offset on a minimum 2:1 basis for key fish habitat lost. A greater compensation ratio may be considered if offsets cannot be sourced in the vicinity of the impact or are not of the same habitat type as that impacted.

The potential impact associated with Burnt Bridge Creek (Type 2 key fish habitat) is the only impact that required consideration of offsetting in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013). Final offset calculations would be carried out following further design development.

B5.3 Silt curtains

Issue raised

Department of Primary Industries (Fisheries) recommends that silt curtains be used wherever feasible to reduce impacts of turbidity on aquatic habitats and species.

Response

The use of silt curtains as an integral part of the construction of the Middle Harbour crossing is described in Section 6.4.4 of the environmental impact statement.

During dredging operations, floating silt curtains would be used to minimise impacts on the surrounding marine environment. There will be three types of silt curtain used to provide several layers of protection:

1) Two deep draft silt curtains (one on each side of the crossing) designed with a draft of 10-12 metres placed around the dredging activities
2) Shallow draft silt curtains ('Moon pools') about two to three metres deep immediately at the dredge excavation point, attached to the backhoe dredge
3) Shallow silt curtains around ecologically sensitive areas (eg nearby seagrass and rocky reef habitat) to provide additional protection.

With regards to the shallow silt curtains around ecologically sensitive areas described above, environmental management measure B31 (refer to Table D2-1 of this submissions report) commits to silt curtains being installed around seagrass patches and subtidal rocky reef to minimise potential impacts from turbidity. It should be noted that the wording of environmental management measure B31 has been revised to remove reference to "within the Zone of Influence as described in the Appendix T (Technical working paper: Marine ecology)". When referring to Figure 5-2 of Appendix T (Technical working paper: Marine ecology), the zone of influence does not contain any seagrass patches which would technically preclude the additional silt curtains being placed around sensitive habitats adjacent to the Middle Harbour south cofferdam (BL7), which was not the intention. The

revised environmental management measure is provided below (also refer to Table D2-1 of this submissions report):

> To minimise the potential impact of turbidity (suspended sediment) on sensitive marine vegetation and habitats, silt curtains will be installed around seagrass patches and subtidal rocky reef ~~contained within the Zone of Influence as described in the Appendix T (Technical working paper: Marine ecology)~~ **within 25 metres of the Middle Harbour cofferdam construction support sites (BL7 and BL8).**

The requirement for the three types of silt curtain described above is included in environmental management measure WQ16 (refer to Table D2-1 of this submissions report). Monitoring requirements to ensure the silt curtains are effective as well as siting requirements to ensure any potential indirect impacts on any sensitive marine habitat are minimised are provided in environmental management measures B32 and B33 (refer to Table D2-1 of this submissions report).

B5.4 Management of White's Seahorse

Issue raised

Department of Primary Industries (Fisheries) recommends that an inspection for White's Seahorse be carried out within the 24 hour period prior to the commencement of on-ground disturbances within potential White's Seahorse habitat.

Response

Transport for NSW's commitment to carry out pre-construction surveys of potentially affected marine habitat areas to search for White's Seahorse (and other Syngnathids) and relocate them to nearby habitat is outlined in environmental management measure B5 (refer to Table D2-1 of this submissions report). In response to the issues raised by Department of Primary Industries (Fisheries), environmental management measure B5 has been revised as follows (refer to Table D2-1 of this submissions report):

> Pre-construction surveys of potentially affected marine habitat areas will be carried out ~~as close as practicable to 24 hours~~ **in the 24 hour period** prior to commencement of works **that may impact potential habitat** by suitably qualified and experienced marine ecologists to search for White's Seahorses (and other Syngnathids) and relocate them to nearby habitat.
>
> **Prior to the pre-construction survey, consultation with Department of Primary Industries (Fisheries) will be carried out to obtain a permit under Section 37 of the *Fisheries Management Act 1994* to authorise potential relocations.**

B5.5 Consultation regarding White's Seahorse

Issue raised

Department of Primary Industries (Fisheries) requests to be consulted in relation to the number of White's Seahorse found during the survey of the work area and in relation to the proposed relocation site for any seahorses found. A permit is required under Section 37 of the *Fisheries Management Act 1994* to relocate the White's Seahorses.

Response

A commitment to consulting with Department of Primary Industries (Fisheries) and the need to obtain a permit under Section 37 of the *Fisheries Management Act 1994* has been included in the revised environmental management measure B5 (refer to Table D2-1 of this submissions report). The revised environmental management measure is outlined in Section B5.4 above.

B5.6 Consultation with Department of Primary Industries (Fisheries)

Issue raised

Department of Primary Industries (Fisheries) requests to be consulted in relation to the proposed offset or rehabilitation of impacted nearshore and subtidal habitats, including the development of detailed offset strategies and plans.

Response

Rehabilitating and restoring areas of subtidal rocky reef and intertidal rocky shore, sand and mudflat habitats to be removed as a result of the project, to the extent reasonably practicable is committed to in environmental management measure B34. In response to the issue raised, this environmental management measure has been revised to include consultation with Department of Primary Industries (Fisheries) in relation to this process and is provided below (refer to Table D2-1 of this submissions report):

> Subtidal rocky reef habitat removed along the shoreline at the Middle Harbour north cofferdam (BL8) and intertidal rocky shore, sand and mudflat habitats removed at the Spit West Reserve construction support site (BL9) will be rehabilitated and restored as close as possible to pre-construction conditions **to the extent reasonably practicable** ~~where feasible and reasonable~~ **and in consultation with Department of Primary Industries (Fisheries).**

Biodiversity offset requirements are discussed in Section 19.6.1 of the environmental impact statement. Regarding offsetting of marine impacted nearshore and subtidal habitats, the project is likely to result in 'no net loss' of nearshore and subtidal fish habitat as a result of the implementation of revised environmental management measure B34, and a number of other environmental management measures proposed to minimise impacts to marine vegetation and sensitive habitat (i.e. B28 to B33). As such, offsetting is not anticipated to be required.

B5.7 Monitoring and management plans

Issue raised

Department of Primary Industries (Fisheries) supports the development and implementation of seagrass and water quality monitoring and management plans.

Response

The Department of Primary Industries (Fisheries) comment is noted. Section D1 of this submissions report builds upon the environmental management plan framework identified in Section 28.5 of the environmental impact statement, identifying the framework for the management of key issues. Table D1-1 provides the likely sub-plans, along with the relevant guidelines or requirements of each plan, which would support the implementation of the construction environmental management plan.

Relevant sub-plans to the management of marine ecology issues include:

- Soil and water management plan – which would address, but is not limited to, water quality monitoring and management
- Flora and fauna management plan – which would address, but is not limited to, seagrass monitoring and management measures and intertidal and rocky reef management measures
- Dredge management plan – which would address, but is not limited to, management of dredging operations and measures (ie silt curtains) to be used to minimise potential impacts to sensitive foreshore areas eg seagrass areas.

The above sub-plans would also be prepared based on the requirements of environmental management measures provided in Table D2-1 of this submissions report which address impacts to water quality and marine vegetation and sensitive habitat. However, and as discussed in Section D1.1, the sub-plan structure may be modified during detailed construction planning to respond more effectively to particular contractor or stakeholder requirements.

In addition, monitoring during dredging activities will be carried out as part of a dredge monitoring program. The monitoring program will validate the effectiveness of mitigation measures implemented to manage potential impacts on the water quality and sensitive marine vegetation and habitats of Middle Harbour, in accordance with revised environmental management measure WQ12 (refer to Table D2-1 of this submissions report), as follows:

> Monitoring during dredging activities will be carried out to validate the effectiveness of mitigation measures implemented to manage potential impacts on the water quality and sensitive marine vegetation and habitats of Middle Harbour. The use of real-time turbidity monitoring at both potential impact and background locations, as well as adoption of a tiered (trigger level) management approach for sensitive sites to manage any potential impacts, will be included in a dredge monitoring program. The dredge monitoring program will be developed in consultation with an appropriately qualified and experienced specialist, DPI Fisheries and the NSW EPA prior to its implementation.

B5.8 Offset strategy

Issue raised

Section 7 of Appendix T (Technical working paper: Marine ecology) states “Supplementary measures may include for example, funding towards achieving actions outlined in threat abatement or species recovery plans”. The Department of Primary Industries (Fisheries) advises that there are no threat abatement or species recovery plans for White’s Seahorse or *Posidonia australis*. If funding is to be directed towards these species, please refer to the actions outlined in the Priorities Action Statements for each species on the Department of Primary Industries (Fisheries) website.

Response

Transport for NSW acknowledges the Department of Primary Industries (Fisheries) recommendation that if funding as a supplementary offset measure is to be directed to White’s Seahorse or *Posidonia australis*, this should be directed towards achieving the actions outlined in the Priorities Action Statements for each species.

Notwithstanding, as concluded in Section 7 of Appendix T (Technical working paper: Marine ecology) and in the response above, offsetting of marine fish habitats is not anticipated as a result of the project.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B6 – Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator

November 2021

B6 Department of Planning, Industry and Environment (Water)

Contents

B6.1 Water licences

Issue raised

Prior to approval, Transport for NSW should quantify any predicted operational water take, including incidental water take from tunnelling, as a result of the project and clearly demonstrate that appropriate water access licences are held or can be obtained to account for this take or clearly describe any exemptions that apply. It is recommended that Transport for NSW meet with the Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator to discuss the regulatory requirements.

Response

The predicted potential operational water take and incidental water take from tunnelling during construction are detailed in Chapter 16 (Geology, soils and groundwater) of the environmental impact statement.

Tunnel inflows have been predicted for five time periods during the construction phase, as shown in Table 16-11 of the environmental impact statement. Total inflows over the construction period would be potentially around 2817 megalitres (ML), with annual inflows during construction peaking at about 899 ML/year in 2025. Operational tunnel inflows are outlined in Table 16-14 of the environmental impact statement. Inflows were calculated for two time periods, the first year of operation (2028) and after 100 years of operation (2128). The tunnel inflows would reduce over time as the groundwater system reaches equilibrium. It is predicted that potentially, annual inflows would be about 551 ML/year in 2028, falling to about 436 ML/year by 2128. The modelling of operational impacts has assumed that the tunnels are not lined (except for a 125 metre section on either side of Middle Harbour) and would therefore experience unconstrained groundwater inflows, as noted in Section 16.5.2 of the environmental impact statement. In addition, the model assumes full hydraulic connection in the hydrogeological layers, which may not be the case. The predicted operational impacts therefore provide a conservative estimate of groundwater inflows to the tunnel, particularly as measures will be implemented during tunnel construction to ensure that groundwater inflows into each tunnel during the operation phase do not exceed one litre per second per kilometre across any given kilometre, as required by revised environmental management measure SG16 (refer to Table D2-1 of this submissions report).

Water access licences and approvals administered under the *Water Management Act 2000* are discussed in Section 3.2.1 of Appendix N (Technical working paper: Groundwater). The discussion on what exemptions Transport for NSW has under the *Water Management Act 2000* unintentionally referenced the Water Management (General) Regulation 2011 which was repealed in July 2018. The primary regulation under the *Water Management Act 2000* should have referred to the Water Management (General) Regulation 2018 (refer to Table A5-13 of this submissions report).

Notwithstanding, the discussion within Section 3.2.1 of Appendix N (Technical working paper: Groundwater) that Transport for NSW is exempt as a roads authority from requiring a water access licence during construction of the project remains consistent under the Water Management (General) Regulation 2018. Schedule 4, Part 1, Clause 2 of the regulation relates to water required for road construction and road maintenance. As such, Transport for NSW would be exempt from requiring a water access licence for construction of the project. This approach is consistent with other tunnelling projects such as the M6 Motorway (Stage 1) and M4-M5 Link.

Transport for NSW will continue to engage with the Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator throughout further design development and construction of the project as relevant.

Prior to operation, appropriate water access licences would be obtained to account for groundwater take, and/or any exemptions that apply would be described.

B6.2 Controlled activities and vegetation management plan

B6.2.1 Guidelines for controlled activities

Issue raised

Prior to approval, Transport for NSW should demonstrate due consideration of the guidelines including detailing setbacks and the establishment of vegetated riparian zones where works occur beside watercourses.

Response

A number of approvals are not required for the project including a controlled activity approval under section 91 of the *Water Management Act 2000,* as discussed in Section 2.2.1 of the environmental impact statement. As such, the application of the Natural Resources Access Regulator's guidelines for controlled activities on waterfront land to the project and adherence to the requirements of the guidelines to obtain a controlled activity approval is not required.

Notwithstanding, the project has been designed, and environmental management measures developed, to be consistent with the objectives for riparian corridor management as detailed within the *Guidelines for controlled activities on waterfront land – Riparian corridors* (NSW Department of Primary Industries (DPI) (Office of Water), 2018).

Under the definition of a riparian corridor from the *Guidelines for controlled activities on waterfront land – Riparian corridors* (NSW DPI (Office of Water), 2018), the two areas of the project that are relevant for consideration are:

- Flat Rock Drive construction support site (BL2) – due to proximity to Flat Rock Creek
- Surface road works at Balgowlah including Balgowlah Golf Course (BL10) and Kitchener Street (BL11) construction support sites – due to proximity to Burnt Bridge Creek and localised adjustment works needed to extend the existing drainage culvert under Burnt Bridge Creek Deviation.

Descriptions of Flat Rock Creek and Burnt Bridge Creek in relation to the project are provided in Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement, and their waterway features are shown in Figure 17-2 and Figure 17-3 respectively.

Flat Rock Creek is predominantly a concrete lined (open drain and closed box culvert) stormwater channel. Flat Rock Drive construction support site (BL2) is located adjacent to an unnamed constructed surface open channel bordering the eastern side of the support site. Flat Rock Creek is located within a box culvert in this area (refer to Figure 17-2 of the environmental impact statement). About 150 metres east of Flat Rock Drive the Flat Rock Creek box culvert outlets into a human made (naturalised) excavated bedrock channel followed by a natural bedrock stream until it enters Tunks Park, where it again flows into an underground box culvert. The Flat Rock Drive construction support site (BL2) works are located about 120 metres upstream of the Flat Rock Creek riparian zone. The unnamed constructed surface creek on the eastern side of the support site has a riparian zone that would be impacted by the project drainage works.

Burnt Bridge Creek is a naturalised creek upstream, however downstream comprises a combination of concrete and rock fill construction, which is present at the Kitchener Road crossing in Balgowlah. In the proximity of the project, Burnt Bridge Creek has been highly modified from original Burnt Bridge Creek Deviation works, historical local subdivision and Balgowlah Golf Course formation

works. Localised adjustment of Burnt Bridge Creek would be required to facilitate an extension of the existing box culvert crossing of Burnt Bridge Creek Deviation and inclusion of scour protection. Direct vegetation impacts around Burnt Bridge Creek have been significantly reduced by moving the portal to the south and establishing an exclusion zone around riparian native vegetation adjoining the creek.

Design development and construction planning initiatives and environmental management measures that have been developed to minimise impacts on the environmental functions of the riparian corridors associated with Flat Rock Creek and Burnt Bridge Creek within and/or adjacent the construction footprint are detailed in Table B6-1 below.

Table B6-1 Project initiatives and environmental management measures to minimise impacts on riparian corridors

Project area	Design development and construction planning initiatives	Environmental management measures
Flat Rock Drive construction support site (BL2)	• The Flat Rock Drive construction support site (BL2) was chosen to be located in an area of Flat Rock Reserve which was previously used as a landfill site until 1985 • Flat Rock Creek has been avoided and impacts in Flat Rock Reserve are mostly limited to revegetated areas that supported the landfill site until 1985. The site was capped with clay in 1998 and has since been progressively revegetated • Drainage works associated with an existing aboveground unnamed watercourse within Flat Rock Reserve would be staged to ensure flows and velocities are not substantially changed and to avoid downstream erosion and bed and bank stability impacts to Flat Rock Creek.	SG9, WQ13, WQ15, B1, B6, B13, B27, B40, B45, LP8, V1, V10, WM8
Surface road works at Balgowlah including Balgowlah Golf Course (BL10) and Kitchener Street (BL11) construction support sites	• The preferred design for the connection to and from the Burnt Bridge Creek Deviation and surface road works at Balgowlah has reduced impacts to Burnt Bridge Creek to the east and west of Burnt Bridge Creek Deviation, including potentially reduced impact on mature trees in the golf course compared to other options (refer to Section 4.5.5 of the environmental impact statement) • With the preferred design, impacts are restricted to the east side of Burnt Bridge Creek Deviation • Direct vegetation impacts around Burnt Bridge Creek have been significantly reduced by moving the portal to the south and establishing an exclusion zone around riparian native vegetation adjoining the creek (refer to Section 19.4 of the environmental impact statement) • The extension to the existing culvert would be designed with low gradient and scour protection to minimise impacts to geomorphology. The extent of scour protection would be minimised during further design development as far as practicable. The gradient, sinuosity and channel capacity would remain consistent with upstream and downstream	SG9, WQ4, WQ5, WQ8, WQ13, WQ15, F4, B6, B13, B27, B40, B45, V1, V10, WM8

Project area	Design development and construction planning initiatives	Environmental management measures
	sections of the creek. Where required, grade controls and bank stabilisation works would be implemented to manage anticipated high velocity conditions • Drainage works associated with the localised adjustment of Burnt Bridge Creek would be staged to ensure creek flows and velocities are not substantially changed and to avoid downstream erosion and bed and bank stability impacts.	

The full wording of the above listed environmental management measures is provided in Table D2-1 of this submissions report. The environmental management measures listed are proposed to minimise scour, control erosion and sedimentation, minimise vegetation impacts, minimise impacts to geomorphology and fish passage and detail requirements for rehabilitation of disturbed areas and landscaping. The environmental management measures also refer to use of a number of best management practice guidelines including, but not limited to, *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority (RTA), 2011a), *Policy and guidelines for fish habitat conservation and management* (NSW DPI, 2013), *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull and Witheridge, 2003), *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004), and *Managing Urban Stormwater: Soils and Construction - Volume 2D Main Road Construction* (NSW Department of Environment and Climate Change (DECC), 2008).

B6.2.2 Vegetation management plan

Issue raised

Post approval, vegetation establishment that may occur on waterfront land beside Flat Rock Creek and Burnt Bridge Creek should be managed under a vegetation management plan with appropriately structured riparian zone.

The preparation of the plan should be in accordance with the Natural Resources Access Regulator's guideline available at: www.industry.nsw.gov.au/__data/assets/pdf_file/0006/160467/licensing_approvals_controlled_activities_veg_mgt_plans.pdf.

Response

As discussed in Section B6.2.1 above, the application of the Natural Resources Access Regulator's guidelines for controlled activities on waterfront land to the project and adherence to the requirements of the guidelines to obtain a controlled activity approval is not required. However, a number of environmental management measures have been developed for rehabilitation and landscaping works associated with the project which will apply to land adjacent to Flat Rock Creek and Burnt Bridge Creek and are considered consistent with the *Guidelines for vegetation management plans on waterfront land* (NSW DPI, 2012). These environmental management measures would be incorporated into the flora and fauna management plan prepared for the construction of the project, refer to Section D1 of this submissions report. As discussed in Section B6.2.1 above, Flat Rock Drive construction support site (BL2) is located adjacent to an unnamed constructed surface open channel bordering the eastern side of the support site. Flat Rock Creek is located within a box culvert in this area about 120 metres upstream of the Flat Rock Creek riparian zone.

The consistency of the environmental management measures (refer to Table D2-1 of this submissions report) with the requirements of the Natural Resources Access Regulator's guidelines for vegetation management plans is discussed further below:

- The urban design and landscape plan will detail the landscape features for the land adjacent to Flat Rock Creek and Burnt Bridge Creek that has been disturbed by the project and would include identification of vegetation species composition, planting layout and densities. It would also include methods and maintenance requirements and would be developed in accordance with best management practice guidelines such as *Beyond the Pavement 2020* (Transport for NSW, 2020a) and supplementary Transport for NSW urban design guidelines such as *Landscape design guidelines: Design guideline to improve the quality safety and cost effectiveness of green infrastructure in road corridors* (Roads and Maritime Services, 2017d). The urban design and landscape plan would be developed by a suitably qualified and experienced person and will be made available to the public for feedback (refer to environmental management measure V1)
- A number of environmental management measures include commitments to minimise clearing of native vegetation during further design development and construction planning as relevant, including environmental management measures B1, B6, V9 and V10. Environmental management measure B1 is specific to the Flat Rock Drive construction support site (BL2). Where possible, trees will be protected or pruned rather than removed. Pruning works will be supervised by a qualified arborist (refer to revised environmental management measure V10)
- In addition to environmental management measures B1, B6, V9 and V10, the project has also established an exclusion zone around riparian native vegetation adjoining Burnt Bridge Creek to reduce direct impact on the riparian corridor (refer to Section 19.4 of the environmental impact statement)
- Vegetation will be re-established within the construction footprint, where feasible, in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) (refer to environmental management measure B13)
- Disturbed floodplain environments next to the watercourses and/or along overland drainage lines will be stabilised as soon as practical following disturbance (refer to revised environmental management measure WQ15)
- Weed species will be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) (refer to environmental management measure B25)
- Exclusion zones will be set up at the limit of clearing in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) (refer to new environmental management measure B45)
- A number of design requirements for the localised adjustment of Burnt Bridge Creek in addition to bank stabilisation works would ensure a stable watercourse and riparian corridor is established consistent with the main objective of a vegetation management plan as detailed in *Guidelines for vegetation management plans on waterfront land* (NSW DPI (Office of Water), 2012b) (refer to environmental management measure WQ4).

B6.3 Surface water

B6.3.1 Potential impacts of reduced baseflows

Issue raised

Prior to approval, Transport for NSW should quantify the potential impacts of reduced baseflows in detail and develop appropriate monitoring and mitigation strategies.

Response

Transport for NSW notes that the issue raised by the Department of Planning, Industry and Environment (Water) is in the context of impacts to surface waters and groundwater dependent ecosystems.

Transport for NSW has carried out additional groundwater modelling and impact assessment since exhibition of the environmental impact statement. A clarification is provided in Section A5.1.15 which summarises the additional studies carried out and the overall findings. Further details of the work completed are provided in Appendix E of this submissions report.

One important consideration highlighted in the clarification is that streamflow in a waterway is made up of a number of components including rainfall run-off, direct rainfall into the stream, discharge from stormwater pipes and groundwater contributions. The proportion of streamflow that comes from groundwater (referred to as groundwater baseflow) is generally a small component of overall streamflow. The boundary between each of these sources of water is difficult to distinguish. Strict definitions of groundwater baseflow are difficult to formulate but in general terms, groundwater baseflow represents river flow sourced from groundwater aquifers. Groundwater and surface water interaction can occur from the stream to groundwater, vice versa or in both directions at different times, depending on river and groundwater levels and hydrogeologic conditions. In practice, only part of the upstream river reaches may be receiving baseflow, whilst other reaches may be losing water to groundwater (Engineers Australia, 2009).

Potential impacts from reduced groundwater baseflows to surface waters and groundwater dependent ecosystems are discussed in detail in the following chapters of the environmental impact statement:

- Chapter 16 (Geology, soils and groundwater) – details potential impacts on groundwater dependent ecosystems from groundwater drawdown
- Chapter 17 (Hydrodynamics and water quality) – details potential impacts on water availability and surface water flows during construction and operation
- Chapter 19 (Biodiversity) – details potential impacts on groundwater dependent ecosystems and aquatic ecology from reduced baseflows to surface waters.

Further detail is included in the related technical working papers including Appendix N (Technical working paper: Groundwater), Appendix O (Technical working paper: Surface water quality and hydrology) and Appendix S (Technical working paper: Biodiversity development assessment report).

As noted above, Transport for NSW has carried out further investigations and assessment of predicted groundwater baseflow reductions and the potential environmental impacts 100 years following commencement of operation at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek. The additional investigations and analysis comprised impacts on freshwater ecology, groundwater dependent ecosystems, surface water quality and considerations of social and community values for Flat Rock Creek, Quarry Creek and Burnt Bridge Creek and the investigations are detailed in Appendix E of this submissions report. Additional field survey of Flat Rock Creek, Quarry Creek and Burnt Bridge Creek was carried out to assess the nature of each creek's streambed and the potential for interaction between creek surface waters and groundwater and this information was used in revised groundwater modelling of the project. A more detailed ecological assessment has also been carried out of the potential effects on aquatic ecosystems due to predicted reductions in baseflow at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer to Annexure A of Appendix E of this submissions report) A summary of the impacts and proposed mitigation and management strategies is provided below. As stated in the environmental impact statement, groundwater drawdown predictions are conservatively based on unconstrained groundwater inflows

into the tunnel and this conservative approach was also used in the revised groundwater modelling (refer to Appendix E of this submissions report). As measures will be implemented during tunnel construction to ensure that groundwater inflows into each tunnel during the operation phase do not exceed one litre per second per kilometre across any given kilometre in accordance with revised environmental management measure SG16 (refer to Table D2-1 of this submissions report), actual groundwater drawdown and baseflow reductions would likely be less than these predictions.

The overall findings of the additional studies are generally consistent with statements contained in the relevant chapters of the environmental impact statement and no additional management or mitigation measures are considered necessary to address the predicted impacts from groundwater baseflow reductions.

Notwithstanding, a focussed study will be carried out in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Group) to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems, as required by revised environmental management measure SG6 (refer to Table D2-1 of this submissions report). The study will consider how existing site features affect the interaction between surface water and groundwater along the affected reaches of these watercourses, and the hydraulic connectivity in the underlying geology. Where ecological impacts are predicted to be worse than that presented as part of the environmental impact statement/submissions report, feasible and reasonable mitigation measures to address the impacts will be identified in consultation with a suitably qualified and experienced specialist, incorporated into the detailed design, and implemented during construction. The mitigation measures considered will include tunnel linings.

While the focussed study will mainly consider freshwater ecology and confirm the impact assessment within the environmental impact statement, water quality of the abovementioned creeks would be a key part of this consideration.

Groundwater baseflow reductions

A summary of the hydrogeological investigations and revised groundwater modelling predictions carried out following exhibition of the environmental impact statement is provided in Section 3 of Appendix E of this submissions report. With the exception of Flat Rock Creek, Quarry Creek and Burnt Bridge Creek, at the end of construction and after 100 years of operation of the project, all other waterways are expected to experience baseflow reductions of less than five per cent as reported in the environmental impact statement. Potential baseflow reductions at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek at the end of construction and after 100 years of operation are provided in Table 6-5 of Appendix N (Technical working paper: Groundwater) and Table 3-3 of Appendix E of this submissions report and have been assessed as:

- Flat Rock Creek – maximum baseflow reduction of 43.6 kilolitres (kL)/day (20 per cent baseflow reduction) at the end of construction and a maximum baseflow reduction of 526 kL/day (30 per cent baseflow reduction) after 100 years of operation
- Quarry Creek – maximum baseflow reduction of 4.1 kL/day (23 per cent baseflow reduction) at the end of construction and a maximum baseflow reduction of 11 kL/day (63 per cent baseflow reduction) after 100 years of operation
- Burnt Bridge Creek – maximum baseflow reduction of 16.7 kL/day (79 per cent baseflow reduction) at the end of construction and a maximum baseflow reduction of 20 kL/day (60 per cent baseflow reduction) after 100 years of operation.

The above predicted reductions in groundwater baseflow after 100 years of operation are lower than those in Table 6-10 of Appendix N (Technical working paper: Groundwater). The difference between the predictions reported in the environmental impact statement and the revised groundwater modelling is due to the additional reaches of Flat Rock Creek identified in the May 2021 field survey that were not previously included in the modelling, as well as changes to the streambed classifications of some sections of both Flat Rock Creek and Burnt Bridge Creeks and consequently, the contribution of groundwater baseflow to these creek sections, as discussed in Section 3.2 of Appendix E of this submissions report.

Streamflow measurements at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek were made in May 2018 following a period of two weeks without rain and during the 2017 to 2019 drought period (Bureau of Meteorology, 2021), as discussed in Section 2.3 of Annexure F of Appendix N (Technical working paper: Groundwater). Based on these streamflow measurements, groundwater baseflow in many areas of these three creeks was calculated to comprise less than one per cent of streamflow eg in upstream areas of Flat Rock Creek and generally less than six per cent in Burnt Bridge Creek (refer to Section 3.3 of Appendix E of this submissions report). Even with the predicted groundwater baseflow reductions, this would generally equate to less than a three per cent reduction of streamflow for both the mid-stream and downstream parts of Burnt Bridge Creek and the upstream part of Quarry Creek after 100 years of operation.

Along the downstream sections of Flat Rock Creek, groundwater baseflows are estimated to comprise a much larger proportion of streamflow; around 67 per cent. The revised groundwater predictions indicate that at the weir of Flat Rock Creek, groundwater baseflow reductions would be expected to reduce total streamflow by 22 per cent. Following rainfall, due to an increased contribution from stormwater, any changes from the project to groundwater baseflow for most parts of Burnt Bridge Creek and the upstream parts of Flat Rock Creek and Quarry Creek would be negligible. Also, as mentioned above, the predicted reduction in streamflow would be offset by discharges from the wastewater treatment plant at Artarmon.

In the downstream areas of Flat Rock Creek, the relatively high streamflow volume means that reasonable flows would generally be expected to be maintained, despite the predicted groundwater baseflow reductions. At the Flat Rock Creek weir where there is an estuarine influence, any changes to streamflow would be inconsequential relative to the tidal influence.

It should be noted that Transport for NSW has been approached by Willoughby City Council with a request to utilise a regular amount of treated tunnel inflow from the Gore Hill Freeway operational wastewater treatment plant as part of their planned water harvesting improvement scheme in the Artarmon/Willoughby Flat Rock Creek catchment area. Agreements on a water sharing arrangement would take in full consideration of any requirements to offset Flat Rock Creek flows.

Transport for NSW intends to develop an Interface Agreement with Willoughby City Council which would provide more detail on the scope, rights and obligations for both the construction and operational phases of the project. Transport for NSW would continue to work with Willoughby City Council regarding the viability of accessing water from the Beaches Link wastewater treatment plant at Artarmon during further design development. The Interface Agreement would include any applicable arrangements associated with Willoughby City Council's stormwater harvesting schemes in Flat Rock Creek.

Freshwater ecology

Summaries of the freshwater ecology and surface water quality investigations carried out following exhibition of the environmental impact statement are provided in Section 4.1 and 4.3 of Appendix E of this submissions report respectively. Burnt Bridge Creek includes a mixture of shallow and deep pools and cascade/riffle zones in its upper and middle reaches before becoming a concrete-lined

culvert that runs through the Balgowlah industrial estate to Manly Lagoon which is estuarine. Upstream of the Burnt Bridge Creek Deviation, the riparian corridor is considered 'quasi natural' and is dominated by native trees and shrubs with frequent long deep pools, riffles and cascades. The riparian condition of the middle and downstream areas of the creek is either partially or highly modified.

Quarry Creek is a small natural estuarine tributary of Flat Rock Creek which drains Cammeray. Flat Rock Creek and Quarry Creek also include a mixture of shallow and deep pools and cascade/riffle zones in their upper and middle reaches before reaching the estuarine section downstream of Flat Rock Creek weir. The riparian corridors of these two creeks are also generally in good condition. Water quality sampling at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek demonstrates that water quality is generally poor due to elevated nutrients and metals.

Stormwater flows have a noticeably large influence on all three creeks, generally resulting in scouring of the bedrock and removing coarse and fine sediments. Very few instream macrophytes were recorded in the creeks and there were no native fish observed or caught. Australian River Assessment System (AUSRIVAS) analyses indicated macroinvertebrate assemblages at all creeks were either severely or extremely impaired and suffered from severe pollution.

The freshwater sections of Burnt Bridge Creek, Flat Rock Creek and Quarry Creek were found to all have depauperate (ie lacking in numbers of variety of species) assemblages of macroinvertebrates, non-existent assemblages of native fish and generally very few, if any, native macrophytes. This is despite the riparian habitat of many parts of all of the creeks being in reasonable if not good condition, and containing mostly native vegetation. Therefore although much of the freshwater reaches of Burnt Bridge Creek, Flat Rock Creek and Quarry Creek appear healthy, the aquatic ecology is considered to be generally poor. The reasons for such poor condition are likely to be a consequence of generally high levels of some nutrients and dissolved metals in the creeks, regular scouring by stormwater discharges and the presence of weirs in Burnt Bridge Creek and Flat Rock Creek, and steep cascades in all creeks that would prevent some species from colonising the middle to upper reaches.

Consistent with findings reported in the environmental impact statement (refer to Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report)), detailed field investigations confirmed the presence of pool habitats in most reaches of the creeks. Therefore even in periods of low flow eg in dry periods in summer and considering the revised predictions of groundwater baseflow reductions, it is expected that many of these pools would be deep enough to retain water and therefore aquatic habitat between rainfall events. Also, the predicted reduction in baseflow at Flat Rock Creek is likely to be offset by discharges to the creek from the Gore Hill Freeway operational wastewater treatment plant, as noted in Section 19.5.3 of the environmental impact statement and discussed in more detail later in this section.

Given the above, it is considered that predictions of changes to groundwater baseflow caused by the project would not substantially alter the flow regime in any of the three creeks to the extent that it would affect instream habitat and that the project would not significantly impact the aquatic ecology of Burnt Bridge Creek, Flat Rock Creek or Quarry Creek. As there are no sensitive species present, there would be no impact on aquatic communities in these creeks, including any threatened freshwater fauna, flora species or ecological communities or endangered populations listed under the *Fisheries Management Act 1994* and/or the *Environment Protection and Biodiversity Conservation Act 1999.*

Groundwater dependent ecosystems

A summary of the additional investigations of groundwater dependent ecosystems carried out following exhibition of the environmental impact statement is provided in Section 4.2 of Appendix E of this submissions report.

The ecological condition of groundwater dependent ecosystems in the project area were determined from information contained in Appendix S (Technical working paper: Biodiversity development assessment report) and information gathered as part of the additional site survey conducted in May 2021. The ecological condition of Flat Rock Creek, Quarry Creek and Burnt Bridge Creeks are such that they are all considered to be low ecological value groundwater dependent ecosystems, on account of the poor water quality, lack of aquatic habitat and assemblages present and the impacts of intermittent stormwater discharges.

A patch of Coastal Sandstone Gully Forest, Coastal Sand Forest and Sandstone Riparian Scrub is located about 280 metres south-east of the tunnel alignment at the Flat Rock Drive construction support site (BL2) and is considered to be of moderate ecological value.

Coastal Upland Swamp in the Sydney Basin Bioregion threatened ecological community (Coastal Upland Swamp) is considered of high ecological value. The closest mapped patch of Coastal Upland Swamp is located about 95 metres to the west of the Wakehurst Parkway in Garigal National Park. The other, smaller, patch of Coastal Upland Swamp is north of Bantry Bay Oval, about 135 metres south-east of the construction footprint (refer to Figure 3-6 of Appendix S (Technical working paper: Biodiversity development assessment report)).

No direct impacts on groundwater dependent ecosystems would occur as a result of the project, as stated in Section 19.5.4 of the environmental impact statement.

Revised groundwater baseflow reductions of between 30 and 63 per cent are predicted for Burnt Bridge Creek, Flat Rock Creek and Quarry Creek (refer to Table 3-3 of Appendix E of this submissions report). Most of the water in these creeks is derived from surface runoff and stormwater discharge, so would unlikely be affected by the predicted baseflow reductions. These percentages of baseflow reduction are considered to pose a low level of risk to groundwater dependent ecosystems in Quarry Creek and Burnt Bridge Creek, and a moderate level of risk in Flat Rock Creek.

Predicted groundwater drawdown beneath the Coastal Sandstone Gully Forest, Sandstone Riparian Scrub and Coastal Sand Forest along Flat Rock Creek, and below the Coastal Upland Swamp is not expected to affect these vegetation communities because they are likely supported by rainfall and shallow, perched aquifers. They are therefore considered to be at a low level of risk.

The predicted groundwater drawdown at the patch of Coastal Upland Swamp identified north of Bantry Bay Oval (if experienced) would be less than one metre at the end of construction and after 100 years of operation. Any impact to this patch of Coastal Upland Swamp would be further reduced following the implementation of the environmental management measures outlined in Table D2-1 of this submissions report. Due to its small size, urbanised context and modified floristics, including numerous weedy exotic species, impacts to this patch of Coastal Upland Swamp are considered not to be significant, as discussed in Section 19.5.4 of the environmental impact statement.

The predicted impacts (if experienced) will be further reduced following implementation of a number of the environmental management measures detailed in Table D2-1 of this submissions report, including:

- Groundwater modelling will be updated with ongoing groundwater monitoring to refine the inflow predictions. Inflow predictions will be updated prior to finalising detailed design and will include designed tunnel linings, and the detailed design will be updated based on the updated

operational inflow and impact predictions (refer to revised environmental management measure SG2)

- Measures will be implemented during tunnel construction to ensure that groundwater inflows into each tunnel during the operation phase do not exceed one litre per second per kilometre across any given kilometre (refer to revised environmental management measure SG16).

As the findings of the additional investigations and assessments are consistent with those presented in the environmental impact assessment, no additional environmental management measures are considered necessary.

Wastewater treatment plan discharges to creeks

During construction, tunnel inflows would be collected, treated and discharged into Flat Rock Creek and Burnt Bridge Creek. During operation, tunnel inflows would be collected, treated and discharged into Flat Rock Creek only. There are no planned construction or operational project discharges of tunnel inflows to Quarry Creek. Construction and operational wastewater treatment plants will be designed to treat wastewater generated from tunnel groundwater inflows to meet the discharge criteria contained in revised environmental management measures WQ11 and WQ17 respectively (refer to Table D2-1 of this submissions report).

The predicted combined discharge quantity to Flat Rock Creek from the Flat Rock Drive construction support site (BL2) and the Punch Street construction support site (BL3) during construction is 1019 kL/day as outlined in Table 5-3 of Appendix O (Technical working paper: Surface water quality and hydrology). The predicted potential discharge quantity to Flat Rock Creek from the Gore Hill Freeway wastewater treatment plant during operation is 1425 kL/day as outlined in Table 6-1 of Appendix O (Technical working paper: Surface water quality and hydrology). Based on this, the project discharges to Flat Rock Creek during both construction and operation would offset the loss in groundwater baseflow and potentially result in a net increase in streamflow.

The predicted discharge quantity to Burnt Bridge Creek from the Balgowlah Golf Course construction support site (BL10) during construction is 428 kL/day, as outlined in Table 5-3 of Appendix O (Technical working paper: Surface water quality and hydrology). Based on this, the project discharges to Burnt Bridge Creek during construction would offset the loss in groundwater baseflow during construction. The predicted maximum reduction in groundwater baseflow to Burnt Bridge Creek is 20 kL/day after 100 years of operation. However, there are no planned operational project discharges to Burnt Bridge Creek.

B6.3.2 Monitoring impacts to geomorphology

Issue raised

Prior to approval, Transport for NSW should develop appropriate plans for monitoring impacts to geomorphology resulting from the project and also put in place an action plan to mitigate any actual impacts that are detected by monitoring.

Response

Impacts to geomorphology as a result of the project are detailed in sections 17.4.4 and 17.5.5 of Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement. The main potential geomorphology impacts during construction would relate to potential scour from treated water discharges from construction wastewater treatment plants, potential scour from increased surface runoff volume and rate, potential mobilisation of sediment within watercourses and instream works associated with the localised adjustment of Burnt Bridge Creek and drainage works within an existing aboveground constructed watercourse within Flat Rock Reserve.

Construction impacts will be minimised through implementing a number of environmental management measures to address potential scour and sedimentation risks including environmental management measures SG9, WQ8, WQ15 and WQ30 (refer to Table D2-1 of this submissions report for the full wording of these environmental management measures). The general approach to mitigating and managing potential erosion and sedimentation impacts from the project during construction is described in Section 6.5.1 of the environmental impact statement. Monitoring construction impacts would be through the implementation of the soil and water management plan as detailed in Section D1 of this submissions report. The soil and water management plan would include inspection requirements to ensure the environmental management measures are performing effectively and actual or potential soil and water management issues are identified.

The main geomorphology impacts during operation would relate to potential scour from treated water discharges from the Gore Hill Freeway wastewater treatment plant and the localised adjustment of Burnt Bridge Creek.

The Gore Hill Freeway wastewater treatment plant would discharge into Flat Rock Creek via the local stormwater system at a flow rate of about 0.016 kilolitres per second. This rate is lower than the creek flow rate under a two-year ARI flood event (0.02 kilolitres per second). It is therefore considered that Flat Rock Creek bed and banks would be able to handle expected wastewater treatment plant flow rates without impacting the creek form and geomorphic processes. As such, operational monitoring of geomorphology impacts in Flat Rock Creek is not considered to be required.

For the proposed localised adjustment of Burnt Bridge Creek, the adjustment will be designed considering the susceptibility of the creek to scour from increased flow and runoff in accordance with environmental management measure WQ4 (refer to Table D2-1 of this submissions report). As discussed in Section B6.2.1 above, at this location Burnt Bridge Creek has been highly modified and the original creek and riparian zones were significantly adjusted during original Burnt Bridge Creek Deviation works and during historical local subdivision and golf course formation works. The extension to the existing culvert will be designed with a low gradient and scour protection to minimise impacts to geomorphology. The extent of scour protection would be minimised during further design development as far as practicable. The gradient, sinuosity and channel capacity will be consistent with upstream and downstream sections of the creek. Where required, the adjustment will include grade controls and bank stabilisation works to manage anticipated high velocity conditions.

As works for the proposed localised adjustment of Burnt Bridge Creek would be carried out during construction, the monitoring and inspection requirements discussed above in regard to the soil and water management plan would also apply. This would ensure that controls and design measures are effectively installed and constructed and stabilised as soon as practical following disturbance in accordance with revised environmental management measure WQ15. As such, operational monitoring of geomorphology impacts in Burnt Bridge Creek is not considered to be required.

B6.4 Groundwater take and inflows

Issue raised

The Department of Planning, Industry and Environment (Water) recommends a Condition of Approval that all practicable measures should be taken to limit operational groundwater inflows into each tunnel to no greater than one litre per second across any given kilometre (1 L/s/km), and that compliance with this condition cannot be determined by averaging groundwater inflows across the length of the tunnels. In addition, measurement devices must be in place at the completion of the

tunnel construction to measure tunnel groundwater take at one kilometre intervals and reported in the water monitoring and management plan.

Response

The recommendation from the Department of Planning, Industry and Environment (Water) is noted. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Notwithstanding, environmental management measure SG16 has been updated for consistency with the Western Harbour Tunnel and Warringah Freeway Upgrade project condition of approval E216. The revised environmental management measure has removed reference to averaging as follows (refer to Table D2-1 of this submissions report):

> Measures will be implemented during tunnel construction to ensure that groundwater inflows **into each tunnel** during the operation phase do not exceed 1L/s/km ~~on average over the entire tunnel length~~ **across any given kilometre**.

Section 4.7 of Appendix N (Technical working paper: Groundwater) has also been updated to remove reference to averaging (refer to Table A5-13 of this submissions report).

B6.5 Groundwater modelling

Issue raised

Transport for NSW is to update the groundwater conceptual and numerical models to include data collected after 1 December 2017. The project construction must not be started before confirming that the updated models suggest similar or smaller effects than those predicted in the groundwater modelling report dated December 2020. The updated modelling is required to include the following as a minimum on top of the previous modelling:

a) Present evidence that the current version of the model was independently reviewed by a qualified third-party hydrogeologist or modeller as recommended in the *Australian Groundwater Modelling Guidelines 2012*

b) Updated report with adequate quality control (proofreading, improved plots, additional maps like for potential and actual evapotranspiration, coordinates shown on maps, etc.)

c) Cross-sections perpendicular to the tunnel alignment to support the conceptual modelling and 3D representation of the conceptual model

d) Composite parametric sensitivity analysis (parameter identifiability) to provide basis for model calibration and uncertainty analysis. This must include all parameters (hydraulic conductivity, storage parameters, recharge, evapotranspiration, GHB and bed conductance terms, etc.)

e) Reconsider the representation of evapotranspiration in the project's groundwater models

f) Using updated end of calibration period heads and boundary conditions as starting initial conditions in predictive modelling

g) Assessment of the Project's full surface water depletion effects, not just its baseflow reduction effects (ie include assessment of the potential to increase losses from surface water features where they already occur)

h) Considering the need to represent existing and approved fully tanked tunnel sections in the groundwater models as flow barriers

i) Improved sensitivity analysis based on the results of parameter identifiability to support model calibration efforts

j) Improved model calibration (against longer monitoring records and additional hydraulic testing data)

k) Improved contaminant transport risk assessment, including particle tracking modelling as a minimum

l) Consideration of the need for additional uncertainty analysis

m) Assessment of tunnel groundwater inflows over sections of no more than 1000 metres in length and representing this information in suitable table and map formats for each year during the construction phase, the first year of operation, and every ten years from the end of operation for 100 years

n) Compare the pressure heads obtained from the MODFLOW-USG 3D groundwater flow modelling against those obtained from the coupled CTRAN/W–SEEP/W 2D saline water intrusion model to cross-validate the models.

Response

The request from the Department of Planning, Industry and Environment (Water) to update the groundwater conceptual and numerical models to include data collected after 1 December 2017 is noted.

Transport for NSW is currently planning additional geotechnical investigations and monitoring at key locations to gather additional hydrogeological data. The contractor/s would also carry out more detailed geotechnical assessments once appointed as part of further design development. The existing groundwater monitoring program for both groundwater levels and quality will be continued through construction in accordance with environmental management measure SG1 (refer to Table D2-1 of this submissions report).

As information from the additional geotechnical investigations and monitoring becomes available, the groundwater model will be updated to refine the predictions, as required by revised environmental management measure SG2 (refer to Table D2-1 of this submissions report). Inflow predictions will be updated prior to finalising detailed design and will include designed tunnel linings, where feasible and reasonable, and the detailed design will be updated based on the updated operational inflow and impact predictions. If refined predictions of groundwater levels and drawdown indicate that impacts would be greater than the impacts presented in the environmental impact statement, feasible and reasonable mitigation measures will be incorporated into the detailed design and implemented.

Groundwater modelling will be conducted considering *Australian groundwater modelling guidelines* (Barnett et al., 2012), including sensitivity analysis and consideration of future climate change, as required. Parts b) to n) as recommended by the Department of Planning, Industry and Environment (Water) would be considered in following the *Australian groundwater modelling guidelines* (Barnett et al., 2012).

In addition and related to part a) as recommended by the Department of Planning, Industry and Environment (Water), a suitably qualified independent expert reviewed the groundwater modelling methodology and outputs in accordance with the *Australian groundwater modelling guidelines* (Barnet et al., 2012), as identified in Section 16.2 of the environmental impact statement. The independent review was carried out by GHD and it found that:

- The model predominantly follows the approach recommended in the guideline
- The conceptualisation has considered all available data, which has been effectively represented in the model design

- Overall, the modelling is considered suitable to assess changes to the groundwater conditions associated with the proposed tunnel alignment.

The independent review identified a small number of issues that would be considered further as part of verification and refinement of the models prior to construction and operation.

B6.6 Acid sulfate soils and contamination

B6.6.1 Acid sulfate soils assessments

Issue raised

After approval and prior to construction, Transport for NSW should undertake assessment for acid sulfate soils at all surface disturbance sites.

If any potential for acid sulfate soils is indicated at these sites the proponent must develop, provide for review, and implement an appropriate acid sulfate soils management plan.

Response

Assessment of acid sulfate soils is included in Chapter 16 (Geology, Soils and Groundwater) of the environmental impact statement. In summary, areas of Class 5 acid sulfate soil risk have been mapped in the Manly and Willoughby local environmental plans. It should be noted that acid sulfate soils are not typically found in Class 5 areas, however Class 5 areas are located within 500 metres of Class 1, 2, 3 or 4 land. The assessment concluded that the risk of acid sulfate soils being present within the construction footprint is low to negligible, with the exception of soils within Spit West Reserve and sediments within Middle Harbour and The Spit, which have been identified as potentially containing acid sulfate soils.

Prior to ground disturbance in high risk areas at Spit West Reserve and Middle Harbour, testing will be carried out to determine the presence of acid sulfate soils as required by environmental management measure SG14 (refer to Table D2-1 of this submissions report). If acid sulfate soils are encountered, they will be managed in accordance with the *Acid Sulfate Soil Manual* (Acid Sulfate Soil Management Advisory Committee (ASSMAC), 1998).

The *Acid Sulfate Soil Manual* (ASSMAC, 1998) provides action criteria for when an acid sulfate soil management plan is required. The need for a plan will be confirmed following the testing described in environmental management measure SG14. Notwithstanding, Section D1 of this submissions report has identified the likely sub-plans to the construction environmental management plan, along with the relevant guidelines or requirements of each plan, for the project. A soil and water management plan would be prepared as part of the construction environmental management plan and it would address (but is not limited to) management responses to acid sulfate soils.

B6.6.2 Contamination risk assessments

Issue raised

After approval and prior to construction, Transport for NSW should conduct contamination risk assessments, including evaluation of the potential for mobilisation towards the tunnels due to groundwater drawdown, at all potential contamination sites along and adjacent to the twin tunnels alignments.

Response

Areas of environmental interest for contamination within 500 metres of the project are identified in sections 6.1.3.3 and 6.2.3.3 of Appendix N (Technical working paper: Groundwater) for the construction and operation phases of the project respectively. Potential drawdown predictions at

these areas at the end of construction and during operation of the project are provided in Table 6-3 and Table 6-8 respectively of Appendix N (Technical working paper: Groundwater) and are based on a conservative (worst case) scenario of an unlined tunnel and unconstrainted groundwater inflows. It is likely the system would be stratified, possibly with disconnected perched aquifers therefore groundwater inflows may be reported as greater than the one litre per second per kilometre design requirement. These predictions indicate that significant migration of contamination from areas of environmental interest (contaminated sites) is not anticipated. Notwithstanding this, a number of environmental management measures have been proposed to manage potential contamination migration risks as described below.

Transport for NSW will carry out further investigations of potentially contaminated areas directly affected by the project in accordance with revised environmental management measure SG8 (refer to Table D2-1 of this submissions report) and, subject to the outcomes, will implement remediation action plans if site remediation is warranted.

Transport for NSW has revised environmental management measures SG18, SG19 and SG2 to clarify their role in managing the potential for migration of contaminated groundwater and potential contamination hazards. Environmental management measures SG18 and SG19have been revised to include within their scope potential impacts from the 'migration of potential contaminant hazards' in addition to potential impacts to beneficial aquifer use from the migration of contaminated groundwater or the quality of groundwater tunnel inflows. In addition, Transport for NSW has extended the scope of revised environmental management measures SG18 and SG19 to all project phases to enable the potential identification and implementation of feasible and reasonable measures during further design development in advance of construction, where necessary. Additionally environmental management measure SG2 has been revised to include consideration of monitoring for contamination carried out as part of SG18. Updated wording is provided in Table D2-1 of this submissions report.

In accordance with these revisions, Transport for NSW will consider additional locations for groundwater monitoring that are subject to medium and high risk of groundwater contamination during construction and operation in accordance with revised environmental management measure SG18 (refer to Table D2-1 of this submissions report). Where relevant, modelling/mass balance analysis will be carried out to assess potential impacts on beneficial aquifer use, the likely quality of groundwater inflows and migration of potential contaminant hazards. If the groundwater quality monitoring and associated analysis identifies potential impacts to beneficial aquifer use from the migration of contaminated groundwater, the quality of groundwater tunnel inflows, or migration of potential contaminant hazards, feasible and reasonable management measures will be identified and implemented in accordance with revised environmental management measure SG19 (refer to Table D2-1 of this submissions report).

Monitoring for contamination carried out in accordance with revised environmental management measure SG18 (refer to Table D2-1 of this submissions report) would be considered in the updating of the groundwater modelling required by revised environmental management measure SG2 (refer to Table D2-1 of this submissions report).

B6.7 Groundwater management and monitoring plans

B6.7.1 Groundwater management plan

Issue raised

After approval and prior to construction, Transport for NSW should develop and implement a detailed groundwater management plan including a detailed groundwater monitoring program,

groundwater impact trigger criteria, mitigation measures and trigger action response plan with appropriate timeframes for implementation of response actions. This should include the following elements:

a) The groundwater management plan to be provided to the Department of Planning, Industry and Environment (Water) for review three months prior to commencement of construction activities

b) Include planning to reduce all occurrences of high groundwater inflow, predicted or encountered during construction. This must include the mitigation measures (eg grouting of the formation prior to tunnelling, tunnel lining, unforeseen water ingress handling strategy) to be implemented to manage these occurrences

c) Include provisions to undertake a groundwater bore census prior to construction, and periodically for the life of the project. This is to ensure any impact to any private bores is captured throughout the life of the project. The bore census details need to be included in the Annual Environmental Review

d) All 'make good' provisions are to be detailed in the Groundwater Management Plan and occurrences of 'make good' provisions being implemented are to be detailed in the Annual Environmental Review

e) Water quality monitoring of groundwater inflow prior to treatment and before discharge must be detailed.

Response

Section D1 of this submissions report builds upon the environmental management plan framework identified in Section 28.5 of the environmental impact statement, identifying the framework for the management of key issues. Table D1-1 of this submissions report provides the likely sub-plans, along with the relevant guidelines or requirements of each plan, which would support the implementation of the overarching construction environmental management plan.

Table D1-1 of this submissions report includes a groundwater management plan which will address groundwater mitigation including monitoring and inspection requirements and compliance records. The groundwater management plan would also be prepared based on the requirements of environmental management measures provided in Table D2-1 of this submissions report which address impacts to, but are not limited to, groundwater drawdown and quality, and impact to registered groundwater bores. However, and as discussed in Section D1.1 of this submissions report, the sub-plan structure may be modified during detailed construction planning to respond more effectively to particular contractor or stakeholder requirements. The content and purpose of these plans would be developed in consultation with the relevant stakeholders such as Department of Planning, Industry and Environment (Water). Further detail on specific environmental management measures related to the recommendations provided in parts b) to e) by Department of Planning, Industry and Environment (Water) is provided below.

Groundwater inflow predicted or encountered will be further refined following implementation of revised environmental management measures SG2 and SG16 (refer to Table D2-1 of this submissions report). Revised environmental management measure SG2 requires groundwater modelling to be updated with ongoing groundwater monitoring to refine inflow predictions and detailed design to consider these predictions and include designed tunnel linings, where feasible and reasonable. Revised environmental management SG16 requires measures to be implemented during tunnel construction to ensure that groundwater inflows into each tunnel during the operation phase do not exceed one litre per second per kilometre across any given kilometre.

The existing groundwater bores considered by the project are identified in Section 5.5.7 of Appendix N (Technical working paper: Groundwater), and construction and operational impacts to

existing bores are considered in sections 6.1.3.2 and 6.2.3.2 respectively. The project is generally assessed to cause negligible impact to identified groundwater supply bores for the majority of bores. The current viability of existing bores is uncertain as outlined in Table 16-17 of the environmental impact statement. However, if impacts are realised, the make good provisions will be applied (if required) to either maintain the long term viability of the bores or to provide an alternative supply or compensation, as required by environmental management measure SG3 (refer to Table D2-1 of this submissions report).

Water quality monitoring of groundwater inflows will be managed through the implementation of environmental management measure SG1 (refer to Table D2-1 of this submissions report) which outlines the continuation of the existing groundwater monitoring program for both groundwater levels and quality through construction. The quality of any discharge of groundwater by the project will be managed through the implementation of revised environmental management measure WQ11 (refer to Table D2-1 of this submissions report) identifying the criteria for discharges from wastewater treatment plants during the construction phase of the project.

B6.7.2 Groundwater monitoring plan

Issue raised

After approval and prior to construction, Transport for NSW should prepare a groundwater monitoring plan acceptable to the Department of Planning, Industry and Environment (Water) for additional hydrological and hydrogeological investigations and monitoring based on the recommendations made in the technical report on Groundwater, the modelling report and the Department of Planning, Industry and Environment (Water)'s assessment. The groundwater monitoring plan must include:

a) Adequate network coverage, including sentinel bores, to enable satisfactory assessment of potential contamination plume development, groundwater drawdown and baseflow reduction in areas of recognised higher risk. Detail of the groundwater level monitoring and monitoring of any induced water stress in the vegetation communities to be undertaken in areas of bushland and recreational parklands highly valued by the general public and local communities

b) Adequate monitoring site coverage to enable the proponent to demonstrate there is no saltwater intrusion during the life of the project

c) Monitoring and recording of any significant groundwater inflows along the entire tunnel alignment, including but not limited to the predicted high inflow areas

d) Collection of additional permeability data regarding vertical gradients and vertical hydraulic conductivity

e) The groundwater monitoring plan is required to be fully implemented at least one year prior to commencement of construction.

Response

The recommendation by Department of Planning, Industry and Environment (Water) to carry out groundwater monitoring is noted. Field investigations including drilling, permeability testing, monitoring bore installation, and water level and quality monitoring carried out as part of the assessment are outlined in Section 4.1 and 4.3 of Appendix N (Technical working paper: Groundwater). Transport for NSW has committed to continuing the existing groundwater monitoring program for groundwater levels and quality throughout construction of the project, as detailed in environmental management measure SG1 (refer to Table D2-1 of this submissions report). The detail the groundwater monitoring program should include is outlined in Section 7.3 of Appendix N (Technical working paper: Groundwater). By continuing the existing groundwater monitoring

program, Transport for NSW will ensure that sufficient background conditions are obtained as recommended by Department of Planning, Industry and Environment (Water) in part e) above.

Transport for NSW is currently planning additional geotechnical investigations and monitoring at key locations to gather additional hydrogeological data, as discussed in Section B6.5 above. As part of this planning, Transport for NSW will consider the recommendations by Department of Planning, Industry and Environment (Water) regarding groundwater monitoring and adjust any additional geotechnical investigations and monitoring as required.

Additional monitoring is also to be carried out regarding locations that are subject to medium and high risk of groundwater contamination and further analysis to potential impacts on beneficial aquifer use and the likely quality of groundwater inflows as detailed in revised environmental management measure SG18 (refer to Table D2-1 of this submissions report).

In relation to saline intrusion, significant saline intrusion due to groundwater drawdown is not anticipated even under the current conservative (worst-case) predictions (refer to Section 6.2.3.1 of Appendix N (Technical working paper: Groundwater). Notwithstanding, saline intrusion will be investigated further and managed (if required) through the application of revised environmental management measure SG2 (refer to Table D2-1 of this submissions report).

B6.8 Additional recommendations not required pre-approval or post-approval/pre-construction

Issue raised

During construction, accurate measures of inflows are required to be recorded, mapped and the grout sealing process undertaken to reduce the inflow documented. This information is to be included in the monitoring data presented in the Annual Environmental Reports and any further modelling or planning process during construction.

Response

The response in Section B6.7.1 above outlines the groundwater management plan and associated monitoring and compliance reporting provisions to be implemented for the project during construction. The groundwater management plan would provide the specific details on monitoring including how data is recorded and mapped and what contingency measures are applied to ensure compliance with environmental management measures and any conditions of approval.

Issue raised

Areas close to estuaries with thin shallow veneer of cover over fractured rock formation are required to be fully tanked.

Response

The project has included provision for lining a 125 metre section of the alignment on either side of Middle Harbour. This area is consistent with the recommendation by the Department of Planning, Industry and Environment (Water) and is considered to be highly fractured and would likely result in higher levels of water ingress into the driven tunnels than encountered on other parts of the alignment.

Issue raised

After commissioning of the tunnels, Transport for NSW is to verify the groundwater models after 10 years of the project's operation. The modelling of groundwater monitoring data collected during the first 10 years of operation of the tunnels is acceptable, provided the previously predicted

groundwater impacts are verified and no exceedances of these or the trigger criteria in the groundwater management plan have occurred during that time.

Response

Commitments to further groundwater monitoring are reflected in environmental management measure SG1 (refer to Table D2-1 of this submissions report). The existing groundwater monitoring program for both groundwater levels and quality will be continued through construction. Outcomes of updated groundwater modelling will identify any requirements for further groundwater monitoring during the operational phase of the project. In addition, and as discussed above in Section B6.5, groundwater modelling will be updated during further design development to refine predictions in accordance with revised environmental management measure SG2 (refer to Table D2-1 of this submissions report). In implementing revised environmental management measure SG2, inflow predictions will be updated prior to finalising detailed design and will include designed tunnel linings, where feasible and reasonable. The detailed design will be updated based on the updated operational inflow and impact predictions. Additional feasible and reasonable mitigation measures will be incorporated during further design development if refined predictions of groundwater levels and drawdown indicate that impacts would be greater than the impacts presented in the environmental impact statement.

As stated throughout the environmental impact statement, groundwater drawdown predictions are conservatively based on unconstrained inflows into the tunnel. As measures will be installed to restrict groundwater inflows into each tunnel to no more than one litre per second per kilometre across any given kilometre (as required by revised environmental management measure SG16), actual drawdown levels and extents would likely be less than these predictions. Transport for NSW is currently planning additional geotechnical investigations and monitoring at key locations to gather additional hydrogeological data and the contractor/s would also carry out more detailed geotechnical assessments once appointed.

The aim of the revised environmental management measure SG2 and associated commitments in related environment management measures discussed in the above responses (eg SG1, SG16, SG18 and SG19), is to avoid and/or proactively manage potential groundwater impacts through further design development. This approach would minimise the need to rely on long term monitoring programs.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B7 – Department of Planning, Industry and Environment (Crown Land)

November 2021

B7 Department of Planning, Industry and Environment (Crown Land)

Contents

B7.1 Property

Issue raised

Any affected Crown land or roads in the area will need to be compulsorily acquired under the *Land Acquisition (Just Terms Compensation) Act 1991.*

Response

Three areas of Crown land proposed to be acquired as part of the project were identified in Chapter 20 (Land use and property) of the environmental impact statement. Additional areas of Crown land may also be subject to a substratum acquisition as detailed in Section 20.4.1 of the environmental impact statement.

Transport for NSW will compulsorily acquire the affected Crown land in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and relevant Transport for NSW property acquisition guidelines, as required by environmental management measure LP3 (refer to Table D2-1 of this submissions report). Where relevant, consultation would also be carried out with trustees of affected Crown land as part of the acquisition process.

Acquisition required for the purposes of establishing and operating Cammeray Golf Course construction support site (BL1) is being progressed as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project as stated in Chapter 20 (Land use and property) of the environmental impact statement. Transport for NSW is consulting with the golf club, the Department of Planning, Industry and Environment (Crown Land) and North Sydney Council (the trustee) to achieve this.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B8 – Fire and Rescue NSW

November 2021

B8 Fire and Rescue NSW

Contents

B8.1 Fire and life safety systems

Issue raised

It is understood Transport for NSW will be required to carry out consultation with Fire and Rescue NSW throughout the design process in regard to the fire and life safety aspects of the project. As such, Fire and Rescue NSW submit no specific comments or recommendations for consideration given that agency specific requirements can be addressed at this time.

Response

Transport for NSW would continue to consult with key stakeholders throughout further design development, construction and during operation of the project and in accordance with the consultation requirements of the environmental impact statement, revised environmental management measures and conditions of approval. This would include consultation with Fire and Rescue NSW in relation to fire safety, emergency planning and management for the project. Table 6-1 of Appendix E (Community consultation framework) has been updated to include Fire and Rescue NSW as a key stakeholder (refer to Table A5-13 of this submissions report). Consultation for the project will be carried out in accordance with the community consultation framework, as required by environmental management measure SE3 (refer to Table D2-1 of this submissions report).

The key fire and life safety aspects of the project are described in Chapter 5 (Project description) of the environmental impact statement and would include maintenance and emergency breakdown bays, fire and incident detection equipment, communication systems, fire suppression systems, emergency lighting, smoke management and power systems, cross passages or longitudinal egress passages, and tunnel closure systems. The fire and life safety systems would be installed in accordance with Australian Standard *AS 4825:2011 Tunnel Fire Safety* (Standards Australia, 2011), applicable Austroads and Transport for NSW guidelines, and the outcomes of consultation with emergency services, including Fire and Rescue NSW.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B9 – Heritage NSW

November 2021

B9 Heritage NSW

Contents

B9.1 Consultation with Aboriginal stakeholders

Issue raised

Heritage NSW understands that Transport for NSW is committed to meaningful engagement through a robust Aboriginal consultation process and that consultation with the Aboriginal community will be ongoing for the life of the project.

Response

Heritage NSW's comment that Transport for NSW is committed to meaningful engagement through a robust Aboriginal consultation process is acknowledged. Transport for NSW will continue to consult with key stakeholders throughout further design development, construction and during operation of the project and in accordance with the consultation requirements of the environmental impact statement, environmental management measures and conditions of approval.

Consultation with Aboriginal stakeholders regarding the project has been ongoing since 2017 and is detailed in Chapter 7 (Stakeholder and community engagement) of the environmental impact statement and Appendix L (Technical working paper: Aboriginal cultural heritage assessment report).

In addition, consultation has continued with Aboriginal stakeholders during the preparation of this submissions report. The Metropolitan Local Aboriginal Land Council, as the applicable local Aboriginal land council in the study area, was consulted on the findings of the updated mapping and assessment of Aboriginal cultural heritage sites as documented in Appendix A of this submissions report. A representative from Metropolitan Local Aboriginal Land Council also attended associated site inspections as part of the assessment. A representative from the Aboriginal Heritage Office attended a further site inspection of AHIMS site 45-6-0662 (Frenchs Forest; Bantry Bay; Wakehurst Parkway) as also reported in Appendix A of this submissions report and as discussed further in Section B9.2 below. A record of these inspections is included in Table A2-8 of this submissions report.

Ongoing consultation with Aboriginal stakeholders prior to and during construction of the project will be carried out as required by revised environmental management measures AH1 and environmental management measures AH4, AH5 and AH7 (refer to Table D2-1 of this submissions report) to inform further assessment of Aboriginal heritage items and the development of the Aboriginal heritage interpretation strategy. Consultation for the project will be carried out in accordance with the community consultation framework provided as Appendix E (Community consultation framework)), as required by environmental management measure SE3 (refer to Table D2-1 of this submissions report).

Should the project be approved then relevant consultation requirements included in the project conditions of approval would also be complied with.

B9.2 Aboriginal heritage interpretation strategy

Issue raised

Heritage NSW supports the development of an Aboriginal heritage interpretation strategy in consultation with the Registered Aboriginal Parties.

Response

Transport for NSW acknowledges Heritage NSW's support for the development of an Aboriginal heritage interpretation strategy for the project. The Aboriginal heritage interpretation strategy will be

developed as part of the project Urban Design and Landscape Plan in consultation with Registered Aboriginal Parties and other relevant stakeholders, as required by environmental management measure AH7 (refer to Table D2-1 of this submissions report).

B9.3 Management of AHIMS site 45-6-0662

Issue raised

Heritage NSW supports the proposed approach to identify the location of previously recorded Aboriginal heritage site 45-6-0662 to be carried out in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (Department of Environment, Climate Change and Water (DECCW), 2010b).

Response

Transport for NSW acknowledges Heritage NSW's support for the proposed approach to identify the location of AHIMS site 45-6-0662.

AHIMS site 45-6-0662 (Frenchs Forest; Bantry Bay; Wakehurst Parkway) could not be confirmed during the field inspection and the Aboriginal Heritage Office advised the site was likely covered by gravel and vegetation, as discussed in Chapter 15 (Aboriginal cultural heritage) of the environmental impact statement and Appendix L (Technical working paper: Aboriginal cultural heritage assessment report).

Following exhibition of the environmental impact statement, a further attempt to locate AHIMS site 45-6-0662 was carried out during a site inspection on 22 January 2021. The inspection was organised by Transport for NSW and was attended by a representative from the Aboriginal Heritage Office. The inspection is reported in Section 3 of Appendix A of this submissions report. During the site inspection, site 45-6-0662 could not be located, however a potential engraving site was identified nearby. The potential engraving site was inspected again on 20 May 2021. During the 20 May 2021 inspection a further search for AHIMS site 45-6-0662 was carried out in the presence of a representative from Metropolitan Local Aboriginal Land Council, however AHIMS site 45-6-0662 could not be located.

Given the above, environmental management measure AH1 has been updated to allow for the management of site 45-6-0662 prior to construction. The revised environmental management measure is provided below (refer to Table D2-1 of this submissions report):

> Before the start of construction, ~~further consultation with Heritage NSW, the Metropolitan Local Aboriginal Land Council, the Aboriginal Heritage Office and the Registered Aboriginal Parties will be carried out to decide an appropriate course of action for the Aboriginal site 45-6-0662 on Wakehurst Parkway, as the location of this site could not be confirmed during field inspection (site is likely covered by gravel/vegetation).~~
>
> ~~If considered appropriate,~~ an archaeological investigation ~~may~~ **will** be carried out at the possible **Aboriginal heritage** site **45-6-0662** location to carefully remove the gravel/vegetation, to **try and locate and** confirm its presence and record the underlying site condition. **This will occur in the presence of a representative from Metropolitan Local Aboriginal Land Council.**
>
> If new information regarding site condition is identified during consultation suggesting the site may be subject to impacts due to vibration and settlement, environmental management measures AH2, AH3 and AH4 will apply.
>
> In the absence of confirming the site, if during construction works a site is located, the unexpected finds protocol prescribed in AH5 would apply. Further, Heritage NSW, an appropriately qualified archaeologist and the Metropolitan Local Aboriginal Land Council will be contacted and the site will be re-recorded in situ.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B10 – Heritage Council of NSW

November 2021

B10 Heritage Council of NSW

Contents

B10.1 Overview

Issue raised

The Heritage Council of NSW notes the city-shaping nature of this critical infrastructure project and has provided their response to maximise heritage outcomes.

Response

Transport for NSW acknowledges the Heritage Council of NSW comment. Transport for NSW is committed to preserving heritage items along the project corridor and minimising project impacts.

B10.2 Managing vibration impacts on non-Aboriginal heritage items

B10.2.1 Preventing both cosmetic and structural damage

Issue raised

The Heritage Council of NSW recommends that environmental management measure NAH10 (and other relevant NAH environmental management measures) should have an aim to prevent both cosmetic and structural damage and not just to prevent cosmetic damage to heritage items such as to Tarella and Walter Burley Griffin Incinerator.

Response

Environmental management measure NAH10 is specific to the Seaforth 'Harbour Foreshores' heritage item and states that:

> A structural survey will be prepared for all maritime infrastructure within the Seaforth 'Harbour Foreshores' that could be subject to vibrational impact to determine minimum working distances and vibration limits to be observed to prevent cosmetic damage. Vibration monitoring will be carried out during works to ensure vibration levels do not exceed appropriate limits. The recommended actions in Appendix G (Technical working paper: Noise and vibration) will be followed.

The construction vibration objectives for the project are discussed in Section 3.4.5 of Appendix G (Technical working paper: Noise and vibration). Potential structural damage of buildings by vibration is typically managed by ensuring vibration does not exceed certain limits and standards, such as British Standard *BS 7385-2:1993 Evaluation and measurement of vibration in buildings Part 2 – Guide to damage levels from ground borne vibration* (British Standards Institution (BSI), 1993) and German Standard *DIN 4150-3:2016 Vibration in Buildings – Part 3: Effects on Structures* (Deutsches Institut für Normung (DIN), 2016). As outlined in Transport for NSW's *Construction Noise and Vibration Guideline* (2016a), guidance for cosmetic damage of structures is provided in the British Standard *BS 7385-2(1993):1993*, while German Standard *DIN 4150-3:2016* has criteria of particular relevance for heritage structures.

British Standard *BS 7385-2:1993* can be used as a guide to assess the likelihood of building damage from ground vibration. The standard suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur. Cosmetic damage consists of minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls. 'Minor' damage is considered possible at vibration magnitudes which are twice those given for cosmetic damage and 'major' damage to a building structure may occur at levels greater than four times those values.

Section 3.4.5.3 of Appendix G (Technical working paper: Noise and vibration) discusses the sensitivity of heritage structures and has adopted a conservative vibration damage screening level of 2.5 millimetres per second for their assessment.

Given that cosmetic damage occurs at lower vibration levels than those that cause minor and major damage to a building structure, the requirement of environmental management measure NAH10 to prevent cosmetic damage implicitly provides protection against structural damage occurring. Accordingly, amendment of NAH10 (and other NAH environmental management measures) as recommended by the Heritage Council of NSW is not considered necessary.

Vibration generating activities will be managed through the establishment of minimum buffer distances to achieve screening levels, as detailed in environmental management measure CNV7 (refer to Table D-2 of this submissions report). Where vibration levels are predicted to exceed the screening levels, a more detailed assessment of the impacted structure and attended vibration monitoring will be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items, the more detailed assessment will specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.

The construction noise and vibration management plan developed for the project will identify the relevant criteria and management levels in relation to noise and vibration, including for specific heritage items as detailed in revised environmental management measure CNV1 (refer to Table D-2 of this submissions report). This would include any relevant criteria and requirements established through the implementation of environmental management measure CNV7.

The potential for vibration impacts to Tarella and Walter Burley Griffin Incinerator are assessed in Table 14-3 of the environmental impact statement. Tarella is located at 3 Amherst Street, Cammeray and is in the vicinity of tunnelling work for the Beaches Link tunnel. Walter Burley Griffin Incinerator is located at 2 Small Street, Willoughby, and is in the vicinity of tunnelling work for the ramp tunnel connection to the Gore Hill Freeway. Annexures K and L of Appendix G (Technical working paper: Noise and vibration) provide maps with heritage items identified and the minimum working distances for vibration from mainline and ramp tunnelling and surface works shown respectively. On this mapping, both items have been identified as being outside of minimum working distances for vibration from mainline and ramp tunnelling and surface works. As described in Table 14-3 of the environmental impact statement, both Tarella and Walter Burley Griffin Incinerator have been assessed as having potential for temporary vibration impacts due to construction activities and very slight permanent settlement and ground movement impacts caused by tunnel excavation. However, with the implementation of the environmental management measures proposed in Table D-2 of this submissions report, the level of impact on these heritage items was assessed as being negligible.

Building condition surveys will be prepared for properties (and heritage assets) where the project has the potential to cause cosmetic or structural damage prior to the commencement of construction, as per revised environmental management measure SG7 (refer to Table D-2 of this submissions report). For most structures, vibration levels would generally be below levels that may cause potential damage. Within three months of the completion of construction, a post-construction survey will then be offered to property owners of buildings where a pre-construction survey was carried out. Any damage caused by the project will be rectified.

An Independent Property Impact Assessment Panel, comprising geotechnical and engineering experts, will be established prior to the commencement of works to independently verify building condition survey reports, resolve any property damage disputes relating to construction and

establish ongoing settlement and vibration monitoring requirements, as required by environmental management measure SG5 (refer to Table D-2 of this submissions report).

B10.2.2 Consideration of vibration impacts for potential non-Aboriginal terrestrial heritage items

Issue raised

Environmental management measure CNV7 recommends a more detailed assessment will specifically consider the heritage values of the structure (heritage items) as part of the management of construction vibration impacts. The Heritage Council of NSW recommends that the assessment should also include the three potential non-Aboriginal terrestrial heritage items and not just already listed heritage items.

Response

Potential (unlisted) non-Aboriginal terrestrial heritage items are identified in Section 14.3.2 of the environmental impact statement and Section 3.3 of Appendix J (Technical working paper: Non-Aboriginal heritage). These include ANZAC Park, Henry Lawson's Cave and Balgowlah Golf Course. It should be noted that a fourth item, Bernie House, did not meet the significance thresholds for local or state listing, as discussed in Section 4 of Appendix J (Technical working paper: Non-Aboriginal heritage).

Construction vibration assessments carried out as part of Appendix G (Technical working paper: Noise and vibration) considered both listed and unlisted non-Aboriginal heritage items. Maps with heritage items identified and the minimum working distances for vibration from mainline and ramp tunnelling and surface works shown are provided in Annexures K and L respectively of Appendix G (Technical working paper: Noise and vibration). It should be noted that these three sites are incorrectly marked as being ‘listed’ sites in the mapping legend. This issue has been corrected by inclusion as a clarification in Part A of this submissions report (refer to Table A5-13 for further discussion).

On this mapping, ANZAC Park has been identified as being within the minimum working distance for unsound structures for Beaches Link surface works within the Warringah Freeway road corridor but outside of minimum working distances for mainline and ramp tunnelling. It is noted that ANZAC Park was unintentionally excluded from the discussion within Section 5.2.5.1 and Table 5-19 of Appendix G (Technical working paper: Noise and vibration). Subsequently, the omission was also repeated in Section 10.6.3 of the environmental impact statement. Notwithstanding, and similar to requirements for Cammeray Park, ANZAC Park would be subject to review prior to construction to confirm whether any sensitive structures or features are located within the park and if further investigation for vibration impacts is required. This issue has been corrected by inclusion as a clarification in Part A of this submissions report (refer to Table A5-13 for further discussion).

Henry Lawson’s Cave is located well outside of the minimum working distances for mainline and ramp tunnelling and Flat Rock Drive construction support site (BL2) (the closest surface works site). As such, Henry Lawson’s Cave is not required to be considered further for vibration impacts.

Balgowlah Golf Course is a heritage item that is not listed. However, it has been conservatively assessed in Appendix J (Technical working paper: Non-Aboriginal heritage) as being of local significance. The proposed works would be of large scale and major intensity, with portions of the golf course being modified through the construction of a new access road, new and improved open space and recreation facilities and motorway facilities. The changes to the Balgowlah Golf Course would be permanent and irreversible and the level of impact on the heritage item would be major. Additionally, for the purposes of the environmental impact statement, the club house has been

assumed to be demolished so as to represent a conservative worst-case scenario. As such, Balgowlah Golf Course as a heritage item was not considered in the construction vibration assessment carried out as part of Appendix G (Technical working paper: Noise and vibration).

A dedicated consultation process jointly led by Transport for NSW and Northern Beaches Council will take place to give the community an opportunity to provide input on the final layout of the new and improved open space and recreation facilities at Balgowlah. This process will start after planning approval and in advance of construction commencing.

Northern Beaches Council has acknowledged in their submission that Balgowlah Golf Couse is currently not listed and that on balance they support the proposed plans for new and improved open space and recreation facilities at the site (refer to Section B11.13.6 of this submissions report).

With regard to environmental management measure CNV7, the wording and intent of the management measure is to not differentiate between listed or unlisted non-Aboriginal heritage items identified in Chapter 14 (Non-Aboriginal heritage) of the environmental impact statement. As discussed above, both listed and unlisted non-Aboriginal heritage items were considered in the construction vibration assessments carried out as part of Appendix G (Technical working paper: Noise and vibration), with the exception of Balgowlah Golf Course. The assessment also considered Aboriginal heritage sites and maritime heritage items. All 'heritage items' proposed to be subject to more detailed assessment in accordance with environmental management measure CNV7 are identified in Section 5 of Appendix G (Technical working paper: Noise and vibration). As noted above, a clarification in Table A5-13 will ensure ANZAC Park is identified along with the other items. Accordingly, amendment of environmental management measure CNV7 as recommended by the Heritage Council of NSW is not considered necessary.

B10.3 Archival recording

Issue raised

Environmental management measure NAH2 recommends archival recording of only two non-Aboriginal heritage items (of local significance) impacted by the project. The Heritage Council of NSW recommends that advice should be sought from relevant local councils for their recommended conditions for archival recording.

Response

Following consideration of Northern Beaches Council's submission on the environmental impact statement and Council's request for consideration of an additional two potential non-Aboriginal heritage items, environmental management measures NAH2 (refer to Table D2-1 of this submissions report) has been revised to include these additional items (refer to Appendix H of this submissions report for more information). As such, archival recording in accordance with the *Photographic Recording of Heritage Items Using Film or Digital Capture* (Heritage Council of NSW, 2005b) guideline will be carried out for the following items:

- Balgowlah Golf Course, Balgowlah
- Frenchs Bullock Track, Killarney Heights
- Canberra Concrete Bus Shelter, Frenches Forest
- Wakehurst Parkway Memorial, Killarney Heights.

All items are located in the Northern Beaches local government area. Further discussion on the above items is provided in Section B11.13 and Appendix H of this submissions report.

B10.4 Heritage items of historical archaeological potential

Issue raised

The Heritage Council of NSW notes that there were no heritage items identified as having historical archaeological potential likely to be impacted, except those linked to maritime archaeological values. This assessment and the use of an unexpected heritage items procedure is appropriate.

Response

The Heritage Council of NSW's comments and acknowledgement of the appropriateness of the unexpected heritage items procedure, *Standard Management Procedure: Unexpected Heritage Items* (Roads and Maritime Services, 2015c), is noted.

B10.5 Managing slumping impacts on maritime archaeology

Issue raised

Heritage NSW as delegate of the Heritage Council of NSW supports the mitigation conditions for maritime archaeology but notes that the environmental impact statement is yet to assess the potential affects (if any) of slumping on the known and previously identified/undiscovered heritage sites that may exist within the proposed works area. The Heritage Council of NSW identifies that further work to determine the effects and possible extent of slumping associated with dredging in these areas (if any), and this should provide further courses of action in the Maritime Heritage Management Plan which address any threats to known and potentially buried maritime heritage sites in slumping areas, and subsequent actions to manage, record, interpret and conserve any sites which may be exposed and/or subsequently threatened as a result of these works.

Response

Slumping in maritime archaeology refers to the sides of a channel or dredged area collapsing until eventually a stable incline is achieved. The horizontal extent of the slumping (ie distance from the cut of the sea bed/bed of the harbour that would be disturbed) depends on the nature of the bed of the harbour and substrate, depth of the cut, existing batter and the period of time involved. Slumping can potentially result in any maritime heritage item that may be buried on the sea bed/bed of the harbour being exposed or being moved, resulting in accelerated degradation and/or reduction in integrity of a site with resulting potential loss of heritage significance.

The construction of the immersed tube tunnels would require dredging of the bed of the harbour at the Middle Harbour crossing to create a trench of varying depth for the installation of the immersed tube tunnels, as discussed in Chapter 6 (Construction work) of the environmental impact statement.

There are several maritime heritage items in the vicinity of the dredge works, including Clive Park Unidentified No. 1 Shipwreck, Side scan sonar anomaly (16W-06) and various magnetic anomalies which have a potential of maritime heritage value, as detailed in Appendix K (Technical working paper: Maritime heritage).

Slumping with respect to the project was considered by the Maritime heritage specialist in the preparation of Appendix K (Technical working paper: Maritime heritage) and was not determined to be a potential impact to maritime heritage items due the following factors:

- On the eastern, western and southern sides of the southern cofferdam the slumping risk is removed as the cofferdam structure supports the surrounding bed of the harbour
- Slumping would not be expected adjacent to the southern cofferdam structure due to the limited disturbance of the bed of the harbour required for piling activities

- In the vicinity of Clive Park Unidentified No. 1 Shipwreck, the layer of sediment over bedrock is relatively thin, therefore the potential for slumping in this area is very low
- Once the cofferdams are decommissioned, the cofferdam piles would cut off at bed of the harbour level ensuring the slumping risk is still avoided in the longer term
- The risk of slumping of the walls of the trench for the immersed tube tunnels would be minimised by sloping the trench walls at a gradient of about 14 degrees (25 per cent or 4:1) for soft sediment areas to maximise the stability of the trench and minimise the risk of slumping. This batter angle would negate the need for any repeated dredging during the course of project to remove accumulating sediments across the construction depth
- Survey accuracy and the modern dredge equipment that would be used for dredging operations would accurately control dredge depth and excavation area by utilising GPS technology which ensures extent of removal of material is strictly controlled and over excavation does not occur. This would also be regularly checked by divers. In addition, regular reviews of side scan sonar and/or multibeam information of the trench and edges of the trench would be carried out by a maritime archaeologist
- The very unlikely and low archaeological sensitivity of the bed of the harbour around the proposed dredging (with the exception of anomalies whose heritage values have not been assessed as yet and/or very small parcels of the bed of the harbour which is yet to be assessed for maritime heritage sites)
- The trench for the immersed tube tunnels would be progressively filled in with a gravel bed and locking fill at the sides of the immersed tube tunnel units where required, so time for any slumping to eventuate would be limited (refer to Chapter 6 (Construction work) of the environmental impact statement for further description).

Risks to maritime heritage, including potentially unidentified/undiscovered maritime heritage sites will be managed in accordance with environmental management measures NAH3 which provides for the development of a Maritime Heritage Management Plan. Actions to manage, record, interpret and conserve any heritage items that may be exposed or otherwise impacted by the works would be detailed in the Heritage Management Plan.

In terms of Clive Park Unidentified No. 1 Shipwreck, the following environmental management measures are relevant:

- NAH3(d)(ii) includes provision for periodic monitoring before and during construction, and final site inspection
- NAH5 requires an archival recording of Clive Park Unidentified No. 1.

As stated earlier, regular reviews of side scan sonar and/or multibeam of the edges of the immersed tube tunnel trench would be carried out during the dredging works as part of standard dredging construction methodology. Notwithstanding that slumping impacts are not expected for the project, in response to issue raised by the Heritage Council of NSW, new environmental management measure NAH16 has been prepared to ensure that these reviews are periodically checked on a monthly basis by a maritime archaeologist, as per the following (refer to Table D2-1 of this submissions report):

> During dredging works at the Middle Harbour crossing, side scan and/or multibeam information will be reviewed on a monthly basis by a suitably qualified maritime archaeologist in order to identify any newly exposed anomalies of potential cultural heritage significance. If any anomalies are identified, divers under the supervision of a maritime archaeologist will assess the cultural significance of the anomaly. Heritage mitigation response/s proportionate to the assessed level of the cultural heritage significance will then be determined and implemented.

B10.6 Recommended conditions of approval

Issue raised

The Heritage Council of NSW provides detailed recommended heritage conditions of approval in an attachment to their submission.

Response

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during their assessment of the project.

B10.7 Advice from relevant local councils

Issue raised

As the study area contains 73 listed terrestrial heritage items (mostly of local significance) and conservation areas, advice should be sought from the relevant local councils.

Response

The local councils within the study area for the project have lodged submissions following exhibition of the environmental impact statement. The non-Aboriginal heritage issues raised in the submissions from Northern Beaches Council and Willoughby City Council are addressed in sections B11.13 and B12.13 respectively of this submissions report. Mosman Council and North Sydney Council did not raise any concerns in relation to non-Aboriginal heritage (refer to sections B13 and B14 respectively of this submissions report for these submissions).

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B11 – Northern Beaches Council

November 2021

B11 Northern Beaches Council

Contents

B11.1 Support for the project

Issue raised

Pages 1, 4, 5, 6, 12, 13, 15, 23, 42, 43, 46

Northern Beaches Council is broadly supportive of the project as the NSW Government's largest investment in new infrastructure in the Northern Beaches local government area. Council continues to provide, in principle, support for the construction of the project, subject to the minimisation of the impacts on the community and the environment.

Council states that the environmental impact statement has taken into account the key issues that they raised previously in their November 2018 submission during the reference design consultation period. These key issues included ensuring that the project caters for appropriate levels of public transport within the tunnel; exploring alternate options to address community concerns regarding the access road and connectivity to the portal; maximising green space at Balgowlah; ensuring independent scientific review of the potential air emissions; impacts on flora and fauna; location of construction support sites and enhanced consultation for future stages of the project.

Council lists six key reasons why the project is vital for the Northern Beaches (*Pages 4-6, Page 15*):

1. To address the existing high levels of traffic congestion on the Northern Beaches. The Northern Beaches has only three access points that are highly congested during the morning and evening peak periods and on weekends. The project would provide a fourth access route to the Northern Beaches with additional road space for express bus services to facilitate greater take-up of public transport and increase the catchment encompassed by a 30 minute travel time to and from the Northern Beaches
2. To provide a direct connection to the Sydney Motorway Network (which has been planned since the 1960s), and seamlessly link the Northern Beaches with Greater Sydney and beyond, whilst reducing the cost of congestion and delays to both residents and businesses. The project creates the opportunity to provide direct links for improved public transport connections via bus services direct to North Sydney (Metro and Heavy Rail), Sydney CBD, St Leonards and Macquarie Park. The original planning for the Warringah Freeway included a surface expressway from Wakehurst Parkway at Seaforth, to the current Warringah Freeway at Cammeray, with a high-level bridge across Middle Harbour. This proposal would have resulted in significant property acquisition and would have created a physical barrier across the route
3. To support the future growth of the Northern Beaches region. The Northern Beaches region is forecast to grow from 265,468 people in 2016 to 288,431 in 2036, representing an increase of about 22,963 people (8.7 per cent growth or 0.4 per cent annual growth rate). While there may be short term impacts to this growth as a result of the COVID-19 pandemic, it is crucial that all levels of government continue to plan for infrastructure projects, to ensure that long term growth is appropriately managed. The majority of this growth is expected to occur in the four Strategic Centres (Frenchs Forest, Brookvale-Dee Why, Mona Vale and Manly) and land use planning strategies are currently underway for these centres earmarked for growth. Two of these Strategic Centres, Frenchs Forest and Brookvale-Dee Why, is of particular relevance to the project and are expected to accommodate a significant number of dwellings over the next 20 years
4. To unlock Phases Two and Three of Council's *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a) for Frenchs Forest. Council's Structure Plan identifies the phased delivery of 4,360 dwellings to 2037. Council's Structure Plan identifies that Phases Two and Three are reliant upon the delivery of State infrastructure items such as the project. The project is therefore critical to achieving the objectives of Council's Structure Plan and approach to the delivery of housing for the Northern Beaches region over the next 20 years

5. To support additional growth in Brookvale as part of Council's Brookvale Structure Plan project. The Brookvale precinct is undergoing review to identify capacity to accommodate additional dwellings. The major issue identified after the draft Brookvale Structure Plan was placed on public exhibition in 2017, was the ability of the road and transport network of the Brookvale-Dee Why precinct to accommodate additional growth. In response to this, Council has worked with Transport for NSW to complete additional traffic modelling of the precinct. The model identifies a range of housing and employment growth scenarios, including an assessment of the impact of the project. The model demonstrates that the project, in addition to other traffic and transport upgrades, would lead to a reduction in traffic loads on key roads at Pittwater Road and Condamine Street, providing a positive benefit to the transport network within Brookvale, with flow-on effects to surrounding areas. The Brookvale Structure Plan therefore further supports the need for the project to support additional housing and employment growth
6. To support an infrastructure led recovery in light of the COVID-19 pandemic. The NSW Government's 'COVID-19 Recovery Plan' identifies the delivery of an infrastructure pipeline over four years, as a key action to assist with the economic recovery of NSW. If approved, the project will increase the range of projects identified under this infrastructure pipeline and contribute towards additional job creation and economic growth that will accelerate the economic recovery of NSW.

Council noted the following support for specific aspects of the project:

- Support for the justification and need for the project (*Page 4*)
- Acknowledgement that the project will transform the transport network of the Northern Beaches by relieving existing pressure on the main arterial roads and providing an additional access point to the region (*Page 4*)
- Council was consulted during the options development process and is generally satisfied with the location of the connections to and from Wakehurst Parkway including tunnel portal locations. The temporary construction support site location has been reduced in footprint considerably, compared to early versions of the project designs and now minimises the impact on the Manly Warringah War Memorial State Park and little to no impact on the Seaforth Oval Precinct. The ventilation outlet at this location has been pushed further north away from the dwellings in Judith and Kirkwood Streets. Requests have been made by sections of the community for access from Seaforth into the portals at Wakehurst Parkway. However, Council is satisfied that this option is not viable due to the impact on the environment as a result of the increased width of the corridor required and the relocation of the portals into close proximity to the residential area (*Pages 6 and 7*)
- The project has transformed from the initial surface expressway of the 1950's to the current tunnel connection to the Western Harbour Tunnel and Warringah Freeway Upgrade project. With advances in tunnelling techniques, a tunnel of this length has become a viable alternative. This will result in a significant decrease in the number of properties that need to be acquired for the project and also the reduces the impact on the environment compared to a surface connection (*Page 6)*
- Council notes that considerable work has been done to consider several options for the Balgowlah portals and proposed access road connection. Several options were considered and discounted early in the evaluation, due to increased property acquisition, flood impact concerns and visual and environmental impacts that included additional vegetation clearing, impacts on Burnt Bridge Creek further downstream of the current Kitchener Street Bridge and impacts on a wider population catchment. The current design takes advantage of the natural grade to assist with the tunnel dive under nearby residential areas and the access road has been moved to reduce the impact on nearby residential properties that are not in the acquisition area. The current design takes into account some of the community issues raised during the design consultation process and maximises the recreational space returned to the community earlier in

the project timeline than was previously possible. Council is of the view that refinement of the detailed design will produce greater benefits to the community (*Page 7*)

- Council is satisfied that the Secretary's environmental assessment requirements for stakeholder and community engagement have been appropriately met in the environmental impact statement and that effective engagement has been carried out with the relevant community in the lead-up to the exhibition of the environmental impact statement (*Page 12*)
- The environmental impact statement shows in a transparent manner the issues raised by the community and stakeholders and the response or action taken. The project refinements in response to feedback are well documented and in a readable format (*Page 12*)
- Support for the high-level vehicle management strategies proposed in the environmental impact statement, noting that more detail would be considered as the project progresses towards construction (*Page 13*)
- Support for revised environmental management measure CTT2 and environmental management measures CTT4, CTT5 and CTT7 (refer to Table D2-1 of this submissions report) that are relevant to recreational boating (*Page 15*)
- General support for the proposal by Council's Heritage team and support for the identified heritage conclusions and strategies, with several additional recommendations that can further help to ameliorate any negative heritage impacts (*Page 23*)
- Support for efforts to minimise fauna roadkill through, in particular fauna exclusion fencing along the entire alignment of Wakehurst Parkway (*Page 36*)
- The Aboriginal Heritage Office (which is a partnership of councils, including Northern Beaches Council) has reviewed Appendix L (Technical working paper: Aboriginal cultural heritage assessment report) and largely agrees with the proposed environmental management measures, and that the Secretary's environmental assessment requirements have been met (*Page 26*)
- Strong support for environmental management measures B5, B9, B28, B29 and B31 - B38 (refer to Table D2-1 of this submissions report) that are relevant to marine ecology (*Page 42*)
- Acknowledgement of the efforts to minimise property acquisitions and the prioritisation of utilising Transport for NSW land where possible (*Page 42*)
- Support for the initiatives proposed for acquired land in the Northern Beaches after the construction period (*Page 43*)
- Council notes that the overall Precinct Concept Masterplans have progressed well and that the big-picture outcomes are well founded, justified and supported (*Page 46*).

Response

Transport for NSW acknowledges the in principle support provided by Northern Beaches Council and looks forward to continued engagement with council on the issues raised.

B11.2 Assessment process

B11.2.1 Terminology

Issue raised

Page 8

Manly Warringah War Memorial State Park has been incorrectly labelled as 'Manly Dam Reserve' in the environmental impact statement.

Response

Northern Beaches Council's comment on the correct terminology use for Manly Warringah War Memorial State Park is noted. A clarification has been included in Table A5-13 of Part A of this submissions report. This clarification does not impact the outcome of the assessment provided in the environmental impact statement.

B11.2.2 Post approval issues

Issue raised

Page 2

Northern Beaches Council recommends that the following key areas of concern are addressed by the project during the detailed design phase of the project:

- Bushland and biodiversity impacts and associated offsetting
- Groundwater drawdown in the local catchments
- Ecological impacts on the local creeks and Middle Harbour
- Noise, traffic and vibration impacts on the local residents during construction and how this is managed through the environment protection licence
- Impact on the adjoining road network, congestion during construction and operational impacts around the peripheral network approaching the tunnel
- Public transport priority over private car usage
- Tunnel emissions and ongoing monitoring
- Active transport and bus connectivity during and post construction
- Local road network being used to bypass the work zones
- Balgowlah Golf Course precinct and the reuse of the club house for the community
- Consultation and next steps.

Response

The points raised by Northern Beaches Council to be addressed during the detailed design phase are noted. A number of environmental management measures have been developed to address these concerns and are included in Table D2-1 of this submissions report. In addition, Section D1 of this submissions report builds upon the environmental management plan framework identified in Section 28.5 of the environmental impact statement, identifying the framework for the management of key issues including a number of the concerns raised by Council. Table D1-1 of this submissions report provides the likely sub-plans, along with the relevant guidelines or requirements of each plan, which would support the implementation of the overarching construction environmental management plan.

In addition, responses to the areas of concern are provided in the following sections of this submissions report:

- Bushland and biodiversity impacts and associated offsetting: Section B11.18
- Groundwater drawdown in the local catchments: Section B11.15
- Ecological impacts on the local creeks and Middle Harbour: Section B11.18
- Noise, traffic and vibration impacts on the local residents during construction and how this is managed through the environment protection licence: Section B11.9

- Impact on the adjoining road network, congestion during construction and operational impacts around the peripheral network approaching the tunnel: Section B11.7 and Section B11.8
- Public transport priority over private car usage: Section B11.3.4
- Tunnel emissions and ongoing monitoring: Section B11.11
- Active transport and bus connectivity during and post construction: Section B11.7 and Section B11.8
- Local road network being used to bypass the work zones: Section B11.7
- Balgowlah Golf Course precinct and the reuse of the club house for the community: Section B11.13.8
- Consultation and next steps: Section B11.6.

B11.2.3 Project design revisions

Issue raised

Page 10

All design revisions are to be approved by Northern Beaches Council prior to construction.

Response

Transport for NSW will continue to engage and consult with Northern Beaches Council, the community and other key stakeholders so they are informed and have opportunities to provide feedback to the project team during further design development and construction phases. An interface agreement would be established between Transport for NSW and Council and would establish appropriate ongoing engagement and protocols around matters such as design review.

The project design would continue to be refined during further design development as noted in Section 28.3 of the environmental impact statement. Further design development would be based on the project approval, including the environmental impact statement, this submissions report and the revised environmental management measures (refer to Table D2-1 of this submissions report). In addition, Section 28.3 of the environmental impact statement has outlined areas where further work would be carried out to optimise the design outcomes and construction planning as well as key project components that have been identified as requiring resolution during further design development (refer to Table 28-2 of the environmental impact statement).

Council will be able to provide input into the final layout of the new and improved open space and recreation facilities at Balgowlah during the dedicated consultation process jointly led by Transport for NSW and Council, as described in Section 5.2.13 of the environmental impact statement. This consultation will be separate to the consultation for the environmental impact statement and is expected to commence after planning approval and in advance of construction starting. As part of this consultation process, Council will have the opportunity to approve the final design of the new and improved open space and recreation facilities.

Any changes to the project would be reviewed for consistency with the assessment contained in the environmental impact statement and this submissions report including relevant revised environmental management measures, environmental performance outcomes and any future conditions of approval. If design refinements are not consistent with the approval issued by the NSW Minister for Planning and Public Spaces, approval would be sought from the Minister for any such modifications in accordance with the requirements of Division 5.2 of the *Environmental Planning and Assessment Act 1979*.

For any future design refinements, a screening assessment would be carried out to consider whether the refinement would result in:

- Any inconsistency with the conditions of approval
- Any inconsistency with the objectives and operation of the project as described in the environmental impact statement
- A change to the approved project that may require a modification of the approval
- Any potential environmental or social impacts of a greater scale or impact on previously unaffected receivers than that considered by the environmental impact statement or the submissions and preferred infrastructure report.

B11.3 Project development and alternatives

B11.3.1 New access road at Balgowlah

Issue raised

Page 7

Northern Beaches Council recommends reconfiguring the new access road connecting the Beaches Link tunnel to Sydney Road. The recommendation is to utilise the incline and include for an underpass for the access road to provide direct access to the tunnel portals in both directions. This proposal would eliminate the need for traffic signals to connect the access road with the Burnt Bridge Creek Deviation and tunnel portals. Council acknowledges that this modification will require additional works to grade-separate this part of the alignment, but is of the opinion that it will benefit the overall road network, and specifically, the inbound bus services using the surface road connection along Burnt Bridge Creek Deviation.

Response

The Balgowlah connection designs have evolved between 2016 and 2020 from concept design through to reference design and were guided by key project objectives. The specific key objectives for the Balgowlah area were refined through community and stakeholder inputs between 2018 and 2020 and are outlined in Table 4-7 of the environmental impact statement. The design process included consideration of around 37 road and tunnel alignment options which were initially checked on suitability against the key project objectives. Eleven of those design options were elevated beyond initial checks and were considered and reviewed in more detail against the project objectives and with comparison against previous preferred design iterations. The reference design taken through to the environmental impact statement was the preferred design which was selected after comparison against the other ten alternatives. A summary of the Balgowlah connection alternatives is provided in Section 4.5.5 of the environmental impact statement. For connections to Sydney Road, various alternatives were evaluated as part of the project development (refer to Section 4.5.5 of the environmental impact statement for more detail).

The proposal of a grade separation/underpass suggested by Northern Beaches Council in their submission would potentially deliver free flow for traffic travelling southbound on Burnt Bridge Creek Deviation in the vicinity of the new access road. The various Balgowlah connection alternatives which were evaluated in more detail as part of the project development noted above, also included free flowing traffic on Burnt Bridge Creek Deviation. However, these alternatives were assessed as sub-optimal when considered against the project objectives. Council's proposed solution of reconfiguring and lowering the new access road into an extended underpass is not considered to be a reasonable alternative based on environmental and community impacts when compared with value for money benefits delivered by the preferred design. These impacts would include:

- A longer program for construction of additional cut and cover/trough due to more complex staging that would be required to maintain existing traffic flows during construction
- Greater construction noise impacts due to the longer construction program and increased excavation in rock to form an extended trough
- Due to level changes created by a lowered access road trough solution, access to the proposed public car park for the new and improved open space and recreation facilities would be more complex, problematic and would likely be not possible without an additional service road. Further, the additional service road would reduce space available for the new recreation facilities
- The cost and impacts of additional infrastructure would be high in relation to the relatively minor traffic performance benefits provided. The proposed signalised intersection is modelled to operate at Level of Service A with an average delay of 14 seconds or less during the busiest peak traffic periods. Removing this delay through the implementation of grade separation would provide a relatively minor traffic performance benefit considering the impacts and costs for a grade separation alternative
- Grade of the access road is currently steep at 6.5 per cent and would need to be steeper at around 8.5 per cent to connect to the existing Burnt Bridge Creek Deviation southbound lanes. A vertical alignment of about 8.5 per cent would not be ideal from a traffic performance perspective and may result in additional road traffic noise and vehicle emissions compared to a lower grade.
- Increased potential flood inundation risk for the ramp tunnel due to a deep trough near the Burnt Bridge Creek alignment
- Access to the operational motorway facility would be not possible due to a steep ramp. The proposal would also likely require an additional length of service road which would require a larger project footprint and thereby reduce space available for the new recreation facilities.

B11.3.2 Active transport connection at Sydney Water pipeline

Issue raised

Page 10

Northern Beaches Council recommends that a shared path underpass be provided at the Sydney Water pipeline alignment, to allow access for the future regional shared paths linking Beacon Hill and St Ives.

Response

The project would facilitate future regional shared paths linking Beacon Hill and St Ives with the proposed active transport infrastructure as part of the upgrade of Wakehurst Parkway. The Sydney Water pipeline is located about 330 metres south of Aquatic Drive, Frenchs Forest. This location is around mid-way between the new shared user underpass beneath Wakehurst Parkway adjacent Yarraman Avenue (about 200 metres south of the Sydney Water pipeline) and the proposed replacement of the existing pedestrian bridge across Wakehurst Parkway (about 230 metres north of the Sydney Water pipeline). With the construction of the new shared user path along the eastern side of Wakehurst Parkway, Transport for NSW is working with Northern Beaches Council to provide a formalised connection to the Sydney Water pipeline for pedestrians and cyclists. The new shared user path along the eastern side of Wakehurst Parkway would connect to the new shared user underpass adjacent to Yarraman Avenue and the proposed replacement of the existing pedestrian bridge with a new shared user bridge across Wakehurst Parkway. Another underpass at the Sydney Water pipeline location is not considered warranted.

B11.3.3 Feasibility of rail-based solutions

Issue raised

Page 15

Northern Beaches Council acknowledge that the absence of a rail line servicing the Northern Beaches, and the topography and dispersed nature of the population, means that a rail line is unlikely to ever be economically feasible. There is a reliance on road-based transport to serve the Northern Beaches, and the project will provide an extra link to reduce pressure on the three existing road corridors serving the Northern Beaches.

Response

Alternative transport modes including rail were considered as strategic alternatives to the project and are discussed in Section 4.3.5 of the environmental impact statement. While many of these modes and upgrades are complementary to the project as part of a broader integrated transport network, none of the proposed initiatives negate the need to resolve the existing road network capacity constraints between the lower North Shore and the Northern Beaches.

Transport for NSW understands that public transport patronage is increasing in line with population and economic growth. Accordingly, the NSW Government is investing in numerous public transport projects to support this growth. However, road traffic is also growing due to the same factors as it serves trips which public transport cannot fulfil, or is less suitable for, such as diverse origins, destinations, purposes and timing.

The physical and urban geography of the Northern Beaches region presents barriers to the consideration of rail-based solutions in addressing the transport challenges faced by the region. The provision of rail infrastructure is also reliant on the location of and accessibility to high density residential or commercial property in close proximity to the proposed location of stations as well as along its route. Given the high cost of constructing and operating rail infrastructure and the low density nature of the Northern Beaches, it is considered that demand would not be high enough to make investing in a specific or dedicated rail link to the Sydney CBD a viable alternative in the immediate future. Similarly, topography and population density issues mean that light rail is also not a viable alternative.

Due to the high cost and long lead time for a heavy or light rail solution, the alternative approach for public transport improvement is to focus on improving the speed and reliability of road based public transport such as bus services – for example, by implementing bus priority measures and developing rapid bus services. Such investment can be delivered as part of a long-term, staged approach to increasing corridor capacity, as and when required, at substantially lower cost than heavy and light rail infrastructure. With a relatively high carrying capacity, rapid or express bus services offer a mass transit solution for bus corridors where a rail based solution is unsuitable. As such, adequate, reliable and efficient public transport using road infrastructure (ie rapid and express bus services) is considered a more suitable and appropriate public transport solution for the Northern Beaches area.

The project would materially improve the functionality and performance of the bus network, by reducing congestion and providing travel time savings and improved trip reliability on the surface road network as discussed in Section 4.3.5 of the environmental impact statement. The project would also provide opportunities for faster and more reliable express bus services to travel via the tunnel and motorway network from the Northern Beaches to strategic centres including North Sydney, the Sydney CBD, Macquarie Park and St Leonards. The design for Beaches Link would also allow for these services to interchange with the new Victoria Cross Metro Station at North Sydney. Furthermore, the use of the Beaches Link tunnel for express bus services would reduce pressure on the Military Road/Spit Road and Warringah Road/Eastern Valley Way bus corridors,

enabling opportunities for further optimisation of local bus services in consultation with key government and other project stakeholders such as councils.

The project would also allow for more direct and safer access to and from the Northern Beaches for freight and heavy vehicles using the new tunnel further enabling opportunities for improving the speed and reliability of road based public transport on arterial routes. This would deliver greater efficiencies and safety for business and road users at a local and regional level. A rail alternative is unable to provide opportunities for any freight and heavy vehicle improvements which will otherwise be facilitated by the project.

The Beaches Link tunnel was recommended for further review and development in the *State Infrastructure Strategy Update* 2014 (Infrastructure NSW, 2014). The *Northern Beaches Transport Action Plan* (Transport for NSW, 2016), outlined proposed rail initiatives of relevance to the project. These included a second harbour rail crossing as well as a new rail line to the Sydney CBD. Subsequently, this new rail line to the CBD was realised by the Sydney Metro City & Southwest project, which is a 30 kilometre extension of metro rail line from the end of the existing Sydney Metro Northwest terminus at Chatswood. The Sydney Metro City & Southwest project will travel from Chatswood, under Sydney Harbour, through newly established stations in the Sydney CBD through to Bankstown in the south west of the city. The Sydney Metro City & Southwest project will enhance the Sydney rail network and enable it to carry an additional 100,000 people per hour in peak periods, delivering sufficient capacity to serve the city well into the future. Supplemented by a rapid bus service between Dee Why and Chatswood that is currently being planned, this means more people are likely to travel by rail, helping to reduce the number of buses travelling into the Sydney CBD from locations north of Sydney Harbour. This would also provide increased capacity for buses and cars travelling from the Northern Beaches to the Sydney CBD.

It should be noted that the project does not preclude the consideration of heavy rail links to the Northern Beaches in the future, should population growth and density drive this need.

B11.3.4 Public transport priority over private car usage

Issue raised

Page 2

Northern Beaches Council would like public transport priority over private car usage to be addressed by the project during the detailed design phase of the project.

Response

Beaches Link has been designed to be a key piece of the public transport network of the Northern Beaches, allowing for the future provision of express bus connections with North Sydney, the Sydney CBD, Macquarie Park, St Leonards and potentially other key centres across greater Sydney via the motorway network. Accordingly, the Beaches Link tunnels have been designed to allow use by buses, including taller double decker bus services.

Existing bus infrastructure would be retained during operation including bus lanes or bus traffic signal priority. Specific public transport infrastructure connections to and from the project at Balgowlah, Seaforth, Killarney Heights and Frenchs Forest are outlined in Table 5-9 of the environmental impact statement. At Balgowlah, a northbound and a southbound bus lane would be maintained along the Burnt Bridge Creek Deviation as part of the realignment and widening of the road. This would be consistent with existing bus provisions in this area and would assist in prioritising public transport access to the Beaches Link tunnels. The configuration of the surface roads and ramps at the Gore Hill Freeway Connection component are designed to enable high quality bus connectivity between the Beaches Link tunnels and St Leonards, and strategic centres to the north west via the Lane Cove Tunnel.

While additional surface road public transport infrastructure would not be provided as part of this project, by reducing network congestion on existing surface routes, improving network resilience and increasing reliability in peak periods, the project would make buses a more attractive transport option, supporting and encouraging a mode shift to public transport as outlined in Section 9.1.3 of the environmental impact statement. Modelled peak hour bus travel times, considering the project only, are provided in sections 7.4.5, 7.5.5, 7.6.5 and 7.7.5 of Appendix F (Technical working paper: Traffic and transport).

The project would support the continued operation of the B-Line program along with other existing and proposed bus services by improving travel times and reliability on key routes connecting the Northern Beaches to key centres including Spit Road/Military Road and Warringah Road/Eastern Valley Way. Additionally, reduced vehicle congestion on Warringah Road between Frenchs Forest and Roseville would support the likely implementation of a rapid bus service between Dee Why and Chatswood that is currently being planned. This rapid bus service would be similar in nature to the existing B-Line operating on Military Road/Spit Road.

The project would also create the opportunity for new public transport routes to be developed in response to diverse travel demands and future social and economic development. The project provides the opportunity to supplement existing services with express buses using Beaches Link to access North Sydney, St Leonards and Sydney CBD, as well as to the north west to employment areas like Macquarie Park via Gore Hill Freeway and Lane Cove Tunnel. The design for Beaches Link would also allow for these services to interchange with the new Victoria Cross Metro Station at North Sydney.

B11.4 Project description

B11.4.1 Pedestrian crossing design for new access road at Balgowlah

Issue raised

Page 8

The concept plan indicates the intersection of the new access road and the sports field car park in Balgowlah would be signalised. Northern Beaches Council recommends implementing an all movements signal design at this location to allow safe crossing for pedestrians.

Response

The at-grade pedestrian crossing of the new access road adjacent to the new public car park within the new and improved open space and recreation facilities at Balgowlah is described in Table 5-9 of the environmental impact statement. While the project's connections to and from the Burnt Bridge Creek Deviation including the new access road and its connectivity with Burnt Bridge Creek Deviation and Sydney Road are key to integrating the project with the surrounding road network, the final layout of the new and improved open space and recreation facilities at Balgowlah, including shared user paths and pedestrian crossings of the new access road, are subject to further consultation with Northern Beaches Council and the community.

A dedicated consultation process jointly led by Transport for NSW and Northern Beaches Council will take place to give the community an opportunity to provide input into the final layout of the new and improved open space and recreation facilities at Balgowlah. This consultation will be separate to the consultation for the environmental impact statement and is expected to commence after planning approval and well in advance of construction starting. As part of this consultation process, a community reference group will be established, with representative stakeholder groups and the community, to support Transport for NSW and Council with the development of this important public

space. An expression of interest for participation in the consultation process is expected to be issued in early 2022.

B11.4.2 Realignment and upgrade of Wakehurst Parkway

Issue raised

Page 10

The project proposes the removal of the right turn movement from Wakehurst Parkway northbound onto Frenchs Forest Road East. Northern Beaches Council is of the view the additional travel distance of up to 1.4 kilometres via Warringah Road (measured by Council as 1.6 kilometres to the last driveway in Frenchs Forest Road East) is unacceptable, considering existing and planned future land use in the area, including residential aged care and multi-storey commercial developments. Council recommends maintaining the north-bound right turn from Wakehurst Parkway into Frenchs Forest Road East and providing additional capacity to south-bound traffic lanes by widening the carriageway between Frenchs Forest Road and Warringah Road.

Response

The proposed surface road changes at the intersection of Wakehurst Parkway and Frenchs Forest Road East have been designed to provide an acceptable level of traffic performance and connectivity to all road users in this area while minimising impacts. While the removal of the right hand turn from Wakehurst Parkway northbound into Frenchs Forest Road East would result in an additional travel distance of up to 1.3 kilometres via Warringah Road and Allambie Road and an associated minor increase in travel time of up to four minutes, this is anticipated to impact a relatively small portion of traffic which use the intersection (during the AM and PM peak 150 vehicles use the right hand turn out of a total of 3000 – 4500 vehicles per hour) (refer to Section 7.7.4 of Appendix F (Technical working paper: Traffic and transport)). The substantial majority of traffic using this intersection will benefit from the removal of the right hand turn from Wakehurst Parkway northbound and the associated improvements in intersection performance.

The project design in the Frenchs Forest precinct has been developed to avoid the need for additional property acquisitions (beyond those required for the Northern Beaches Hospital road upgrade project) and major civil works, which may pose significant noise and traffic impacts during construction. The project works in the Frenchs Forest precinct are therefore limited to median and linemarking adjustments.

The alternative proposal to widen Wakehurst Parkway and retain the northbound right turn would likely require additional property acquisitions, result in potential impacts to the Duffys Forest endangered ecological community and generate significant noise and traffic impacts during construction to mitigate the minor impacts proposed to travel distance and travel time. For these reasons Transport for NSW do not propose to change the project design and reintroduce the right turn movement from Wakehurst Parkway northbound onto Frenchs Forest Road East.

B11.4.3 Further widening of Wakehurst Parkway

Issue raised

Pages 10, 16

There would be a significant increase in travel times during the AM and PM peak periods on Wakehurst Parkway southbound between Dreadnought Road and Judith Street. Northern Beaches Council recommends widening of the southbound lanes of Wakehurst Parkway from Dreadnought Road to Warringah Road be considered.

Response

Modelled morning and evening peak hour general travel times through the Frenchs Forest and surrounds area are provided in Table 9-11 of the environmental impact statement. In the AM peak in particular, southbound travel times along Wakehurst Parkway would increase as a result of the project due to the change in traffic patterns that would increase the volumes of traffic turning right from Warringah Road to Wakehurst Parkway, conflicting with the increase in southbound traffic on Wakehurst Parkway.

The potential localised increases in travel times on the key corridors of Warringah Road and Wakehurst Parkway within the area are expected to be less than five minutes during the busiest peak hours in the future. Overall, traffic modelling predicts that potentially increased localised delays at intersections would be offset by broader improvements in connectivity and a reduction in congestion created by the project. For example, average travel time savings between key centres, eg Dee Why and Macquarie Park, are expected to be around 20 minutes. Net travel time saving would be created by the project providing new high capacity motorway connectivity, as well as reducing congestion on existing regional routes like Warringah Road west of Frenchs Forest. It is also noted that overall travel times for general traffic on Warringah Road and Forest Way in the Frenchs Forest area would remain generally unaffected by the project, indicating that potentially increased delays along Wakehurst Parkway would not impact east-west trips.

Notwithstanding this, further traffic analysis and modelling which has been carried out for the preferred infrastructure report (refer to Section 6.3 of the preferred infrastructure report) indicates that the impacts presented in the environmental impact statement would not be most appropriately mitigated by road network upgrades and management alone and that a public transport and demand management approach would be more appropriate. Consequently, Transport for NSW will continue to investigate and collaborate with Northern Beaches Council and other relevant stakeholders on complementary public transport and other demand management initiatives which are enabled by Beaches Link but beyond the scope of the project. This underlines the importance of NSW Government and Council working in collaboration to develop integrated, multi-modal transport solutions which will reduce car dependence, and consequently enable and accommodate the desired growth and improve place outcomes in Frenchs Forest and surrounds.

This approach is consistent with and reliant on the outcomes of the ongoing implementation of the *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a), which highlights that future precinct development beyond Stage 1 of the development is dependent on further delivery of improved transport infrastructure and operations beyond the scope of the Beaches Link project and a continued modal shift from private to public transport.

Transport for NSW will also carry out a review of operational network performance at 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, in accordance with environmental management measure OT1 (refer to Table D2-1 of this submissions report). Where required, additional feasible and reasonable mitigation measures will be identified in consultation with the Department of Planning, Industry and Environment and Council to manage any additional traffic performance impacts identified during the review of operational network performance.

Given the above, the request to widen the southbound lanes of Wakehurst Parkway from Dreadnought Road to Warringah Road is not justifiable at this time, considering the major civil works may pose significant additional noise, traffic and biodiversity impacts during construction and result in potentially relatively small improvements to the transport network. Transport for NSW will continue to work with Council on broader transport network improvements beyond the scope of the project.

B11.4.4 Open space and recreation facilities at Balgowlah

Issue raised

Page 8

The project description is inconsistent in its description of the new and improved open space and recreation facilities at Balgowlah. Figure 5-5 of the environmental impact statement indicates no open space over the tunnel portals at Balgowlah, whereas Figure 5-28 of the environmental impact statement provides a more detailed schematic with open space indicated over the tunnel portals.

While Northern Beaches Council acknowledges the layout in Figure 5-28 of the environmental impact statement is only indicative and consultation with Transport for NSW would take place to provide input on the final layout of the site, Council does not support the facility mix or locations indicated in this figure. As Crown Land Manager for Balgowlah Oval, and due to having a relationship with the many sporting and recreation groups that use this site, Council would like to discuss options for the types of sport and recreation facilities to be included in the design of the new and improved open space and recreation facilities at Balgowlah following construction. Options may include, but are not limited to, organised sporting facilities, passive recreation opportunities, dog exercise areas and improvements to the condition and amenity of Burnt Bridge Creek. Council looks forward to planning this new space in partnership with the State government and key sporting and community groups as well as the current users of these green spaces.

If the open space above the tunnel portal is connected to the pedestrian crossing at Sydney Road, Council would like to consider the use of this space as an off-leash dog park and would require a suitable fence to contain the site. If it is not connected to pedestrian crossings, Council does not want to take possession of this open space and it will remain with Transport for NSW.

Response

As noted by Northern Beaches Council, Figure 5-5 of the environmental impact statement does not indicate open space over the tunnel portals at Balgowlah. Similarly, open space over the tunnel portals is not shown on Figure 5-19 and Figure 5-21 of the environmental impact statement. These figures were prepared to specifically describe the different features of the connections to and from Burnt Bridge Creek Deviation and the associated surface road works at Balgowlah. Figure 5-28 of the environmental impact statement was prepared to specifically show the indicative layout of the new and improved open space and recreation facilities at Balgowlah which is further discussed in Section 5.2.13 of the environmental impact statement.

The layout of the new and improved open space and recreation facilities at Balgowlah as shown in Figure 5-28 of the environmental impact statement is indicative and would be subject to consultation, as noted by Council and stated in Section 5.2.13 of the environmental impact statement. Further detailed graphics and visualisations including a concept masterplan of the new and improved open space and recreation facilities at Balgowlah are provided in Chapter 22 (Urban design and visual amenity) of the environmental impact statement and Section 4.8 of Appendix V (Technical working paper: Urban design, landscape character and visual impact assessment).

As noted in previous responses, a dedicated consultation process jointly led by Transport for NSW and Council will take place to give the community an opportunity to provide input into the final layout of the new and improved open space and recreation facilities at Balgowlah. This consultation will be separate to the consultation for the environmental impact statement. This process is expected to commence after planning approval and well in advance of construction starting. As part of this consultation process, a community reference group will be established, with representative stakeholder groups and the community, to support Transport for NSW and Council with the

development of this important public space. An expression of interest for participation in the consultation process is expected to be issued in early 2022.

Transport for NSW would further refine the design of the Balgowlah tunnel portal cut and cover structure area in consultation with Council during further design development and preparation of the urban design and landscape plan as detailed in environmental management measure V1 (refer to Table D2-1 of this submissions report). Transport for NSW confirms the tunnel portal cut and cover structure area could be connected via the signalised pedestrian crossing of the Burnt Bridge Creek Deviation/Sydney Road intersection. It is noted that this area above the tunnel portal cut and cover structure is identified as an opportunity for open space in Figure 22-3 of the environmental impact statement. Transport for NSW would consult with Council on the most appropriate use of the space, which may also include for example, vegetating the entire area with amenity trees (with no public access) to meet tree replacement commitments.

B11.4.5 Shared user path between Kitchener Street bridge and Dudley Street

Issue raised

Page 8

Northern Beaches Council requests the realigned shared user path between the Kitchener Street bridge and Dudley Street be built out of concrete and not replaced in asphalt, which is the current material.

Response

Concrete would be used where existing shared user paths are to be adjusted.

B11.4.6 Public and active transport connection at Yarraman Avenue

Issue raised

Page 8

Northern Beaches Council recommends the connection from Yarraman Avenue in Frenchs Forest through to the proposed underpass and bus stop be realigned to improve the accessibility for all users.

Response

The recommendation from Northern Beaches Council is noted. The project would ensure access to Yarraman Avenue and the connection to the new bus stops and shared user underpass are satisfactory and in accordance with road design standards, relevant accessibility requirements under the *Disability Discrimination Act 1992* and the crime prevention through environmental design principles included in Appendix V (Technical working paper: Urban design, landscape character and visual impact assessment). However, this area includes a number of engineering and landform constraints, and design development as part of the environmental impact statement identified challenges in providing the new bus stops, ramps and the proposed shared user underpass with an aligned connection from Yarraman Avenue to the shared user underpass. While unlikely that an aligned connection can be provided, this would be further investigated during further design development.

B11.4.7 Active transport connections across Wakehurst Parkway

Issue raised

Page 9

Northern Beaches Council recommends a formal, safe connection be provided between the mountain bike trails on either side of Wakehurst Parkway, as outlined in Council's document *Mountain Biking in Warringah: Research and Directions* (Warringah Council, 2012). Council also requests that safe connections be provided between the walking tracks in Garigal National Park and Manly Warringah War Memorial State Park at several locations along Wakehurst Parkway.

Response

Shared user facilities that would be provided along Wakehurst Parkway to provide a safe connection between walking tracks in Garigal National Park and Manly Warringah War Memorial State Park are outlined in Table 5-9 of the environmental impact statement, and include:

- A new shared user underpass beneath Wakehurst Parkway, about 1150 metres north of Kirkwood Street, to connect Garigal National Park to Manly Warringah War Memorial State Park
- A new shared user underpass beneath Wakehurst Parkway, about 700 metres north of Kirkwood Street, to connect Garigal National Park and the Engravings Trail to Manly Warringah War Memorial State Park.

East-west connectivity near the Garigal National Park and Manly Warringah War Memorial State Park, between walking and mountain bike trails, would also be facilitated by the other connections outlined in Table 5-9 of the environmental impact statement, including:

- A new shared user underpass beneath Wakehurst Parkway about 750 metres south of the intersection with Warringah Road at Frenchs Forest
- Replacement of the existing pedestrian bridge across Wakehurst Parkway with a new shared user bridge about 350 metres south of Warringah Road at Frenchs Forest.

In addition, the project would also provide a new shared user path along the eastern side of Wakehurst Parkway, from the northern end of Kirkwood Street at Seaforth to the intersection with Warringah Road at Frenchs Forest, facilitating access between the Wakehurst Parkway shared user underpasses and bridges.

B11.4.8 Active transport connections to the Northern Beaches Hospital road upgrade project

Issue raised

Page 10

Northern Beaches Council recommends active transport connections be provided between the Northern Beaches Hospital road upgrade project and Wakehurst Parkway in Frenchs Forest.

Response

Active transport connections between the Northern Beaches Hospital road upgrade project and the project along Wakehurst Parkway in Frenchs Forest are shown in Figure B11-1 of this submissions report.

As discussed in the response above, the project would provide a new shared user path along the eastern side of Wakehurst Parkway, from the northern end of Kirkwood Street at Seaforth to the intersection with Warringah Road at Frenchs Forest, to connect with active transport infrastructure constructed as part of the Northern Beaches Hospital road upgrade project along Warringah Road and the northern end of Wakehurst Parkway.

The new shared user path would include a new bridge over a drainage culvert and fauna underpass (constructed as part of Northern Beaches Hospital road upgrade project), about 150 metres south of the intersection with Warringah Road. The project would also replace the existing pedestrian bridge

over Wakehurst Parkway, about 350 metres south of Warringah Road, with a new shared user bridge.

The proposed scope of the project complements other active transport planning being carried out by Transport for NSW. As Northern Beaches Council is aware, for additional connectivity opportunities beyond the project footprint, councils can apply for funding for cycleways under the NSW Government's Walking and Cycling Program. In line with the NSW Government's *Future Transport Strategy 2056*, this program focuses on improving the convenience of walking and cycling for short trips to key destinations and within centres and making walking and cycling safe and reliable by prioritising infrastructure that supports pedestrian and cycling movement. Further information is available at: www.transport.nsw.gov.au/projects/programs/walking-and-cycling-program.

Transport for NSW notes that Council's most recent successful application via the Walking and Cycling Program in 2020/21 included funding for a shared path adjacent to Allambie Road and Rodborough Road, Frenchs Forest, and along Barrenjoey Road linking the Mona Vale Strategic Centre and B-Line interchange with the existing shared path network. Applications for the NSW Government's 2022/2023 Walking and Cycling Program will commence shortly and Transport for NSW encourages Council to continue to apply for funding for specific initiatives via the program.

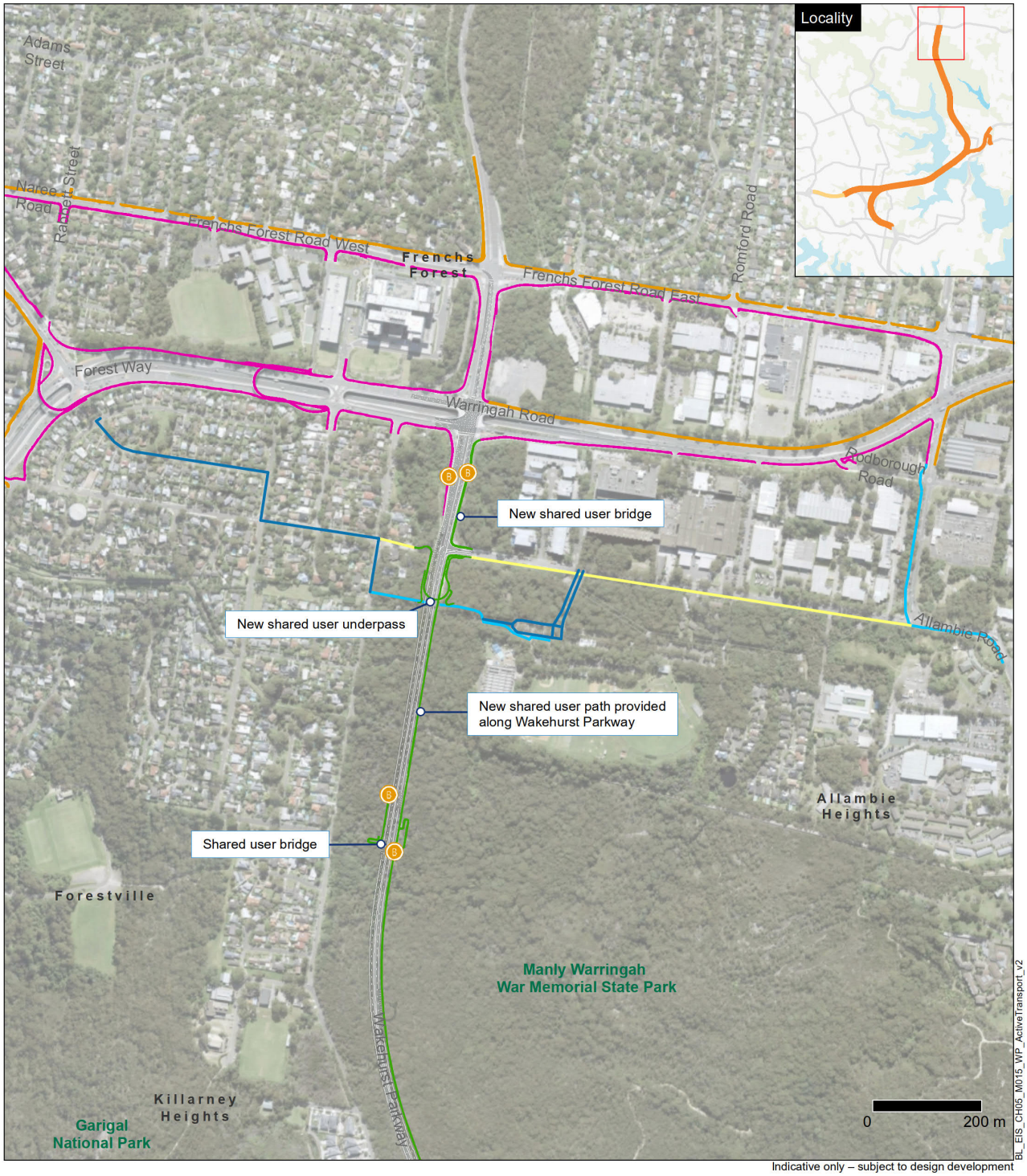


Figure B11-1 Active transport connections between the Northern Beaches Hospital upgrade project and the project along Wakehurst Parkway

B11.5 Construction work

B11.5.1 Material and spoil storage

Issue raised

Page 13

Northern Beaches Council recommends that adequate material and spoil storage be provided during underground tunnel excavation and tunnel fitout to reduce the number of heavy vehicle movements during peak periods.

Response

The temporary construction support sites and acoustic sheds described in Chapter 6 (Construction works) of the environmental impact statement have been designed to provide adequate material and spoil storage for the proposed construction works. The internal acoustic shed design is subject to further design development by the construction contractor/s; however, there would likely be a long 'bin' structure down one side of the shed to maximise stockpile capacity and the ability for loaders to push up spoil. Acoustic sheds are sized to enable underground tunnel excavation up to 24 hours per day, seven days per week. Transport of spoil material would be carried out during standard construction hours (7am to 6pm). If spoil transportation hours were reduced further, larger temporary construction support sites would be required to enable larger storage areas, with additional environmental and property impacts.

Construction road traffic will be managed to minimise impacts of movements during peak periods where feasible and reasonable, in accordance with environmental management measure CTT8 (refer to Table D2-1 of this submissions report).

In the case of transport delays due to conditions such as wet weather at spoil disposal sites, as well as over long weekends and public holidays, underground stockpiling would supplement the capacity of the acoustic sheds, enabling ample excess tunnel spoil to be stored if required. Transport for NSW and its technical and constructability advisors have significant experience in planning tunnelling sites for major tunnel projects. The production rates, haulage rates, stockpiling methods, storage requirements, acoustic shed design and other ancillary infrastructure for the project have been benchmarked against several recent Sydney motorway tunnels and factored accordingly into the design.

B11.5.2 Rehabilitation of temporary construction support sites

Issue raised

Page 11

All hardstand areas proposed for the Balgowlah Golf Course (BL10) or Wakehurst Parkway east (BL13) construction support sites must be demolished and removed from the sites and disturbed areas must be restored to open space or bushland.

Response

Once construction activities have been completed, site clean-up and demobilisation works would be carried out, as specified in Table 6-2 and Section 6.7 of the environmental impact statement. This would include the removal of infrastructure, such as hardstand areas, at temporary construction support sites and the landscaping and rehabilitation of disturbed areas.

Specific to the Balgowlah Golf Course construction support site (BL10), rehabilitation and landscaping following demobilisation would be carried out in accordance with revised environmental

management LP4 (refer to Table D2-1 of this submissions report) and would be subject to the dedicated consultation process jointly led by Transport for NSW and Northern Beaches Council to give the community an opportunity to provide input into the final layout of the new and improved open space and recreation facilities at Balgowlah. This consultation will be separate to the consultation for the environmental impact statement. This process is expected to commence after planning approval and well in advance of construction starting. As part of this consultation process, a community reference group will be established, with representative stakeholder groups and the community, to support Transport for NSW and Council with the development of this important public space. An expression of interest for participation in the consultation process is expected to be issued in early 2022.

For the Wakehurst Parkway east construction support site (BL13), rehabilitation and landscaping of the leased portions of the site following demobilisation will be carried out in accordance with environmental management measure LP5 (refer to Table D2-1 of this submissions report). This will include rehabilitation of the site as soon as practicable to an appropriate condition, taking into consideration the location, land use characteristics, area and adjacent land uses or in accordance with the urban design and landscape plan where applicable (refer to environmental management measure V1 in Table D2-1 of this submissions report). Rehabilitation will be carried out in consultation with Sydney Water and Council.

For the portion of Wakehurst Parkway east construction support site (BL13) that would be acquired by Transport for NSW from Sydney Water, this land would be rehabilitated and revegetated as soon as practicable after construction and handed over to Council to manage for use by the community as part of Manly Warringah War Memorial State Park. Rehabilitation and landscaping will be in accordance with the urban design and landscape plan and as required by environmental management measures B13 and V11 in Table D2-1 of this submission report.

B11.6 Stakeholder and community engagement

B11.6.1 Incorporation of previous feedback from 2018 consultation process

Issue raised

Pages 2, 4

Northern Beaches Council notes the reference design consultation process was carried out in 2018, and this provided the community with the opportunity to provide input into the design of the project and allow the project team to address some of the future concerns that the local community had in relation to the concept design circulated for comment, which was displayed at multiple public engagement sessions. This process also allowed Council staff and the elected representatives to engage with our community, both those directly affected by the proposal and the wider community, to formulate the adopted position of Council – to broadly support the concept, subject to the 10 key issues being addressed as the project progressed. Council is of the view that the environmental impact statement has taken into account their key issues raised in their 2018 submission.

Response

Transport for NSW notes Northern Beaches Council support of the 2018 consultation process and their acknowledgement that the environmental impact statement has taken into account their key issues.

B11.6.2 Adequacy and accuracy

Issue raised

Page 12

Northern Beaches Council is concerned that the management of construction fatigue have been duplicated across sections 7.5.2, 7.5.3 and 7.5.4 of the environmental impact statement, with information varying between these sections. Council found the grammatical structure lacking in these sections and the content difficult to understand. Council recommends that sections 7.5.2, 7.5.3 and 7.5.4 of the environmental impact statement be revised into one easy-to-read section and provided on the project website in to ensure readability for the community.

Response

Construction, consultation, and complaint fatigue are different types of fatigue which could be experienced by the community and are caused by different factors. Construction fatigue is discussed in Section 7.5.3 of the environmental impact statement, whereas consultation fatigue and complaint fatigue are discussed in sections 7.5.2 and 7.5.4 of the environmental impact statement respectively. They are defined as follows:

- Construction fatigue may be experienced by receivers that are near concurrent or consecutive construction activities where the activities overlap or have little or no break between the activities of one project, or multiple adjacent projects
- Complaint fatigue may occur where community perceptions of project complaint management systems result in the failure to report concerns about construction impacts, and/or where multiple proponents are responsible for issues in the same area where construction of multiple projects occurs
- Consultation fatigue may occur when consultation for the project is likely to result in overload or disinterest for community members.

As a result, the information presented in these sections vary as they describe how each type of fatigue that may result from the project would be assessed and managed.

The framework to engage and consult with the community on the project and to receive and respond to feedback during construction is provided in Appendix E (Community consultation framework). Should the project be approved, a detailed community communication strategy would be developed and implemented, based on the community consultation framework.

As part of the community communication strategy, the project's community relations team would continue to work with the project teams for other major projects and developments in the area to identify those persons or organisations who may be susceptible to consultation or construction fatigue (refer to environmental management measures CI1 and CI2 in Table D2-1 of this submissions report).

The community relations team would work to develop an integrated approach to contacting persons or organisations which may experience consultation fatigue and would determine which communication methods stakeholders prefer. The community relations team would also engage closely with stakeholders and community members so that potential cumulative impacts are managed for the project in order to reduce construction fatigue. Complaint fatigue will be managed in accordance with Section 3 of Appendix E (Community consultation framework) (refer to environmental management measure CI4 in Table D2-1 of this submissions report).

B11.6.3 Effectiveness of community consultation

Issue raised

Page 12

In relation to monitoring, reporting and evaluation of community consultation and engagement activities, Northern Beaches Council has advised that they may request a regular report on the assessed effectiveness of community consultation and engagement activities and tools, which could include information about trends or hot-spots for complaints across the Northern Beaches local government area.

Response

Transport for NSW would regularly engage and consult with Northern Beaches Council during construction and respond to feedback received in accordance with processes outlined in Appendix E (Community consultation framework). Council would be briefed on a regular basis on project activities including community engagement and engagement trend or hot-spots for complaints.

The performance and effectiveness of the community consultation and engagement activities carried out during the construction of the project would be regularly monitored and reviewed, as outlined in Section 4 of Appendix E (Community consultation framework).

Data would be collected during community consultation and engagement activities for monitoring, reporting and evaluation purposes to:

- Assess the adequacy of the community communication strategy and its effectiveness in delivering the project's community engagement program
- Measure the performance, timeliness and effectiveness of communication activities and tools through the implementation of the community communication strategy, including the complaints and enquiries handling process
- Demonstrate proactive communication
- Identify trends or hot-spots for complaints, including repeated complaints about preventable issues.

The project's community relations team would also engage with community interest groups to discuss project performance and benchmark the effectiveness of community engagement activities. Community engagement activities and processes would be modified as required, based on feedback and/or issues that arise during the review process.

Transport for NSW would provide Council with engagement statistics and feedback through the engagement mechanisms described above. It is not anticipated that a regular report on engagement statistics would be provided to Council.

B11.6.4 Future consultation with Council and community

Issue raised

Pages 12, 13

Section 7.3 of Appendix E (Community consultation framework) states that 'Regular consultation would occur with State and Local Government agencies to minimise impacts associated with other road work activities'. Northern Beaches Council seeks clarification on the mechanisms, processes and timeframes involved in the consultation with Council and the community, including how Council would be informed of changes to the community engagement activities and processes (as mentioned in Section 4 of Appendix E (Community consultation framework)) and sporadic changes

such as changes to working hours (eg night works). Council can provide a communications contact that will liaise directly with the project community liaison team.

Council requests:

- To receive a copy of the Communication and engagement strategy outlined in Section 7.5.1 of the environmental impact statement
- Location-specific community information, complaint resolution staff and community meetings be provided by Transport for NSW, to address the specific concerns of the local community during the detailed design and construction phases of the project
- Multiple methods be used to inform and engage with the community
- To receive project briefings at regular intervals throughout the project, along with specific briefings and/or memos on high impact construction activities as they occur
- To review media releases or communications materials so that the impacts can be assessed and advice can be provided to the project team before it is made publicly available.

Response

Transport for NSW aims to engage in an open, proactive and transparent community engagement and consultation process prior to and during construction of the project. Appendix E (Community consultation framework) provides the framework to engage and consult with community and stakeholders, including Northern Beaches Council, on the project and to receive and respond to feedback during project development, delivery and operation, in accordance with environmental management measure SE3 in Table D2-1 of this submissions report. Council would be briefed on a regular basis on project activities including community engagement and trends or hot-spots for complaints.

Should the project be approved, a community communication strategy would be developed in accordance with Appendix E (Community consultation framework). The community communication strategy would describe in detail Transport for NSW's liaison and engagement process with stakeholders and consultation activities for the project development, delivery and operation, and would guide the project team's interactions with the community and stakeholders and set standards for proactive engagement.

Communication tools and activities for informing and consulting with stakeholders would be flexible, to suit the nature and scale of each stakeholder's interests and issues, and to reflect any restrictions on face to face engagement, as outlined in Section 6 of Appendix E (Community consultation framework). The community communication strategy would outline the application of communication tools to assist in community and stakeholder engagement activities, as well as the timing for consultation. Mechanisms for distributing information and seeking feedback from the community and stakeholders are discussed in Section 5 of Appendix E (Community consultation framework) and proposed methods of engagement with different stakeholders are listed in Table 6-1 of Appendix E (Community consultation framework). The method of communication would be based on the level of information being provided and the timeframe for the delivery of information. Timing for consultation would be determined and included in the community communication strategy.

Communication mediums would consider the diverse needs of stakeholders, reflect the changing phases of the project, and to reflect any restrictions on face to face engagement that may be in place at any time during the life of the project. Communication tools would be provided in accessible formats to support people with disabilities and people in Culturally and Linguistically Diverse (CALD) communities. More details are provided in Section 5 of Appendix E (Community consultation framework).

It is anticipated that some aspects of the project would require specific communications and/or management strategies due to the nature of the potential impact and/or stakeholder group, as outlined in Section 7 of Appendix E (Community consultation framework). Any such strategies would be guided by the community consultation framework and managed through the community communication strategy. Section 7 of Appendix E (Community consultation framework) includes commitments for communication strategies relating to traffic management (including property access and pedestrian access), noise and vibration management and mitigation, construction activities (including out of hours work) and landscaping/urban design matters. These communication and management strategies would be further developed prior to construction as part of the community communication strategy. Additional, specific design and/or construction related issues may be identified during preparation of the community communication strategy.

The performance and effectiveness of the community consultation and engagement activities carried out during construction would be regularly monitored and reviewed. To assist in monitoring the project's communication and stakeholder engagement performance, the community relations team would engage with community interest groups to discuss project performance and benchmark the effectiveness of community engagement activities. Community engagement activities and processes would be modified as required, based on feedback and/or issues that arise during the review process.

In addition to the community communication strategy for the project, Transport for NSW would engage with Council to establish an overarching place based engagement framework. While outside the scope of this project, this framework considers key transport initiatives within the local government area including among others, the Beaches Link and Gore Hill Freeway Connection project to provide an additional forum for Council to be briefed, kept updated and discuss opportunities and issues across multiple projects.

Further, a dedicated consultation process jointly led by Transport for NSW and Council will take place to give the community an opportunity to provide input into the final layout of the new and improved open space and recreation facilities at Balgowlah, as outlined in Section 21.5.3 of the environmental impact statement. This consultation will be separate to the consultation for the environmental impact statement. This process is expected to commence after planning approval and well in advance of construction starting. As part of this consultation process, a community reference group will be established, with representative stakeholder groups and the community, to support Transport for NSW and Council with the development of this important public space as required by revised environmental management measure LP4 (refer to Table D2-1 of this submissions report). An expression of interest for participation in the consultation process is expected to be issued in early 2022.

B11.6.5 On-site independent community advocate

Issue raised

Page 12

Northern Beaches Council recommends that an independent advocate for the community be engaged on-site to monitor compliance and address any complaints or problems, such as night work noise complaints and stormwater runoff, in a timely manner.

Response

A complaints management system would be developed and implemented before the start of construction activities for the project, as outlined in Section 3 of Appendix E (Community consultation framework). Transport for NSW would provide a number of different complaint

mechanisms to cater to different needs and preferences. This would include ensuring the following mediums are established and maintained to receive and address community enquiries and complaints for the duration of construction:

- A toll-free 24 hour telephone number(s) through which complaints and enquiries can be registered
- An email address to which electronic complaints and enquiries may be transmitted
- A postal address to which written complaints and enquires may be sent
- A mediation system for complaints unable to be resolved
- A mechanism for community members to make enquiries in common community languages of the area.

Details of how to make a complaint would be included in all communications materials such as community updates, notifications, advertisements, and the project website. The toll free project hotline would operate 24/7 during construction and continue for 12 months after the project opens.

A complaints and enquiry register would be established to record the details, response and outcome of complaints and enquiries received. All complaints would be investigated, and an appropriate response would be provided to the complainant. In addition, and as described in Section 7.5.4 of the environmental impact statement, a Community Complaints Commissioner (an independent specialist) would oversee the complaints management system and follow up on any complaint where the public is not satisfied with the response.

The complaints management system would be maintained during construction and for 12 months after the project is completed.

B11.6.6 Establishment of working group

Issue raised

Page 43

Northern Beaches Council recommends that a working group or consultation group comprised of the community and sporting groups be established to consult with Transport for NSW and Council about the future use of the new and improved open space and recreation facilities at Balgowlah, as well as the new shared user paths and reconstruction of the pedestrian overpass at Wakehurst Parkway in Frenchs Forest.

Council notes that preliminary work has been completed by Council for the pedestrian overpass at Wakehurst Parkway in Frenchs Forest to improve pedestrian accessibility from Brick Pit Reserve to Aquatic Reserve. This work has been shared with Transport for NSW.

Council supports liaison between Transport for NSW and Council to develop a dedicated consultation process for all activities post acquisition.

Response

Transport for NSW is committed to engage and consult with the community, Northern Beaches Council and other key stakeholders, and respond to feedback received, in the lead up to and during construction as outlined in environmental management measure SE3 in Table D2-1 of this submissions report. Community and stakeholder consultation and engagement activities that would support the design, construction and operational phase of the project would be outlined in the community communication strategy, as indicated in the above responses. The community

communication strategy would set standards for proactive engagement so that feedback from the community and stakeholders is used to positively influence the project design and delivery.

A dedicated consultation process jointly led by Transport for NSW and Council will take place to give the community an opportunity to provide input into the final layout of the new and improved open space and recreation facilities at Balgowlah, as outlined in Section 21.5.3 of the environmental impact statement. This consultation will be separate to the consultation for the environmental impact statement. This process is expected to commence after planning approval and well in advance of construction starting. As part of this consultation process, a community reference group will be established, with representative stakeholder groups and the community, to support Transport for NSW and Council with the development of this important public space, as required by revised environmental management measure LP4 (refer to Table D2-1 of this submissions report). An expression of interest for participation in the consultation process is expected to be issued in early 2022.

Since exhibition of the environmental impact statement, Transport for NSW has proposed a design refinement to realign the Wakehurst Parkway shared user bridge ramps. Following consultation with the NSW Department of Education – School Infrastructure and Council, it is proposed the ramps for the new shared user bridge be realigned to facilitate direct connectivity between Fitzpatrick Avenue East and Aquatic Drive with secondary access also provided via the bridge to the Warringah Aquatic Centre. The revised ramp alignments would provide improved connectivity along a future pedestrian and cyclist corridor and facilitate a reduction in the area of the Duffys Forest Ecological Community impacted by the project. The revised ramp alignments would also avoid permanent impacts to the Jumping Jack mountain bike trail and facilitate a contiguous shared user path along Wakehurst Parkway at this locale, consistent with the project design along the rest of the Wakehurst Parkway corridor. The design refinement is further discussed in Section A4.3 of this submissions report.

An urban design and landscape plan will be developed during further design development and will include further detail on the urban and landscape design with additional developed visuals, cross sections and plans (refer to environmental management measure V1 in Table D2-1 of this submissions report). This plan will also be made available to the public for feedback.

B11.7 Construction traffic and transport

B11.7.1 Management of heavy vehicles

Issue raised

Pages 13, 14

Northern Beaches Council is of the view that there is a lack of information about heavy vehicle movements and associated potential impacts on pedestrian safety along Sydney Road and Frenchs Forest Road, through to Seaforth Village , residential areas and beyond Seaforth Public School in the environmental impact statement.

Council recommends that the number of heavy vehicle movements during peak periods be minimised and that light construction vehicles be discouraged from using the local road network, especially during the peak periods.

Response

The daily maximum construction vehicle volumes associated with temporary construction support sites are summarised in Table 6-39 of the environmental impact statement. Indicative construction vehicle routes for temporary construction support sites in the Northern Beaches are shown in figures 5-20, 5-21 and 5-25 of Appendix F (Technical working paper: Traffic and transport).

All roads in the Balgowlah area that form part of construction vehicle routes are State or regional roads. The contribution of construction related heavy vehicle traffic would be relatively minor compared to existing background traffic flows along the majority of construction haulage routes in Balgowlah and surrounds (refer to Table 8-11 and Table 6-39 of the environmental impact statement). The potential impacts of construction traffic on the surrounding road network in the Northern Beaches is detailed in Section 8.4.4 (Balgowlah and surrounds) and Section 8.4.5 (Frenchs Forest and surrounds) of the environmental impact statement, with further detail provided in Appendix F (Technical working paper: Traffic and transport).

The project does not propose heavy vehicle movements through Seaforth. Spoil haulage from the Wakehurst Parkway east construction support site (BL13) would be directed to travel north along Wakehurst Parkway so as to avoid Sydney Road and potential impacts to the Seaforth Village (Seaforth Centre). Spoil haulage from the Balgowlah Golf Course construction support site (BL10) would be directed to travel south along Manly Road/Spit Road/Military Road so as to avoid Sydney Road west of Burnt Bridge Deviation and potential impacts to the Seaforth Centre.

Construction would be subject to comprehensive traffic environmental management measures to ensure the safety of members of the public, motorists and construction personnel as detailed in Table D2-1 of this submissions report, such as:

- Ongoing consultation will be carried out with Northern Beaches Council, emergency services and bus operators to minimise traffic and transport impacts in Balgowlah and surrounds (environmental management measure CTT6)
- Construction road traffic will be managed to minimise impacts of movements during peak periods where feasible and reasonable (environmental management measure CTT8)
- Vehicle movements to and from the temporary construction sites will be managed to ensure pedestrian, cyclist and road user safety (environmental management measure CTT9)
- Directional signage, barriers and/or linemarking will be used as required to direct and guide motorists, cyclists and pedestrians past construction sites and on the surrounding network and Variable Message Signs will be used to advise all road users of potential delays, traffic diversions, speed restrictions or alternative routes (environmental management measure CTT10).

In addition, a traffic management plan would be developed and implemented for the project as described in Section D1 of this submissions report which would support the implementation of the above environmental management measures. The traffic management plan would be prepared in accordance with *Traffic Control at Work Sites Technical Manual* (Transport for NSW, 2020g), including carrying out a risk assessment to identify the traffic hazards and risks associated with the construction works including heavy vehicle routes.

B11.7.2 Construction parking

Issue raised

Page 13

Northern Beaches Council requests that Transport for NSW addresses the concerns of residents about the potential impacts of construction staff parking on local roads near the temporary construction support sites. Council recommends that staff parking be provided at satellite locations, and shuttle services be implemented to transport workers to and from the main tunnelling and construction sites. For example, workers could park at the Balgowlah Golf Course construction support site (BL10) and use a shuttle service to access the Spit West Reserve construction support site (BL9) to reduce the impact on Manly Road.

Response

Transport for NSW understands the importance of minimising impacts on local communities, including impacts of worker parking in streets.

Where possible, temporary construction support sites have been located to accommodate provision for parking, and the project has sized temporary construction support sites balancing the different constraints in each location, with a particular emphasis on minimising property acquisitions. The number of car parking spaces and tailored complementary demand management strategies at each temporary construction support site would be determined during detailed construction planning, when the contractor/s has been appointed.

Environmental management measure CTT11 (refer to Table D2-1 of this submissions report) has been revised to better reflect the intention to minimise parking in local streets through a range of complementary solutions as follows:

> Impacts resulting from on- and off-street parking changes during construction will be minimised where reasonable and feasible. Depending on the location, options to manage construction staff and worker parking and manage impacts to stakeholders may include:
>
> a) Proactively encouraging usage of public transport for workers though site induction information sessions
>
> b) Provision of shuttle buses from public transport hubs where appropriate
>
> c) Staged removal and replacement of parking
>
> d) Provision of alternative parking arrangements such as off-site contractor managed parking lots
>
> e) Managed staff parking arrangements
>
> f) Working with relevant council(s) to introduce appropriate parking restrictions adjacent to construction sites and support sites or appropriate residential parking schemes.

The broad strategies currently under consideration for temporary construction support sites north of Middle Harbour include:

- Encourage workers through site inductions and weekly tool box talks to:
  - Use public transport along key bus corridors (including the Northern Beaches B-Line) including Military Road, Spit Road, Manly Road, Sydney Road, Burnt Bridge Creek Deviation and Condamine Street, to access the Spit West Reserve (BL9), Balgowlah Golf Course (BL10) and Kitchener Street (BL11) construction support sites
  - Carpool (if Public Health Orders allow once construction commences)
  - Use paid parking services nearby/parking leases
- Shuttle buses provided where required to and from public transport centres
- Car parking areas for construction workers provided at the Balgowlah Golf Course (BL10), Wakehurst Parkway south (BL12), Wakehurst Parkway east (BL13) and Wakehurst Parkway north (BL14) construction support sites
- Parking provided at Balgowlah Golf Course construction support site (BL10), with shuttle buses provided to Spit West Reserve (BL9) and site vehicle transport to Kitchener Street (BL11) construction support sites (the Spit West Reserve (BL9) and Kitchener Street (BL11) construction support sites would have limited parking for supervision staff)

- Additional parking accommodated on the road reserve within the Wakehurst Parkway Upgrade component of the project as required and suiting staging of works (to support Wakehurst Parkway south (BL12), Wakehurst Parkway east (BL13), Wakehurst Parkway north (BL14) construction support sites)
- Workers would be transported by boat from Spit West Reserve construction support site (BL9) to and from the Middle Harbour cofferdam construction support sites (BL7 and BL8).

Refer to Section A5.1.1 of this submissions report for further details on construction staff and worker parking. Potential residual parking impacts on roads surrounding temporary construction support sites would be detailed in the traffic management plan.

A parking impact assessment has been carried out to better understand existing parking supply and demand in the vicinity of temporary construction support sites (refer to Appendix B of this submissions report). The assessment found that, when considering the worst case scenario assuming that there was no demand management or provision of parking at temporary construction support sites, there would still be sufficient spare parking capacity in the road network surrounding temporary construction support sites in the Northern Beaches local government area to accommodate worker parking. Notwithstanding, Transport for NSW would still implement appropriate demand and supply management strategies as detailed above to manage impacts. Transport for NSW would continue to engage with the community and stakeholders through this process.

B11.7.3 Traffic management plan and traffic management strategies

Issue raised

Pages 10, 11, 13

Northern Beaches Council noted that all work affecting the local road network would require traffic management and approval from Council as the relevant Roads Authority under Section 138 of the *Roads Act 1993*. Council requests that traffic management arrangements be determined during the Traffic Control Group process and be required to meet both Transport for NSW and Australian standards and, where required, Council's Operational Management Standards.

Council would like to be consulted during the development and approval of traffic management plans for construction and recommends that conditions be placed on the use of local roads during school hours, to reduce local impacts and the location of vehicle layover and staging areas to minimise noise in the local road network.

Council also recommends that traffic management strategies, including traffic calming, be brought forward from any operational requirements and be implemented during or prior to construction works, to reduce the impact of traffic rat-running through the local road network to bypass construction works, and to improve community satisfaction with the project.

Response

While section 64(1A) of the *Roads Act 1993* provides for Transport for NSW to exercise the functions of a roads authority with respect to any road for approved State significant infrastructure, ongoing consultation will be carried out with Northern Beaches Council and relevant emergency services and bus operators to minimise traffic and transport impacts, in accordance with environmental management measure CTT6 in Table D2-1 of this submission report. Traffic management arrangements would be determined through the Traffic Control Group process in consultation with Council, where relevant.

It is noted that the contribution of construction related heavy vehicle traffic would be relatively minor compared to existing background traffic flows along the majority of construction haulage routes in the Northern Beaches. The traffic and transport assessment indicates that while there may be some localised impacts during construction, in most locations within the Northern Beaches the road network would still operate at a satisfactory Level of Service during peak periods.

Section D1 of this submissions report builds upon the environmental management plan framework identified in Section 28.5 of the environmental impact statement, identifying the framework for the management of key issues. Table D1-1 provides the likely sub-plans, along with the relevant guidelines and/or requirements of each plan, which would support the implementation of the overarching construction environmental management plan.

One of the sub-plans would be a traffic management plan, which would be prepared in accordance with *Traffic Control at Work Sites Technical Manual* (Transport for NSW, 2020g), Australian Standard *AS 1742.3-2019 Manual of Uniform Traffic Control Devices – Part 3: Traffic Control for Works on Roads* (Standards Australia, 2019b), and any other relevant standard, guide or manual. The content and purpose of the traffic management plan would be developed in consultation with relevant stakeholders, such as Council, as determined by the Department of Planning, Industry and the Environment.

The traffic management plan will also incorporate relevant construction traffic and transport environmental management measures provided in Table D2-1 of this submissions report. These measures, which aim to avoid and minimise impacts on the local road network, include:

- Notifying the community in advance of proposed transport network changes through appropriate media and other appropriate forms of community liaison (refer to environmental management measure CTT7)
- Managing construction traffic to minimise impacts of movements during peak hours where feasible and reasonable (refer to environmental management measure CTT8)
- Managing vehicle movements to and from construction sites to ensure pedestrian, cyclist and road user safety through, for example, manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence (refer to environmental management measure CTT9)
- Using directional signage, barriers and/or linemarking as required to direct and guide motorists, cyclists and pedestrians past construction sites and on the surrounding network. This will be supplemented by Variable Message Signs to advise all road users of potential delays, traffic diversions, speed restrictions or alternative routes (refer to environmental management measure CTT10)
- Identifying truck marshalling areas and using them where required to minimise potential queueing, to ensure associated road safety and minimise traffic and access disruptions in the vicinity of temporary construction support sites and access points to construction support sites (refer to revised environmental management measure CTT13)
- Carrying out activities requiring temporary partial road closures outside of peak periods and/or during night time to minimise the impact of these activities on the road network where feasible and reasonable (refer to environmental management measure CTT14).

Further, ongoing engagement will be carried out with representatives of user groups and managers of social infrastructure located near surface construction works/construction support sites and sensitive social infrastructure above the tunnel alignment (for example, schools, places of worship, aged care, child care, health and medical facilities) about the timing and duration of construction works and management of potential impacts, as required by environmental management measure SE2 (refer to Table D2-1 of this submissions report).

Given the anticipated performance of the local road network under construction, in addition to the implementation of the above measures, Council's recommendation to install traffic calming measures to manage construction related impacts is not considered necessary. The need for traffic calming measures would continue to be considered, monitored and assessed through detailed construction planning moving forward. Council would be engaged regarding the development and agreement of any required traffic calming measures in the future, through forums such as the Traffic Control Group process.

B11.7.4 Transport Coordination Group

Issue raised

Page 14

The Transport Coordination Group should commence in tandem with the detailed design to assess the project delivery program and identify local traffic issues that may cause delays to the project during construction.

Response

Transport for NSW will consult with Northern Beaches Council and other stakeholders, including emergency services and bus operators, on an ongoing basis to identify specific concerns and implement relevant measures to help mitigate potential traffic and transport impacts in the Northern Beaches local government area (refer to environmental management measure CTT6 in Table D2-1 of this submissions report). Council would also be consulted during the development of the traffic management plan prepared for the project, and traffic management arrangements will be determined through the Traffic Control Group process in consultation with Council, where relevant, as outlined in the response above.

Specific communications and/or management strategies for construction traffic management would be developed as part of the community communication strategy prior to construction, as outlined in Section 7 of Appendix E (Community consultation framework). Communication strategies for traffic management would include the establishment of a traffic and transport liaison group that would include representatives from relevant councils and other transport stakeholder groups to discuss traffic management, pedestrian and cyclist management and road safety during construction (refer to Section 7.1 of Appendix E (Community consultation framework)).

A range of environmental management measures that will be implemented to avoid and minimise impacts on the local road network during construction of the project are provided in Table D2-1 of this submissions report and summarised in Section B11.7.3 above.

B11.7.5 Pedestrian and cyclist safety

Issue raised

Page 11

Northern Beaches Council recommends that community access and public safety in, over and through public roads or adjoining publicly accessible reserves be maintained at all times, when practical.

Council recommends that a risk assessment be carried out to determine whether construction activities at the Wakehurst Parkway east construction support site (BL13) would increase safety risks for bike riders on the Manly Dam (Manly Warringah War Memorial State Park) mountain bike track. Any proposed realignment of the mountain bike trail to avoid or minimise risks to bike riders should be reviewed and approved by Council.

Response

As described in the above response, a traffic management plan would be prepared as a sub-plan to the overarching construction environmental management plan for the project, as outlined in Section D1 of this submissions report.

A range of environmental management measures detailed in Table D2-1 of this submissions report will be incorporated into the traffic management plan to maintain the safety and manage the movements of pedestrians, cyclists, road users and workers during construction. Vehicle movements to and from construction sites will be managed via, depending on the location, manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence (refer to environmental management measure CTT9). Directional signage, barriers and/or linemarking will be used as required to safely direct and guide motorists, cyclists and pedestrians past construction sites and on the surrounding network (refer to environmental management measure CTT10). Other measures would include:

- Communicating changes well ahead of time
- Ensuring adjustments and changes are put in place and communicated before existing facilities are closed
- Designing adjustments to shared paths in accordance with road safety standards and guidelines
- Using accredited and trained traffic controllers at all times
- Inducting all workers to ensure safety of the community and site workers are their number one priority
- Road safety audits, where relevant.

The traffic management plan for the project would be prepared in accordance with *Traffic Control at Work Sites Technical Manual* (Transport for NSW, 2020g), which would include a risk assessment to identify the traffic hazards and risks associated with the construction works (refer to Section 3.3.4 of the manual). The risk assessment would determine whether construction activities at the Wakehurst Parkway east construction support site (BL13) would increase safety risks for users of the Manly Warringah War Memorial State Park mountain bike tracks and identify appropriate site-specific control measures where required.

Transport for NSW met with Northern Beaches Council representatives on 2 March and 19 May 2021 to discuss the mountain bike trails, new connectivity opportunities provided between Garigal National Park and Manly Warringah War Memorial State Park and the realignments required during construction and operation of the project.

The project would require a temporary adjustment to some of the mountain bike tracks on either side of Wakehurst Parkway, as identified in Section 21.4.8 of the environmental impact statement. Based on community and bike interest group feedback and concerns raised in submissions on the environmental impact statement, Transport for NSW has carried out some further investigations to refine understanding on potential impacts on these active transport facilities. Refer to Section A4.5 of this submissions report for further details as to potential impacts to mountain bike trails as a result of the project.

Where possible, Transport for NSW would refine the design and seek to avoid or otherwise minimise both temporary and permanent impacts to the mountain bike trail network. Where impacts cannot be avoided, detour routes would be implemented, and advanced notification of track closures provided at key locations. Construction of the three permanent shared user path underpasses proposed along Wakehurst Parkway would be prioritised where feasible. Transport for NSW would continue to consult with Council and relevant mountain biking associations during the

detailed design of the project regarding potential impacts to the Manly Warringah War Memorial State Park mountain bike trails and surround network near Wakehurst Parkway.

B11.7.6 Temporary road and footpath works

Issue raised

Page 11

Northern Beaches Council requests that all temporary road and footpath assets be fit for purpose for the duration of the life of each asset and removed prior to the area being handed back to Council.

Response

New temporary road pavements would be constructed to meet Transport for NSW design standards and Quality Specifications, and would be stable and skid resistant under all weather conditions and structurally sound during use. Temporary shared user path and cycleway pavements would also be constructed to meet Transport for NSW design standards and Quality Specifications, and will be designed with consideration of user safety in accordance with revised environmental management measure CTT15 (refer to Table D2-1 of this submissions report).

Land subject to temporary use, including temporary roads, shared user paths and areas of public open space, will be rehabilitated as soon as practicable to an appropriate condition in accordance with environmental management measure LP5 (refer to Table D2-1 in this submissions report). Rehabilitation will be carried out in consultation with the relevant landowner (where appropriate).

B11.7.7 Management of maritime traffic

Issue raised

Page 14

Northern Beaches Council recommends that construction works in Middle Harbour be managed and scheduled to minimise impacts on recreational boating in the harbour. Council is concerned that Northern Beaches residents who launch their boats from the Davidson Park boat ramp to visit seaward sections of Middle Harbour or Port Jackson would be impacted. The only other Middle Harbour boat ramp in the Northern Beaches east of Spit Bridge is located at Little Manly Beach, which does not have adequate parking to accommodate a significant increase in public use of the boat ramp and requires four-wheel drive vehicles to launch and retrieve boats during low tide.

Council recommends timely and extensive notification of maritime restrictions to all relevant stakeholder groups in the Northern Beaches.

Response

The project has been designed to minimise disruptions to maritime traffic and transport in Middle Harbour. Impacts to waterway users have been reduced by limiting harbour closures, minimising movement of moorings and maintaining access to the foreshore where feasible.

Weekends are typically the busiest period for recreation including recreational boating, as discussed in Table 6-21 of the environmental impact statement, and would be considered during detailed construction planning stages to minimise impacts to recreational activities and residents. Construction maritime traffic activities will be scheduled to avoid times and locations of high recreational maritime traffic, including near the Spit Bridge, where possible in accordance with revised environmental management measure CTT4 (refer to Table D2-1 of this submissions report).

During construction, in the vicinity of the Middle Harbour crossing, vessels would be required to travel an additional distance to avoid construction plant and equipment. A controlled navigation channel will be provided to ensure a safe transition through the site at a posted speed of 4 knots. Transiting the crossing would take about two minutes and 50 seconds.

The installation of the immersed tube tunnel units would require up to four partial and two full closures of up to 48 hours each of Middle Harbour between Northbridge and Seaforth Bluff, as described in Section 8.4.3 of the environmental impact statement. Scheduling of the Middle Harbour closures would be carried out in consultation with Port Authority NSW, other divisions of Transport for NSW and all other relevant stakeholders, in accordance with environmental management measure CTT5 (refer to Table D2-1 of this submissions report).

The Davidson Park boat ramp was considered as part of the navigation impact assessment, and was referred to as the facility/boat ramp at Roseville Bridge in Annexure A of Appendix F (Technical working paper: Traffic and transport). Given the Davidson Park/Roseville Bridge boat ramp is located about five kilometres upstream of the Middle Harbour crossing, it would not be directly impacted by the project. While its users may traverse the location of the Middle Harbour crossing to access the Outer Harbour, with the implementation of the environmental management measures described above, they are unlikely to be significantly impacted.

Should the project be approved, a community communication strategy based on Appendix E (Community consultation framework) would be prepared to provide further details about community involvement during design, construction and the project opening phase, as described in Section B11.6.2. The community communication strategy would guide the project team's interactions with the community and stakeholders and set standards for proactive engagement.

Specific to the construction of the Middle Harbour crossing and potential impacts to recreational users, community groups and clubs, the community will be notified in advance of proposed maritime restrictions in Middle Harbour through appropriate media and other appropriate forms of community liaison in accordance with environmental management measure CTT7 (refer to Table D2-1 of this submissions report). In addition, consultation will be continued with surrounding water based users of Middle Harbour, including Mosman Rowing Club, 1st Northbridge Sea Scout Group, 1st Sailors Bay Sea Scouts and Northbridge Sailing Club, to develop reasonable and feasible management measures to minimise construction impacts (refer to revised environmental management measure CTT16 provided in Table D2-1 of this submissions report).

B11.8 Operational traffic and transport

B11.8.1 Adequacy and accuracy

Issue raised

Page 15

Northern Beaches Council is concerned that operational traffic modelling carried out for the project is not detailed enough, has largely focused on the State and regional road network (major roads) and has not given adequate consideration to the local road network (minor roads), specifically local roads near the tunnel portals. Council notes that the local road network is currently operating at capacity with traffic flowing southwards during the AM peak period and northwards during the PM peak period, and this seems to be an omission in the assessment.

Response

Operational traffic modelling for the project included both regional (macroscopic) and local (microscopic) scale modelling, as outlined in Section 9.2.2 of the environmental impact statement.

An overview of road networks considered in the operational traffic model for the traffic and transport assessment for the project are shown in Figure 3-2 of Appendix F (Technical working paper: Traffic and transport). The assessment approach was developed and delivered by subject matter experts. It has also been peer reviewed and endorsed by the Department of Planning, Industry and Environment.

The broad study area for the traffic and transport assessment of Balgowlah and surrounds is shown in Figure 4-35 of Appendix F (Technical working paper: Traffic and transport) and includes key local and arterial roads in the suburbs of Balgowlah, Mosman, North Balgowlah, Manly Vale and Seaforth, as outlined in Table 4-17 of Appendix F (Technical working paper: Traffic and transport). The broad study area for the traffic and transport assessment of Frenchs Forest and surrounds is shown in Figure 4-44 of Appendix F (Technical working paper: Traffic and transport) and includes local and arterial roads in the suburbs of Frenchs Forest, Killarney Heights and Seaforth, as outlined in Table 4-23 of Appendix F (Technical working paper: Traffic and transport).

Detailed analysis of local area impacts is provided in Section 7 of Appendix F (Technical working paper: Traffic and transport) and Section 9.4 of the environmental impact statement.

In the vicinity of the Balgowlah portals, the assessment shows that the introduction of the project would generally facilitate additional traffic travelling through the corridor within the Balgowlah and surrounds area at greatly reduced levels of delay, and would benefit both regional and local trips. This would result in improved travel times on key routes through the area as a result of the project.

Further traffic analysis and modelling of the Balgowlah and Frenchs Forest areas has also been carried out for the preferred infrastructure report. This analysis (refer to Section 6.3 of the preferred infrastructure report) provides additional detail of the benefits in the Balgowlah area presented in the environmental impact statement, confirming that the local road network is not expected to be materially adversely impacted by the project in this area. As noted in Section B11.4.3 above, for the Frenchs Forest area, the additional detailed analysis indicates that traffic performance issues would not be most appropriately mitigated by road network upgrades and management alone and that an integrated and complementary public transport and demand management approach would be more appropriate. Consequently, Transport for NSW will continue to investigate and collaborate with Northern Beaches Council and other relevant stakeholders on complementary public transport and other demand management initiatives which are enabled by Beaches Link but beyond the scope of the project, consistent with the approach adopted for the *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a).

Transport for NSW will carry out a review of operational network performance 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, in accordance with environmental management measure OT1 in Table D2-1 of this submissions report. Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and Council to manage any additional traffic performance impacts identified during the review of operational network performance. Where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network, in accordance with environmental management measure OT2 (refer to Table D2-1 of this submissions report). Such measures will be determined in consultation with relevant councils and implemented where feasible and reasonable.

B11.8.2 Consideration of COVID-19 impacts

Issue raised

Page 15

Northern Beaches Council states that traffic modelling is based on 2016 data and recommends that traffic modelling for the project consider changes in working patterns and reductions in public transport patronage due to the COVID-19 pandemic and bus timetable changes.

Response

The traffic modelling for the environmental impact statement commenced in November 2017 using Sydney Motorway Planning Model (SMPM) v1.0. This was the best model available at the time and incorporated the relevant available inputs. SMPM v1.0 has been reviewed and is considered fit for the purpose on long-term major road project planning by traffic and transport industry subject matter experts. The same approach was used for the Western Harbour Tunnel and Warringah Freeway Upgrade project, which is part of the same program of works and is considered in the 'Do something cumulative' scenarios in this project's modelling. The suite of data that Transport for NSW has indicates that both the strategic traffic forecasting (SMPM) and microsimulation traffic modelling remain fit for the purpose of long-term planning and assessment of the future road transport network.

The COVID-19 pandemic is an unprecedented event that is currently impacting the way people work and their travel patterns, while creating uncertainty about the future, as discussed in Section 3.1 of the environmental impact statement. Significant uncertainty still exists about how long the impacts of COVID-19 will last.

While the COVID-19 pandemic presents immediate to medium-term challenges for Sydney (and NSW more broadly), the project has been developed with a long-term view to address the challenges Greater Sydney will face over the next 40 years, to enable and accommodate growth, and to deliver long-lasting benefits for road users, communities and businesses. As Sydney continues to grow, faster and more reliable trips are essential to reducing congestion and providing new levels of access to jobs, recreation, and services such as schools and hospitals. Mona Vale Road, Military Road/Spit Road and Warringah Road/Eastern Valley Way road corridors generally operate well over capacity during peak periods, as described in Chapter 3 (Strategic context and project need) of the environmental impact statement. This contributes to high levels of congestion, long and unreliable journey times and, consequently, poor accessibility to and from the region. Beaches Link would create an alternative to the Military Road/Spit Road and Warringah Road/Eastern Valley Way corridors to separate out through and by-pass traffic, reducing pressure on congested road corridors servicing the Northern Beaches and North Shore.

As such, the need for the project and other strategic transport projects to meet the demands of a growing population and economy remains critical to ensuring the future success of Sydney.

Given the immediate to medium term nature of current conditions, the modelling approach used for the environmental impact statement is considered to be the most appropriate methodology for long-term planning and was completed in accordance with appropriate standards and guidelines.

While it is difficult to fully assess the long-term impact of the event, evidence of Greater Sydney's resilience to such disruptions is already apparent. Ongoing traffic and transport monitoring shows that traffic levels on most roads in the project area returned to those levels near that of the pre-COVID-19 pandemic period in early 2021, prior to the mid-2021 lockdown (acknowledging that public transport capacity and user behaviours are still in a temporary state). It is expected that similar trends will be observed once the lockdown rules have been eased, and traffic levels will

return to those levels in the pre-COVID-19 pandemic period. Transport for NSW will continue to monitor and analyse the potential long-term effects of the COVID-19 pandemic on travel demand, including changes to existing travel conditions as well as future travel behaviours and underlying economic demand drivers.

Refer to Section A5.1.17 of this submissions report for further details regarding the effect of COVID-19 on modelling carried out for the environmental impact statement.

B11.8.3 Consideration of the Brookvale and Dee Why Transport Management and Accessibility Plan

Issue raised

Page 18

Northern Beaches Council is currently finalising the Brookvale and Dee Why Transport Management and Accessibility Plan (TMAP) which proposes a number of recommendations along Pittwater Road on the south-bound approach to the tunnel. The study recommends grade separation of the Pittwater Road/Harbord Road/Warringah Road intersection, to cater for anticipated growth. Future case modelling in the TMAP shows significant deterioration of this intersection's performance at completion of the project by 2028. Council recommends that the grade separation of the intersection be completed prior to the opening of the tunnel.

Council also recommends that an upgrade of the Pittwater Road/Condamine Street intersection be considered to improve access to the Burnt Bridge Creek Deviation tunnel portal and bus priority systems, along with other works recommended in the TMAP, due to their level of impact on the performance of roads approaching the tunnel portals.

Response

Grade separation of the Pittwater Road/Harbord Road/Warringah Road intersection, upgrade of the Pittwater Road/Condamine Street intersection and other works recommended by the Brookvale and Dee Why Transport Management and Accessibility Plan are out of scope of the Beaches Link and Gore Hill Freeway Connection project, noting that the project is not expected to have a material impact on traffic volumes or patterns in this area. It is noted that these suggested works are not related to Beaches Link integration issues; rather they appear to be targeted at local traffic and transport issues and general background growth in the area.

Northern Beaches Council should continue to collaborate with Transport for NSW on issues in the Brookvale and Dee Why area through the Brookvale and Dee Why Transport Management and Accessibility Plan and Brookvale Structure Plan process.

B11.8.4 Operational traffics impacts to Northern Beaches peninsula

Issue raised

Page 16

Northern Beaches Council is concerned that, although the project would result in a decrease in traffic demand on Spit Road, Warringah Road, Eastern Valley Way and Mona Vale Road, it would also facilitate an increase in traffic demand into and out of the Northern Beaches peninsula by up to nine per cent.

Response

The impacts of the project on the performance of the broader road network, including the traffic demands on the existing arterial roads into and out of the Northern Beaches peninsula, is outlined in Section 9.4.1 of the environmental impact statement. The project would enhance the resilience of the road network by providing additional road network capacity and alternate north-south and east-west linkages to reduce congestion and potential gridlock in the event of incidents on the road network.

As noted by Northern Beaches Council, the project would facilitate growth in traffic demand into and out of the Northern Beaches peninsula resulting from the increased accessibility that it would provide. However, it is noted that the project would provide an increase in road capacity (ie six new lanes of motorway standard road across Middle Harbour) which would accommodate this demand and enable the net project benefits in terms of improved travel times and reliability. In general, users of the Beaches Link as well as existing connections to the Northern Beaches peninsula, including Mona Vale Road, Eastern Valley Way, Spit Road and Warringah Road, would benefit from reduced congestion and improved road safety as a result of the project lowering daily traffic demand on these roads by introducing a new, higher standard of road as an alternative.

Strategic traffic modelling of the project indicates that the project, combined with the Western Harbour Tunnel and Warringah Freeway Upgrade, would deliver substantial benefits to traffic travelling on the strategic road network, with trips between strategic centres saving up to 22 minutes when travelling across Sydney Harbour from the Northern Beaches during peak periods in the 'Do something cumulative 2037' scenario (refer to Section 8.1 of Appendix F (Technical working paper: Traffic and transport)).

It is also noted that the opportunity for express bus services in the Beaches Link tunnel is aimed to drive a mode shift from cars/private vehicles to public transport. The project would provide the opportunity for efficient access and interchange with heavy rail or metro connections at North Sydney, which would help drive that mode shift to increased public transport use and less private vehicle use on the Northern Beaches peninsular.

B11.8.5 Operational traffic benefits for Balgowlah and surrounds

Issue raised

Page 16

Northern Beaches Council noted the following specific benefits of the project for Balgowlah and surrounds:

- There would be a significant reduction in congestion and delays at the intersection of Manly Road and Sydney Road
- The Level of Service at the Sydney Road/Condamine Street intersection would improve slightly during the AM peak
- Most intersections in Balgowlah and surrounds deteriorate to some extent in terms of Level of Service during the AM and PM peak periods without the project. This mirrors the overall impact of latent background growth across all major intersections
- Without the project, there are significant increases in travel times for general traffic and buses on most major travel corridors through Balgowlah and surrounds
- With the project, there are improvements in travel times for general traffic and buses on most major travel corridors through Balgowlah and surrounds

- The greatest travel time and delay reduction benefits for Balgowlah and surrounds would be realised in the 'Do something cumulative' scenario, which includes the Western Harbour Tunnel and Warringah Freeway Upgrade project.

Response

Northern Beaches Council's acknowledgement of benefits of the project are noted.

B11.8.6 Intersection performance impacts in Balgowlah and surrounds

Issue raised

Page 16

Northern Beaches Council raised concerns about the following intersection performance issues in the Balgowlah and surrounds area:

- The Frenchs Forest Road/Sydney Road intersection continues to perform poorly even under the 'Do something cumulative' scenario, with Level of Service remaining 'F' during the PM peak period
- The Level of Service at the Sydney Road/Condamine Street intersection would decrease during the PM peak
- The Condamine Street/Burnt Bridge Creek Deviation intersection has increased delays in both AM and PM peaks
- The Access Road/Sydney Road/Maretimo Street intersection has increased delays during the AM and PM peak periods. In the PM peak period, the average delay would increase from 9 seconds (in the 'Do minimum 2027' scenario) to 30 seconds (in the 'Do something cumulative 2037' scenario) (Level of Service changes from A to C)
- The Access Road/Burnt Bridge Creek Deviation intersection has increasing delays over time, however it is still Level of Service A
- Most intersections in Balgowlah and surrounds would continue to operate at similar levels of service in both peaks with the project. The roundabout at Frenchs Forest Road/Sydney Road would continue to exceed capacity Level of Service F. Some form of capacity improvement is required to ease congestion and rat-running.

These issues would need to be addressed either through conditions of approval or consultation with Council.

Response

Transport for NSW notes Northern Beaches Council's concerns about intersection performance issues in Balgowlah and surrounds. Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

It is important to recognise that single-point assessment criteria, like Level of Service, do not present a complete picture of road network traffic operations in the complex and constrained urban network environment that the project is located in, as outlined in Section 3.6 of Appendix F (Technical working paper: Traffic and transport). Isolated midblock and intersection Levels of Service do not recognise that traffic is often constrained upstream (meaning that vehicles cannot get to the evaluation point) and therefore give results with an unrealistically low level of demand and delay. Similarly, single-point assessments do not recognise that traffic can be constrained downstream, meaning vehicles are queued through the evaluation point within the model. The individual intersection results therefore only show throughput at that single-point rather than realistic overall network performance.

The operation of the modelled road network as a whole is regarded as being a more holistic and relevant indication of performance when considering typical road transport journeys, recognising that there may be some locations where there may be improvement, while at others there may be some deterioration. Changes at individual intersections points should therefore not be considered in isolation. Rather, network impacts should be considered holistically through network metrics such as network speeds and corridor travel times.

Modelling of traffic travel times in Balgowlah and surrounds indicates that travel times across the network and on most key routes throughout the area are expected to improve as a result of the project (refer to Section 9.4.5 of the environmental impact statement). As noted by Council, intersection impacts within the area are minor, with most intersections continuing to operate at similar levels of service with the project. While some intersections would continue to experience a poor level of service due to existing network constraints and issues time benefits, the project would result in an overall improvement to network performance.

Further traffic analysis and modelling which has been carried out for the preferred infrastructure report (refer to Section 6.3 of the preferred infrastructure report) confirms the operational modelling outcomes for the Balgowlah and surrounds study area that the project would not adversely impact the performance of the local road network. It is acknowledged that the intersection (roundabout) of Sydney Road/Frenchs Forest Road is an existing network pinch point which has a material influence on broader network performance; although the project is expected to relieve some demand at this intersection, existing congestion issues would not be fully mitigated by the project. Sensitivity testing indicates that if the capacity of this intersection was improved, the benefits of the project in the area would be further amplified.

Transport for NSW will continue to work with Council through relevant forums and processes in developing solutions for local area traffic issues such as this which are beyond the scope of the project. It is noted that the Transport for NSW Network Solutions team within Planning and Programs will shortly commence investigations on capacity improvements to the Frenches Forest Road/Sydney Road roundabout. The Network Solutions team will engage with Council in the last quarter of 2021 to inform these investigations.

Transport for NSW will carry out a review of operational network performance 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, as per environmental management measure OT1 in Table D2-1 of this submissions report. Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and Council to manage any additional traffic performance impacts identified during the review of operational network performance.

Transport for NSW will also investigate options to mitigate potential localised network issues in accordance with environmental management measure OT2 (refer to Table D2-1 of this submissions report). Where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network. Such measures would be determined in consultation with Council and implemented where feasible and reasonable.

B11.8.7 Local area traffic management at Balgowlah

Issue raised

Page 16

Northern Beaches Council is concerned that there would be an increase in traffic on local roads between Kitchener Street and Sydney Road as traffic from North Balgowlah enters the tunnel. Local

area traffic management on Wanganella Street, Rickard Street and West Street, to encourage the use of Woodland Street and Condamine Street, should be discussed with Council during detailed design.

Response

Surface connections at Balgowlah would attract traffic demand from both east and west of Burnt Bridge Creek Deviation, as outlined in Section 9.4.5 of the environmental impact statement. The additional traffic from North Balgowlah could travel via Kitchener Street to access the new access road from Sydney Road east. This could potentially increase traffic volumes on local roads between Kitchener Street and Sydney Road, unless local area traffic management is also put in place to minimise increased traffic on local roads. Local area traffic management on Wanganella Street, Rickard Street and West Street would result in traffic demand using Woodland Street and Condamine Street instead, which is more appropriate to the function of these roads. The requirement for traffic calming measures in this area would be determined during further design development. The final design and location of traffic calming measures would be developed in consultation with Northern Beaches Council, in accordance with environmental management measure OT2 (refer to Table D2-1 of this submissions report).

B11.8.8 Increased heavy vehicle usage on Pittwater Road and Condamine Street corridor

Issue raised

Page 15

Northern Beaches Council is concerned that the project would result in increased heavy vehicle use of the Pittwater Road and Condamine Street corridor, diverting such vehicles from Mona Vale Road.

Response

The changes to the heavy vehicle demand travelling into and out of the Northern Beaches peninsula is discussed in Section 9.4.1 of the environmental impact statement. As identified by Northern Beaches Council, peak period heavy vehicle demand on Mona Vale Road would decrease by up to 35 per cent as a result of the project under the under the ‘Do something’ scenario, which would result in increased heavy vehicle use of the Pittwater Road and Condamine Street corridor.

It is noted that Condamine Street is a State Road with a strong movement function, which currently carries a significant volume of heavy vehicle traffic. Although there would be a material increase in heavy vehicles along this corridor, this would not fundamentally change the nature/movement function of the corridor. Considering this context, it is expected that the corridor will be able to safely and efficiently accommodate the increase in heavy vehicles.

It is also noted that the project would provide the following strategic benefits related to heavy vehicle traffic:

- Substantially reduce the travel times for freight trips and an increase in productivity
- An improvement in the overall amenity of the existing arterial road network to and from the Northern Beaches peninsula due to the movement of heavy vehicle trips from surface arterial roads to the motorway tunnels
- Reduced interactions between general traffic, heavy vehicles, public transport vehicles, pedestrians and cyclists. This reduced interaction would improve road safety and reduce the severity of crashes on the arterial road network.

B11.8.9 Consideration of the Balgowlah/Manly Vale Traffic and Parking Review

Issue raised

Page 17

Northern Beaches Council recently completed the Balgowlah/Manly Vale Traffic and Parking Review, that proposed several projects to reduce congestion in and around the Balgowlah Industrial Area, including:

- The access road from Sydney Road to the Balgowlah portal must be grade-separated to reduce the risk of accidents or delays at the signalised intersection on the Burnt Bridge Creek Deviation
- Linking the two ends of Quirk Road to provide a bypass of the Balgowlah Road/Roseberry Street and Balgowlah Road/Condamine Street intersections for local trips
- An upgrade to the Balgowlah Road/Condamine Street signalised intersection
- Replacement of the roundabout at Balgowlah Road/Roseberry Street with a signalised intersection to improve intersection efficiency
- Lane reassignment at the intersection of Kenneth Road/Condamine Street to improve efficiency and reduce queuing for traffic exiting Kenneth Road
- Replacement of the roundabout at Kenneth Road/Roseberry Street with a signalised intersection to improve intersection efficiency.

Response

The projects listed above that were proposed as part of the Balgowlah/Manly Vale Traffic and Parking Review are considered out of scope for the project.

The design of the project has considered a wide variety of factors including safety, connectivity, accessibility, efficiency and reliability outcomes for all transport users. The proposed design for the project has been developed through careful consideration ensuring efficient operation, while also balancing and minimising impacts. The recommendation from Council to provide a grade separated intersection between the new access road and Burnt Bridge Creek Deviation has been discussed in Section B11.3.1 above. The proposed design is demonstrated to provide efficient transport network performance without grade separation of the new access road.

The other additional scope items suggested are not considered to be project related issues; rather they appear to be targeted at addressing other existing or background issues within the area. Council should continue to collaborate with Transport for NSW on issues in the Balgowlah and Manly Vale area through existing appropriate forums, such as via the Transport for NSW Network and Safety Services Team.

Transport for NSW will carry out a review of operational network performance 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, in accordance with environmental management measure OT1 in Table D2-1 of this submissions report. Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and Council to manage any additional traffic performance impacts identified during the review of operational network performance. Where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network, in accordance with environmental management measure OT2 (refer to Table D2-1 of this submissions report). Such measures will be determined in consultation with relevant councils and implemented where feasible and reasonable.

B11.8.10 Additional works around Burnt Bridge Creek Deviation tunnel portals

Issue raised

Pages 17, 18

Northern Beaches Council requests that the following projects be introduced in conjunction with the project to address network issues that are demonstrated to increase delays or rat-running as a result of the project, reduce impacts on side streets near the Burnt Bridge Creek tunnel portal and to improve access (in particular for public transport) to the tunnel portal:

- Dedicated bus lanes from the Kentwell Road/Condamine Street intersection through Manly Vale to connect two sections of 24-hour bus lanes to increase the reliability of the express bus services
- Traffic amelioration measures to prevent toll avoidance and/or rat-running in streets in North Balgowlah and Balgowlah Heights approaching the tunnel portal, including Manning Street, Bardoo Avenue, Woodbine Street, Myrtle Street, Kitchener Street, Wanganella Street, and Rickard Street
- The project would remove some rat-running traffic from Balgowlah Heights/Clontarf via Heaton Avenue, Kanangra Crescent and Ethel Street; however, this traffic would be redirected to Wanganella Street and Seaview Street. The ongoing anticipated poor performance of the Frenchs Forest Road and Sydney Road roundabout may mean that rat-running via Kanangra Crescent would not be eased. The community is already concerned about existing speed and volume of traffic in Wanganella Street and Seaview Street past St Cecilia's Catholic Primary School. Traffic calming measures in Wanganella Street and Seaview Street are requested
- Maretimo Street is narrow and is the main frontage for the Balgowlah Boys Campus of the Northern Beaches Secondary College. Council is concerned about increased traffic past Northern Beaches Secondary College Balgowlah Boys Campus, considering the existing congestion during school drop-off and pick-up periods, school bus traffic and large numbers of school students crossing the road. The project does not propose north-south access between Maretimo Street and the new access road, which is considered essential to ensure the continued safe operation of Maretimo Street. There is also a need to reduce the increased levels of rat-running via Maretimo Street, Ethel Street and adjoining side streets.

Some additional work is also required to allow the optimum capacity to be achieved and prioritise public transport to access the portal as a priority.

Response

Analysis of network performance for the Balgowlah and surrounds study area indicates that the operation of the Beaches Link and Gore Hill Freeway Connection would facilitate additional traffic through the corridor at greatly reduced levels of delay and would benefit both regional and local trips, as discussed in Section 9.4.5 of the environmental impact statement. This would result in improved travel times on key routes through the area as a result of the project.

The projects listed above do not appear to be project related issues, and are as such considered out of scope for the project. Transport for NSW would continue to work with Northern Beaches Council on broader network improvements, such as via the Transport for NSW Network and Safety Services Team.

Refer to Section B11.8.12 below for discussion on toll avoidance.

Traffic movements north-south (and vice versa) through the intersection between Maretimo Street and the access road would not be permitted, which would reduce the potential for rat-running via Maretimo Street, as outlined in Section 9.4.5 of the environmental impact statement.

Transport for NSW will carry out a review of operational network performance 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, in accordance with environmental management measure OT1 in Table D2-1 of this submissions report. Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and Council to manage any additional traffic performance impacts identified during the review of operational network performance. Where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network, in accordance with environmental management measure OT2 (refer to Table D2-1 of this submissions report). Such measures will be determined in consultation with Council and implemented where feasible and reasonable.

B11.8.11 Burnt Bridge Creek Deviation tunnel portal congestion

Issue raised

Page 17

Northern Beaches Council is concerned that congestion would occur at the Burnt Bridge Creek Deviation tunnel portal, since there are only two through lanes in each direction and buses have to merge into general traffic lanes to enter the tunnel. While there is an anticipated reduction in congestion on Condamine Street, Council is concerned that there would be increased congestion and delays on Kenneth Road and Balgowlah Road as traffic from Balgowlah, Manly Vale, Fairlight and Manly enters the tunnel portal at Burnt Bridge Creek Deviation and avoids Sydney Road from Manly.

Response

Traffic modelling carried out indicates that the tunnel is expected to operate efficiently within capacity at all locations (both northbound and southbound) during traffic peak periods in the design year of 2037, for both the ‘Do something’ and ‘Do something cumulative’ scenarios. The microsimulation modelling considers the effects of upstream and downstream network constraints, including traffic platooning and queuing including at the intersections of Burnt Bridge Creek Deviation/Condamine Street, Condamine Street/ Kenneth Road and Condamine Street/Balgowlah Road.

Further traffic analysis which has been carried out for the preferred infrastructure report (refer to Section 6.3 of the preferred infrastructure report) confirms the operational modelling outcomes for the Balgowlah and surrounds study area that the project would not adversely impact the performance of the local road network. Travel times recorded on key road corridors along Frenchs Forest Road, Sydney Road, Manly Road and Burnt Bridge Creek Deviation generally indicate an expected improvement to local travel times compared to the 2037 ‘Do minimum’ (for example the Spit Bridge to Burnt Bridge Creek Deviation/Condamine Street intersection travel time would reduce by up to 2 minutes in the northbound direction and up to 6 minutes in the southbound direction). Average speed plots for the Balgowlah and surrounds study area are presented in Section 3.4.5 of Appendix B of the preferred infrastructure report, which further indicate expected improvements in this area.

The new access road/Burnt Bridge Creek Deviation intersection would operate at Level of Service A in the ‘Do something’ and ‘Do something cumulative’ scenarios, as indicated in Section 9.4.5 of the environmental impact statement. Level of Service A indicates good operation in which traffic flows freely and individual drivers are virtually unaffected by the presence of others in the traffic stream.

Key outcomes of the modelled road network performance in the Balgowlah and surrounds area under the 'Do something scenario' include:

- Peak period traffic demand would increase by up to 15 per cent by 2037
- Average travel speeds would improve by up to 77 per cent in the AM peak and 49 per cent in the PM peak by 2037 due to the shift in traffic demand to the project road network and relief of existing pinch points such as the intersection of Burnt Bridge Creek Deviation/Sydney Road/Manly Road. The transfer of this demand from surface arterial roads to the project would reduce congestion and improve travel speeds for local trips
- The number of stops would reduce substantially by up to 56 per cent in the AM peak and 22 per cent in the PM peak. This is due to the reduction in traffic on the surface roads, particularly through the intersection of Manly Road and Sydney Road, which is the primary source of delays in the area.

In the 'Do something cumulative' scenario, peak period traffic demand and average travel speeds in Balgowlah and surrounds would not substantially change when compared to the 'Do something' scenario. Network performance measures indicate that the project would facilitate additional traffic through the area and that travel times and speeds would be similar to the 'Do something' scenario.

Notwithstanding the expected road network benefits for the area, Transport for NSW will carry out a review of operational network performance 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, as per environmental management measure OT1 in Table D2-1 of this submissions report. Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and Northern Beaches Council to manage any additional traffic performance impacts identified during the review of operational network performance.

B11.8.12 Toll avoidance

Issue raised

Page 18

Northern Beaches Council is concerned that Kirkwood Street and Judith Street in Seaforth would be impacted by rat-running as a percentage of traffic would seek to avoid tolling, and suggests traffic calming measures to address the issue.

Response

Toll avoidance is the potential impact of traffic transferring from currently non-tolled roads as a result of introducing a toll. As such, this is not expected to be an impact for the Beaches Link tunnels, as currently un-tolled surface roads would remain un-tolled once the project is operational. The decision to apply a toll to a road is a NSW Government decision and is not made at the project level. Although no decision on the final tolling strategy has yet been made for the project, the traffic and transport assessment assumptions include two-way tolling for the project tunnels. Tolling scenario assumptions considered in the traffic and transport modelling are described in Section 7.2.4 and Section 8.2.4 of Appendix F (Technical working paper: Traffic and transport).

It is acknowledged that surface connections at Balgowlah would attract traffic demand from both east and west of Burnt Bridge Creek Deviation. Traffic from Seaforth and North Balgowlah could travel via Woodbine Street and Kitchener Street to access the new access road from Sydney Road east, since northbound traffic from Seaforth and North Balgowlah would not be able to enter the tunnel at Killarney Heights.

Further, the project is expected to reduce rat running by substantially reducing existing traffic volumes and levels of congestion on existing corridors and network pinch points, such as the intersection of Burnt Bridge Creek Deviation/Sydney Road/Manly Road (as discussed in Section B11.8.11 above). The project would also provide for a separation of through traffic and local traffic which would lead to reduced through traffic using local streets to avoid congestion.

Transport for NSW will carry out a review of operational network performance 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, as per environmental management measure OT1 in Table D2-1 of this submissions report. Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and Northern Beaches Council to manage any additional traffic performance impacts identified during the review of operational network performance. Where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network in consultation with Council, in accordance with environmental management measure OT2 (refer to Table D2-1 of this submissions report).

B11.8.13 Operational traffic impacts to the Frenchs Forest peripheral network

Issue raised

Pages 10, 16

Northern Beaches Council recommends that impacts on the peripheral network in Frenchs Forest, identified by traffic modelling for the project, be addressed as part of the project.

Council raised concern about the following issues:

- The Wakehurst Parkway/Frenchs Forest Road East and Wakehurst Parkway/Warringah Road intersections are both predicted to operate at Level of Service E or F during the AM and PM peak periods by 2037. Widening of Wakehurst Parkway north of Warringah Road may alleviate these conditions
- The Level of Service for the Warringah Road/Hilmer Street intersection deteriorates significantly by 2037 in PM peak with the project
- The Northern Beaches Hospital road upgrades result in improved intersection performance in Frenchs Forest and surrounds until 2027, but it then deteriorates without the tunnel (although generally not to levels experienced in 2012).

These issues would need to be addressed either through conditions of approval or consultation with Council.

Response

The potential for increased localised delays that could be experienced in the Frenchs Forest area due to changes in travel patterns and demand as a result of the project is discussed in Section 9.4.6 of the environmental impact statement. The potential localised increases in travel times on the key corridors of Warringah Road and Wakehurst Parkway within the area are expected to generally be less than five minutes during the morning and evening peak hours as a result of the project. Overall, traffic modelling predicts that potentially increased localised delays at intersections would be offset by the broader improvement in connectivity and reduction in congestion created by the project.

For example, average travel time savings that the project would deliver between key centres, eg Dee Why and Macquarie Park, are expected to be around 20 minutes. Net travel time saving would be created by the project providing new high capacity motorway connectivity, as well as reducing congestion on existing regional routes like Warringah Road west of Frenchs Forest. It is also noted

that overall travel times for general traffic on Warringah Road and Forest Way in the Frenchs Forest area would remain generally unaffected by the project, indicating that potentially increased delays along Wakehurst Parkway would not impact east-west trips.

Notwithstanding this, further traffic analysis and modelling which has been carried out for the preferred infrastructure report (refer to Section 6.3 of the preferred infrastructure report) indicates that the impacts presented in the environmental impact statement would not be most appropriately mitigated by road network upgrades and management alone, and that a public transport and demand management approach would be more appropriate. Transport for NSW would continue to collaborate on options to mitigate potential localised network performance issues in the area, and further leverage the overall benefits and opportunities of the project. This underlines the importance of NSW Government and Council working in collaboration to develop integrated, multi-modal transport solutions which will reduce car dependence, and consequently enable and accommodate the desired growth and improve place outcomes in Frenchs Forest and surrounds.

This approach is consistent with and reliant on the outcomes of the ongoing implementation of the *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a) and accompanying plans (eg *Draft Frenchs Forest 2041 Place Strategy* (NSW Department of Planning, Industry and Environment (DPIE), 2021a)), which highlight that future precinct development beyond Stage 1 of the development is dependent on further delivery of improved transport infrastructure and operations beyond the scope of the Beaches Link project and a continued modal shift from private to public transport.

The Beaches Link and Gore Hill Freeway Connection project reference design scope includes road network modifications to mitigate key changes to traffic patterns and conditions in the Frenchs Forest area created by the project. As noted in Section 6 (Assessment of road intersection operational performance) of the preferred infrastructure report, Transport for NSW would continue to collaborate with relevant stakeholders through the *Northern Beaches Hospital Structure Plan* forum and processes to plan, develop, and implement public transport and demand management initiatives. It is believed that further infrastructure and services planning for the proposed precinct development(s) should be led by the Department of Planning, Industry and Environment/Council as relevant, with Transport for NSW assisting with transport integration aspects where appropriate.

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project. However, Transport for NSW will carry out a review of operational network performance 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections in accordance with environmental management measure OT1 in Table D2-1 of this submissions report. Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and Council to manage any additional traffic performance impacts identified during the review of operational network performance.

Furthermore, where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network required in accordance with environmental management measure OT2 (refer to Table D2-1 of this submissions report). Such measures would be determined in consultation with Council and implemented where feasible and reasonable.

Given the above, the request to widen Wakehurst Parkway north of Warringah Road is not justifiable at this time, considering the major civil works may pose significant additional noise, traffic and biodiversity impacts during construction and result in potentially relatively small improvements

to the road network. Transport for NSW would continue to work with Council on broader network improvements beyond the scope of the project.

B11.8.14 Directional signage

Issue raised

Page 18

Northern Beaches Council is concerned that traffic from Seaforth heading north along Wakehurst Parkway would attempt to carry out a U-turn unsafely at the Wakehurst Parkway/Aquatic Drive intersection in order to enter the tunnel. Directional signs need to indicate there is no access to the tunnel from Seaforth.

Response

Operational ancillary infrastructure for the project would include signage and other traffic control systems as required. Appropriate signage would be determined during further design development. It is noted that traffic coming from Seaforth would be more likely to access the Balgowlah connection to the Beaches Link tunnel (this is 3.5 kilometres from the northern extent of Seaforth), rather than choosing to carry out a minimum 5.5 kilometre trip up and down Wakehurst Parkway to access the Wakehurst Parkway connection. As such, it is considered unlikely that drivers would carry out a U-turn at Wakehurst Parkway/Aquatic Drive intersection to enter the tunnels.

B11.8.15 Regionally significant transport infrastructure items

Issue raised

Pages 19, 43

Traffic using the portal on Wakehurst Parkway would create widespread changes to travel patterns across the local road network. Northern Beaches Council is of the view that additional capacity is required at key intersections in Frenchs Forest and surrounds to cater for the reallocation of flows and to manage the interaction with other routes.

Council welcomes an opportunity to leverage off the project by including funding towards upgrades to periphery roads and property acquisitions identified in Council's *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a) and the Department of Planning, Industry and Environment's *Draft Frenchs Forest 2041 Place Strategy* (NSW DPIE, 2021a).

Council has identified six regionally significant transport infrastructure items that require funding and would like these to be addressed as either part of the project or as a stand-alone support project, to enable further improvement of travel time across the road network to support freight, public transport and general traffic movements across the Northern Beaches:

1. Implementation of a linear bus interchange across Warringah Road at Frenchs Forest: To assist in the facilitation of the delivery of a future east-west bus rapid transit system from Chatswood to Dee Why and provide a cohesive connection point between local services, rapid bus services, and the potential for redirected services using the Beaches Link and Gore Hill Connection to connect the Northern Beaches with the CBD, North Sydney and Macquarie Park
2. Road widening at Frenchs Forest Road West/Naree Road from Bluegum Crescent to Forest Way: to provide local bus access to the linear bus interchange between the existing bus lane opposite Bluegum Crescent to Rabbett Street, with a dedicated 24-hour bus lane and an additional lane between Rabbett Street and Forest Way, to create additional capacity for traffic from the Wakehurst Parkway tunnel and Frenchs Forest Road (West) heading north along Forest Way

3. Road widening at Forest Way between Russell Avenue and Wareham Reserve: to improve the through-flow of the Forest Way and Naree Road intersection, additional capacity is required to allow a dedicated left turn lane into Naree Road
4. Upgrades to Grace Avenue and extension of Naree Road: to allow additional traffic capacity from the west of the Frenchs Forest area, including Davidson and Forestville, and to allow the full potential of the upgraded road network to be realised by allowing traffic to move efficiently through both the primary and secondary road network
5. Traffic Signal upgrades at several intersections along the secondary access route from the north-western approach:
   - Forest Way/Naree Road: To clear the pinch point intersection on the Forest Way and provide peak hour capacity along both Forest Way and Naree Road
   - Naree Road/Grace Avenue: This intersection mentioned in the *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a) can function as a roundabout, however, additional loading of the traffic heading to the project tunnel would need to be actively managed and signals at this location would provide that capacity
   - Frenchs Forest Road West/Sylvia Place: Provision of signals at this location are required towards the end of Stage 1 redevelopment of Frenchs Forest Town Centre and prior to any redevelopment in either Stage 2 or 3. By bringing this work forward, it would allow the network to be in the planned final arrangement and not affect the traffic flow via the Beaches Link when construction is underway
6. Additional bus infrastructure at Frenchs Forest Road East: construction of indented bus bays along Frenchs Forest Road East, especially along the westbound side of the carriageway, would provide better traffic flow along this secondary corridor, providing the opportunity for express buses to clear all stop services using the intermediate stops.

Council has also recommended the widening of the Wakehurst Parkway north of Frenchs Forest Road East. Traffic modelling suggests this section of road would suffer from increased travel times and delays and measures to offset these impacts must be explored.

Council noted that land acquisition may be required to facilitate the above works.

Response

The additional works suggested by Northern Beaches Council are out of scope for the Beaches Link and Gore Hill Freeway Connection project. It is noted that these suggested works are not related to Beaches Link integration issues; rather they appear to be targeted at local traffic and transport issues, including those associated with the proposed development of the Northern Beaches Hospital Precinct. As such, it is considered that these scope items may be better suited for inclusion as enabling infrastructure and services required for the *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a). Council should continue to collaborate with Transport for NSW on issues in the Frenchs Forest area through the *Northern Beaches Hospital Precinct Structure Plan* planning process.

Notwithstanding this, further traffic analysis and modelling has been carried out for the preferred infrastructure report (refer to Section 6.3 of the preferred infrastructure report). As noted in the response to Section B11.4.3, this analysis recommends that road network performance would be more appropriately managed through complementary and integrated public transport and other demand management initiatives (which are beyond the scope of the Beaches Link and Gore Hill Freeway Connection project), before investing in further road capacity upgrades. This underlines the importance of NSW Government and Council continuing to work in collaboration to develop integrated, multi-modal transport solutions which will reduce car dependence, and consequently enable and accommodate the desired growth in Frenchs Forest and surrounds.

B11.8.16 Pedestrian crossings of Sydney Road

Issue raised

Page 16

Northern Beaches Council is concerned that the intersection of Maretimo Street, Sydney Road and the new access road in Balgowlah would not provide a signal controlled pedestrian crossing across Sydney Road while the existing pedestrian bridge across Sydney Road would remain in use.

Response

The new signalised intersection at the southern end of the new access road to accommodate its connection with Sydney Road is discussed in Section 9.4.5 of the environmental impact statement. The new intersection would include a pedestrian crossing across the new access road on the northern side of Sydney Road. Pedestrian connectivity between the new open space and recreation facilities, the Northern Beaches Secondary College Balgowlah Boys Campus and Maretimo Street would be provided via the existing pedestrian bridge to the west of the new access road and would continue to provide north-south connectivity for pedestrians in the area. Additional pedestrian connectivity across Sydney Road to and from Maretimo Street would not be provided at the intersection and is not considered required with the retention of the existing Sydney Road pedestrian bridge.

B11.9 Construction noise and vibration

B11.9.1 Adequacy and accuracy – heavy vehicle movements

Issue raised

Page 13

Northern Beaches Council is of the view the environmental impact statement does not provide adequate information about the potential noise impacts that would result from additional heavy vehicle movements along Sydney Road and Frenchs Forest Road through the Seaforth Village (Seaforth Centre), residential areas and beyond Seaforth Public School.

Response

Potential noise impacts due to the movement of heavy vehicles during construction of the project in Balgowlah, Seaforth and surrounding areas are described in Section 10.6.10 and Section 10.6.11 of the environmental impact statement and further detailed in Section 5.9.3 and Section 5.10.3 of Appendix G (Technical working paper: Noise and vibration).

Construction vehicle movements associated with the Balgowlah surface road works and works at the Balgowlah Golf Course construction support site (BL10) are unlikely to increase road traffic noise levels by more than 2 dB(A) during the day and night time periods, which is likely to be barely perceptible to surrounding sensitive receivers, and complies with road traffic noise criteria specified in the *NSW Road Noise Policy* (Department of Environment, Climate Change and Water (DECCW), 2011b). In addition, night time truck movements generated by the Balgowlah Golf Course construction support site (BL10) would be small compared to existing heavy vehicle numbers on Sydney Road and Burnt Bridge Creek Deviation, therefore the number of maximum noise events that could disturb sleep are not likely to substantially increase.

Temporary construction support sites and haulage routes have been selected to minimise the use of local roads where possible. To limit impacts to the Seaforth Centre, tunnel spoil haulage from the Wakehurst Parkway east (BL13) construction support site would travel north along Wakehurst

Parkway so as to avoid Sydney Road and potential impacts to the Seaforth Centre. Similarly, tunnel spoil haulage from the Balgowlah Golf Course construction support site (BL10) would travel south along Manly Road/Spit Road/Military Road so as to avoid Sydney Road west of Burnt Bridge Deviation and potential impacts to the Seaforth Centre (refer to Figure 5-21 of Appendix F (Technical working paper: Traffic and transport)).

Unless compliance with the relevant traffic noise criteria can be achieved or alternative arrangements have been agreed with affected receivers, construction vehicle movements will not occur on local roads beyond those required for direct access to construction sites as required by environmental management measure CNV6 (refer to Table D2-1 of this submissions report). Project-related heavy vehicle routes and any associated restrictions of use would be documented in a traffic management plan as part of the construction environmental management plan (see Section D1 of this submissions report for further discussion).

In addition, a construction noise and vibration management plan will be developed in accordance with the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a) and implemented for the duration of construction of the project, as required by revised environmental management measure CNV1 in Table D2-1 of this submissions report. This will include measures to minimise impacts from noise and vibration, including from construction traffic, during construction. Further detail on the key issues to be addressed by the construction noise and vibration management plan are provided in Table D1-1 of this submissions report.

B11.9.2 Adequacy and accuracy – noise, vibration and ground-borne noise impacts

Issue raised

Page 20

Northern Beaches Council recommends the potential impacts of construction noise, vibration and ground-borne noise be assessed in residential areas near the project.

Although Council acknowledges some noise impacts during construction may be mitigated by the acoustic sheds, Council is concerned that construction noise impacts would be experienced by a much wider area due to the scale of the project, location of the surface works, movement of heavy vehicles out of normal peak traffic periods and movement of machinery at the surface works areas.

Response

The potential impacts of construction noise and vibration, including ground-borne noise, in residential areas near the project are discussed in Section 10.6 of the environmental impact statement with further detail provided in Section 5 of Appendix G (Technical working paper: Noise and vibration). The assessment considered the potential impacts of construction noise, vibration and ground-borne noise in residential areas near the project. The residential areas in the Northern Beaches local government area considered as part of the assessment are included in Figure 10-4 and Figure 10-5 of the environmental impact statement.

The assessment of construction noise and vibration impacts of the project (provided in Appendix G (Technical working paper: Noise and vibration)) has been carried out per industry standards and guidelines, including the *Interim Construction Noise Guideline* (Department of Environment and Climate Change (DECC), 2009), *NSW Road Noise Policy* (DECCW, 2011b), A*ssessing Vibration: A technical guideline* (Department of Environment and Conservation (DEC), 2006c) and Australian criteria for blasting (Australian Standard *AS 2187.2-2006 Explosives: Storage and Use – Part 2 Use of Explosives* (Standards Australia, 2006)), and is in accordance with the Secretary's environmental assessment requirements issued for the project (refer to Table 10-1 of the environmental impact statement).

Sensitive receivers that may potentially be affected by construction noise and vibration from temporary construction support sites, construction sites and haulage routes were identified by the acoustic specialist from aerial photography and visual inspections, taking into consideration the construction stages and activities, construction footprint, haulage routes, reasonable worst case construction plant and equipment that would be used, topographical and manmade features, construction working hours, other construction projects in the vicinity of the project and past experience of potential noise impacts of similar projects. Identified sensitive receivers included residential receivers both near and further away from the project footprint.

Potential construction ground-borne noise and vibration impacts were considered and mitigated during project development, with design refinements in the Balgowlah/Seaforth area resulting in adjusted tunnel alignments which eliminated low cover tunnelling under multiple Hope Street residential properties, as outlined in Section 4.5.5 of the environmental impact statement. This revised tunnel portal location ensures that the tunnel excavation levels are deeper in the Seaforth area and reduce potential vibration and ground-borne noise impacts.

In addition, general and site specific feasible and reasonable environmental management measures have been developed to minimise potential construction noise and vibration impacts and will be implemented, as outlined in Table D2-1 of this submissions report. These measures include the preparation of location and activity specific construction noise and vibration impact statements (refer to environmental management measure CNV2), developing an out of hours work protocol (refer to revised environmental management measure CNV3), implementing shoulder periods where appropriate and where a road occupancy licence is approved by Greater Sydney Operations for the works (if required) (refer to revised environmental management measure CNV4), monitoring noise and vibration impacts throughout construction (refer to environmental management measure CNV5), specific measures to be implemented during surface road works and minimising heavy vehicle movements outside standard construction hours where feasible and reasonable (refer to revised environmental management measure CNV9), replacing existing noise barriers as soon as possible (refer to environmental management measure CNV11) and minimising cumulative impacts (refer to environmental management measure CNV13).

As noted in the response above, a construction noise and vibration management plan will be developed in accordance with the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a) and implemented for the duration of construction, as required by revised environmental management measure CNV1 in Table D2-1 of this submissions report. The construction noise and vibration management plan would provide further detail on the implementation of the above mentioned environmental management measures. Further detail on the key issues to be addressed by the construction noise and vibration management plan are provided in Table D1-1 of this submissions report.

B11.9.3 Adequacy and accuracy – vibration and ground-borne noise assessment

Issue raised

Page 20

Northern Beaches Council is of the view the combined impact of construction vibration and ground-borne noise should be considered together since residential receivers are unlikely to identify and differentiate between their impacts.

Response

The assessment of vibration and ground-borne noise impacts from construction of the project was carried out in accordance with industry standards and guidelines, including the *Interim Construction*

Noise Guideline (DECC, 2009), *NSW Road Noise Policy* (DECCW, 2011b), A*ssessing Vibration: A technical guideline* (DEC, 2006c) and Australian criteria for blasting (Australian Standard *AS 2187.2-2006 Explosives: Storage and Use – Part 2 Use of Explosives* (Standards Australia, 2006)), and with the Secretary's environmental assessment requirements issued for the project (refer to Table 10-1 of the environmental impact statement).

Although impacts from vibration and ground-borne noise were assessed independently of each other, Transport for NSW understands some residential receivers may find these impacts difficult to differentiate. To assist the community with differentiating between and understanding these impacts the project would implement the community consultation framework (provided in Appendix E), including providing the community with information specifically on tunnelling, an interactive online map to see the tunnel alignment and regular updates on the progress of tunnel construction. Environmental management measures have been identified to address both vibration and ground-borne noise impacts, as outlined in Table D2-1 of this submissions report, and they would be implemented to minimise both construction vibration and ground-borne noise impacts, regardless of whether these are experienced concurrently or independently.

B11.9.4 Concerns over impacts from blasting

Issue raised

Pages 20, 21

While the use of blasting underground was generally foreseen, Northern Beaches Council is not supportive of the requirement for blasting along Wakehurst Parkway due to potential impacts on the community and environment. Council recommends the use of suitable alternative excavation processes for all near surface works where feasible.

Council notes that underground controlled blasting may reduce the amount of rock hammering activity required in these locations to complete the excavation works within the mainline and ramp tunnels.

Response

Controlled blasting may be carried out in hard sandstone cutting areas along Wakehurst Parkway to avoid the need to use vibration and noise intensive excavation methods, such as rock hammers for long durations (refer to Section 10.6.2 and Section 10.6.15 of the environmental impact statement). The use of blasting as an alternative methodology to rock hammering has the potential to minimise the duration of excavation, reducing noise and vibration exposure periods and shorten the overall duration of works in the area.

The potential impacts of blasting on the community, building structures and fauna are outlined in Section 10.6.2 and Section 10.6.15 of the environmental impact statement and Section 5.2 of Appendix S (Technical working paper: Biodiversity Development Assessment Report). The two main impacts from blasting are overpressure, travelling as an airwave causing a vibration response in structures such as buildings, and vibration transmitted through the ground that surrounds the blast. Overpressure and ground vibration have the potential to cause discomfort or annoyance to sensitive receivers and fauna near the blast area, and at high levels have the potential to cause damage to building structures. Fauna inhabiting vegetation and rocky habitat adjacent to Wakehurst Parkway, such as the threatened Large-eared Pied Bat, may also be impacted by elevated noise from blasting through changes to their behaviour and impacts on their physiology. Subject to further design development and approval of the project by the Department of Planning, Industry and Environment, a range of mitigation and management measures will be implemented to minimise the impacts of controlled blasting along Wakehurst Parkway on the community and environment.

Areas likely to require controlled blasting would be confirmed during further design development. Where controlled blasting is proposed, overpressure and vibration levels will be predicted during the blasting design, where appropriate test blasts will be used to develop site rules and confirm blast charges and configurations to achieve the objectives and criteria identified in Australian Standard *AS 2187.2-2006 Explosives: Storage and Use – Part 2 Use of Explosives* (Standards Australia, 2006), as required by revised environmental management measure CNV12 (refer to Table D2-1 of this submissions report). All blasting and associated activities will be carried out in a manner that does not generate unacceptable overpressure and vibration impacts or pose a significant risk to nearby structures and sensitive receivers. Monitoring will occur to determine compliance with the relevant criteria, and the site-specific laws will be adjusted as required based on the monitoring results to ensure ongoing compliance.

Prior to any blasting, all potentially affected sensitive receivers and features in the vicinity will be identified and the potentially affected community will be kept informed of proposed blasting activities (refer to revised environmental management measure CNV12 in Table D2-1 of this submissions report). Controlled blasts would not take place during peak hour traffic periods and not on Sundays or public holidays, as stated in Section 6.9.1 of the environmental impact statement. Traffic near the area would be stopped while the controlled blast is initiated and delays of up to 10 minutes may be experienced. Traffic control measures and advanced signage would be in place to notify vehicles using Wakehurst Parkway of any proposed controlled blasting.

Activity-specific controls will also be developed to manage impacts from controlled blasting on the Large-eared Pied Bat and other fauna along Wakehurst Parkway, in accordance with environmental management measures B7 and B21 in Table D2-1 of this submissions report. The controls to mitigate impacts on the Large-eared Pied Bat will be prepared in consultation with a suitably qualified and experienced microbat specialist and implemented during surface road works as required.

Transport for NSW acknowledges Northern Beaches Council's observation that underground controlled blasting may reduce the amount of rock hammering activity required within the mainline and ramp tunnels.

B11.9.5 Management of ground-borne noise

Issue raised

Page 20

Northern Beaches Council is concerned about the number of properties in Seaforth and Clontarf that will be exposed to ground-borne noise levels above the noise management levels during underground rock hammering activities.

Response

The number of buildings potentially exposed to ground-borne noise levels that exceed either the night time ground-borne noise management level of 35 dB(A) or the evening ground-borne noise management level of 40 dB(A), are shown in Table 10-8 of the environmental impact statement. The predictions for the use of rock hammers in the tunnel show the following:

- Up to 531 residential receivers could be exposed to ground-borne noise levels above 45 dB(A). The potentially affected residential receivers are mainly within Seaforth and in particular Noise Catchment Area (NCA) 53.3 (north of Frenchs Forest Road)
- Eight other sensitive receiver buildings could be ground-borne noise affected (ie above the ground-borne noise management level)

- 16 commercial buildings could be ground-borne noise affected during rock hammer tunnelling activities.

The number of buildings potentially exposed to ground-borne noise above the noise management levels during rock hammering are based on the peak noise levels that a receiver building would be exposed to when the rock hammering is carried out at the closest point to the property.

While Table 10-8 of the environmental impact statement indicates that 17 residential receivers in NCA 46.1 would potentially be impacted by ground-borne noise from roadheader rock hammer tunnelling, all of these receivers are located in Balgowlah, as shown in Annexure J.2 of Appendix G (Technical working paper: Noise and vibration). No receivers within Clontarf would be impacted. As NCA 46.1 extends over both Clontarf and Balgowlah, Annexure B.2 of Appendix G (Technical working paper: Noise and vibration) should be updated to include both Clontarf and Balgowlah as the reference suburbs for NCA 46.1. The impacted suburb in NCA 46.1 in Table 10-8 of the environmental impact statement should also include Balgowlah. A clarification has been included in Table A5-13 of Part A of this submissions report regarding this amendment. This clarification does not change the outcome of the assessment provided in the environmental impact statement.

The environmental management measures, outlined in Table D2-1 of this submissions report, will be implemented to minimise ground-borne noise impacts. Rock hammering work has greater scope to be programmed outside evening and night time periods, where feasible and reasonable, to avoid or reduce ground-borne noise impacts during those more sensitive periods. Where rock hammers are required to carry out subsurface excavations that leave exposed rock requiring ground support, there is potential that some rock hammering may be required outside standard construction hours to minimise any potential for ground movement and for the safety of the workforce underground. Such occurrences are not anticipated to be required frequently.

Where ground-borne noise levels are predicted to exceed the relevant noise management levels, alternative construction techniques and equipment that are likely to generate less ground-borne noise will be investigated and used where feasible and reasonable (refer to environmental management measure CNV8 in Table D2-1 of this submissions report).

B11.9.6 Environmental management measures – general

Issue raised

Page 20

Northern Beaches Council recommends the implementation of substantial mitigation measures, in accordance with the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a), the conditions of approval for the project and/or any environment protection licence, to manage the impact of construction noise and vibration from surface works, tunnelling and marine construction activities proposed for the project.

Council also recommends compiling a register of sensitive receiver locations.

Response

Northern Beaches Council's recommendations to implement mitigation measures to manage the impact of construction noise and vibration from surface works, tunnelling and marine construction activities are noted.

As part of the construction noise assessment process, feasible and reasonable noise treatment measures and management methods have been identified based on the preliminary site layouts and the reasonable worst case plant/equipment operating scenarios, to assist in attenuating and managing noise emissions from the construction activities. Step 4 of Figure 4-1 of Appendix G

(Technical working paper: Noise and vibration) outlines the process that has been applied for the construction noise assessment.

For temporary construction support sites, feasible and reasonable noise treatment measures have been identified and included in the noise model and are presented in Section 5 of Appendix G (Technical working paper: Noise and vibration), eg Table 5-135 provides the management and noise treatment measures applied to the Balgowlah Golf Course construction support site (BL10). These measures have been adopted in the modelling and resulting noise predictions. The predicted noise impacts provided in Section 10.6 of the environmental impact statement are considered to be the residual impacts after feasible and reasonable noise treatment measures are implemented.

Where construction activities occur outside the temporary construction support sites, it is not often possible to meaningfully reduce the magnitude of noise levels at affected receivers (residual noise). In these cases, the management of potential noise impacts must focus on appropriate scheduling, timing and the duration of potentially noisy activities so that affected receivers are provided with appropriate respite. This approach is documented in the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a) and included in revised environment management CNV9 (refer to Table D2-1 of this submissions report).

Following the appointment of a construction contractor/s the temporary construction support site layouts, equipment, construction methods and/or construction hours would be refined during further design development and construction planning. As such, the final details for noise treatments and management measures will be confirmed during further design development and construction planning to determine what is feasible and reasonable, with consideration of cumulative and consecutive construction impacts. This commitment is included in environmental management measure CNV2 (refer to Table D2-1 of this submissions report).

In addition to the above, Table D2-1 of this submissions report outlines the environmental management measures that will be implemented to minimise construction noise and vibration impacts at sensitive receivers. These measures will be included in the construction noise and vibration management plan prepared for the project as required by revised environmental management measure CNV1 (refer to Table D2-1 of this submissions report). This plan will:

- Identify relevant criteria and management levels in relation to noise and vibration
- Identify noise and vibration sensitive receivers and features in the vicinity of the project
- Include standard and additional mitigation from the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a) and detail how and when these will be applied in the project
- Describe the approach that will be adopted for carrying out location and activity specific construction noise and vibration impact assessments to assist with designing and selecting appropriate mitigation and management measures
- Include protocols that will be adopted to manage works required outside standard construction hours eg at temporary tunnelling construction support sites there would be no spoil haulage outside standard construction hours, and only occasional concrete truck deliveries which would be required to ensure ground support installation is completed safely
- Detail the methodology and approach for managing construction noise impacts
- Detail the process for managing construction vibration, including for heritage structures, considering all types of vibration generating works, including blasting
- Outline the approach for identifying and managing potential cumulative impacts, including ensuring appropriate respite for works outside standard construction hours

- Outline the procedures and approach for noise and vibration monitoring to be carried out to confirm construction noise and vibration levels in relation to noise and vibration management levels
- Detail how construction noise impacts from concurrent or consecutive nearby construction works associated with the project will be managed where feasible and reasonable.

Further detail on the key issues to be addressed by the construction noise and vibration management plan are provided in Table D1-1 of this submissions report, including the list of guidelines that would be used to guide its preparation.

Furthermore, to further mitigate construction noise from works outside standard construction hours, noise treatments would be proactively implemented at eligible properties adjacent to the project as early as possible in the construction program as outlined in Appendix I of this submissions report.

Locations of sensitive receivers that may be impacted by noise and vibration from construction of the project are shown in Figure 10-2 to Figure 10-5 of the environmental impact statement with further detail provided in Section B.1 of Annexure B of Appendix G (Technical working paper: Noise and vibration). Further identification and/or refinement of sensitive receiver locations will be considered during preparation of the construction noise and vibration management plan required by revised environmental management measure CNV1 (refer to Table D2-1 of this submissions report).

B11.9.7 Environmental management measures – out of hours work

Issue raised

Page 20

Northern Beaches Council has no objection to night works, as long as normal industry practice and standard environmental licencing conditions are applied (eg no more than two consecutive nights in any noise catchment area unless an agreement is reached with the community) and the use of alternate accommodation is available for those immediately affected.

Response

Work outside standard construction hours will be managed through the preparation and implementation of the construction noise and vibration management plan and detailed construction noise and vibration impact statements as required by environmental management measures CNV1 and CNV2 (refer to Table D2-1 of this submissions report). In addition, an out of hours works protocol will be developed for the construction of the project, in accordance with revised environmental management measure CNV3 in Table D2-1 of this submissions report. The protocol will include:

- Details of works required outside standard construction hours and justifications of why the works are required outside standard construction hours
- The noise and vibration impact assessment processes that will be followed to identify potentially affected receivers and clarify potential impacts
- Mitigation and management measures that are to be considered and implemented where appropriate to manage potential impacts associated with works outside standard construction hours
- Details of the approval process (internal and external) for works proposed outside standard construction hours.

The protocol will be prepared in consultation with the Department of Planning, Industry and Environment and NSW Environment Protection Authority and will be implemented during the duration of construction.

Guidelines such as the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a) and the *Interim Construction Noise Guideline* (DECC, 2009) would be followed in preparing the above management documents, including the use of respite periods and alternative accommodation to mitigate noise and vibration impacts.

It should be noted that works outside of standard construction hours, which result in an $L_{Aeq(15\ minute)}$ noise level more than 5 dB(A) above the rating background level (in accordance with the *Interim Construction Noise Guideline* (DECC, 2009), are generally proposed to be limited to two consecutive nights per week, three non-consecutive nights per week, and 10 nights per month at any one sensitive receiver. Situations when this might not occur include following future community consultation on scheduling preferences, closures of major arterial roads or when approved through an environment protection licence.

In addition, communication and/or management strategies regarding out of hours work and noise and vibration mitigation would be prepared and included in the community communication strategy, as outlined in Section 7 of Appendix E (Community consultation framework). This strategy would detail consultation with residents and businesses near work sites to identify and address noise and vibration issues, as well as procedures for notifying residents about out of hours works and construction activities likely to cause noticeable noise and vibration.

B11.10 Operational noise and vibration

B11.10.1 Operational noise impacts

Issue raised

Page 21

Northern Beaches Council is of the view that the key contributors to the soundscape of local areas would be operational noise from fixed facilities, such as ventilation outlets, mechanical plant and wastewater and electrical plant, as well as road traffic noise at the tunnel portals.

Council notes that the project will have an overall positive impact on operational traffic noise, with only some areas receiving increased background levels.

Response

Operational fixed facilities

Noise from fixed facilities and ancillary infrastructure associated with the operation of the project would include motorway facilities and ventilation outlets, a motorway control centre, tunnel support facilities, and groundwater and tunnel drainage management and treatment systems including a wastewater treatment plant located at Gore Hill Freeway.

Noise levels from operational fixed facilities were assessed in accordance with *Noise Policy for Industry* (NSW Environment Protection Authority (EPA), 2017), which includes both intrusiveness and amenity criteria. No criteria exceedances of relevant criteria are predicted. The results from the assessment are provided in in Section 11.5.5 of the environmental impact statement with further detail included in Section 7.4 of Appendix G (Technical working paper: Noise and vibration).

Notwithstanding the noise assessment findings, operational fixed facilities will be designed to meet project specific noise criteria derived in accordance with the *Noise Policy for Industry* (NSW EPA, 2017) as required by environmental management measure ONV4 (refer to Table D2-1 of this submissions report). This requirement would ensure potential impacts are minimised.

Road traffic noise at the tunnel portals

The key contributor to the soundscape of local areas during operation of the project would be road traffic noise, with four per cent of receiver buildings predicted to experience exceedances in noise criteria, ie increases of 2 dB(A) or more (before mitigation), due to the project, as shown in Section 11.5.2 of the environmental impact statement and Section 7.1 of Appendix G (Technical working paper: Noise and vibration). The noise assessment indicates that road traffic noise levels would exceed noise criteria during the day and night periods in certain locations in the noise catchment areas surrounding Balgowlah, Seaforth, North Balgowlah, Killarney Heights, Allambie Heights and Frenchs Forest. This is due to predicted increases in traffic volumes and redistributed traffic on local roads associated with vehicles entering and exiting the tunnel portals at Killarney Heights and Balgowlah. In the absence of additional traffic calming measures, the following local roads are predicted to be impacted:

- Traffic volumes during the night period along Wanganella Street at Balgowlah are forecast to potentially increase and therefore potentially increase noise levels by more than 2 dB(A), which could result in exceedances of the road traffic noise criteria
- Traffic volumes during the night period along Judith Street at Seaforth and Woodbine Street at North Balgowlah are forecast to potentially increase and therefore potentially increase noise levels by more than 2 dB(A), which could result in exceedances of the road traffic noise criteria.

With the exception of Wakehurst Parkway at Frenchs Forest and local roads indicated above, the majority of properties that are eligible for consideration of noise mitigation beyond the adoption of road design and traffic management measures (refer to Section 11.3.3 of the environmental impact statement) are due to predicted exceedances of the cumulative limit and acute noise levels, rather than increases due to the project. This indicates that existing road traffic noise levels are the main driver for additional noise mitigation, rather than changes due to the project.

The suggestion by Council that road traffic noise at the tunnel portals is a key contributor to the soundscape of local areas is not supported by the operational road traffic noise assessment. Noise catchment areas (NCAs) in the vicinity of tunnel portals Burnt Bridge Creek Deviation and Wakehurst Parkway include NCA 49.1 and NCA 54.1 respectively. These two locations account for 43 of the 247 receivers potentially eligible for consideration of at-property treatment. However, 29 of the receivers potentially eligible for consideration of at-property treatment within NCA 54.1 are not subject to noise levels at the tunnel portals but are subject to consideration due to traffic volumes during the night period along Judith Street at Seaforth and Woodbine Street at North Balgowlah being forecast to increase noise levels by more than 2 dB(A). To manage this potential impact, traffic calming measures within the project area in Balgowlah, North Balgowlah and Seaforth where predicted increases in traffic are likely to result in exceedances of the relevant road traffic noise criteria will be investigated and implemented in consultation with Northern Beaches Council with the aim of limiting potential road traffic noise increases to no more than 2 dB(A) (refer to revised environmental management measure ONV3 in Table D2-1 of this submissions report). The need for at-property treatments will be confirmed during further design development and will consider the potential impact of the proposed traffic calming measures on traffic volumes and speeds.

Additionally, the operational noise performance of the project will be reviewed during further design development and functionally appropriate operational noise mitigation (quieter pavements eg open grade asphalt where functionally appropriate, noise barriers, at-property treatments or a combination of treatments) will be confirmed in accordance with *NSW Road Noise Policy* (DECCW, 2011b), *Noise Criteria Guideline* (Roads and Maritime Services, 2015a) and *Noise Mitigation Guideline* (Roads and Maritime Services, 2015b), as required by environmental management measure ONV1 (provided in Table D2-1 of this submissions report).

Within 12 months of the commencement of the operation of the project, actual operational noise performance will be compared to predicted operational noise performance (as reviewed during

detailed design), as per environmental management measure ONV2 (refer to Table D2-1 of this submissions report). Additional reasonable and feasible mitigation will be considered where any additional receivers are identified as qualifying for consideration of noise mitigation under the *Noise Mitigation Guideline* (Roads and Maritime Services, 2015b).

B11.10.2 Operational vibration impacts

Issue raised

Pages 21, 22

Northern Beaches Council notes that relevant criteria have been used for the operational noise assessment and that the potential for operational ground-borne noise and vibration has been designed out of the project and is not expected to exceed acceptable levels.

Section 11.7 of the environmental impact statement states that vehicles operating on a roadway are unlikely to cause a perceptible level of vibration unless there are significant road irregularities (eg potholes), particularly if the affected receiver is more than 20 metres from the roadway. Council notes that receivers are located within 20 metres of the project footprint along Sydney Road in Balgowlah and between Bantry Bay Road and Wakehurst Parkway in Frenchs Forest.

Response

While it is acknowledged that Section 11.7 of the environmental impact statement describes the potential for operational vibration if significant road irregularities exist, it also states that '*As the new and upgraded roads on the surface and in the tunnels associated with the project would be designed and constructed to avoid road irregularities, operational ground-borne noise and tactile vibration impacts from operation traffic are not expected*'.

As such, operational ground-borne noise and tactile vibration impacts from operational traffic are not expected.

B11.10.3 Environmental management measures – operational fixed facilities

Issue raised

Page 21

The operational fixed facilities are anticipated to operate for 24 hours a day, seven days a week. Northern Beaches Council notes that adequate noise assessment, acoustic treatment and the selection of appropriate plant would be important to maintain residential amenity. Council recommends installing lower sound power level equipment at operational fixed facilities and implementing appropriate noise mitigation measures to achieve a 5 dB(A) reduction in the recommended amenity noise level at the nearest residential receivers, as per the amenity noise levels in *Noise Policy for Industry* (NSW EPA, 2017).

Response

As discussed above in Section B11.10.1, the assessment of potential noise impacts of operational fixed facilities did not identify any exceedances of noise criteria, as specified by the *Noise Policy for Industry* (NSW EPA, 2017) which includes both intrusiveness and amenity criteria.

The operational facilities will be designed to meet project specific noise criteria derived in accordance with the *Noise Policy for Industry* (NSW EPA, 2017) (refer to environmental management measure ONV4 in Table D2-1 of this submissions report).

B11.10.4 Environmental management measures – road traffic noise

Issue raised

Page 21

Northern Beaches Council states that noise barriers for the project appear to be suitable and supports additional noise mitigation, in the form of architectural property treatment, proposed for the project. Council recommends the development of a framework to list appropriate acoustic controls to be installed and identify properties that would be considered for at-property treatment (ie receivers predicted to experience traffic noise level increases of more than 2 dB(A) due to operational road traffic volume increases).

Response

Northern Beaches Council's support for the project proposed noise barriers and additional noise mitigation in the form of at-property treatment is noted.

Receivers to be considered for at-property treatment after the potential benefits of quieter pavements (where functionally appropriate) and new and existing retained noise barriers have been included are identified in Table 11-9 of the environmental impact. Locations and details of the receiver buildings are further described in Annexure R of Appendix G (Technical working paper: Noise and vibration). Please note that the number of receivers considered for at-property treatment would be subject to further design development and confirmation of all proposed mitigation measures, and would be based on the resultant predicted road traffic noise levels.

Further noise modelling will be carried out during further design development to confirm the final noise barrier arrangements and the receivers that are eligible for consideration for at-property treatments as required by environmental management measure ONV1 (refer to Table D2-1 of this submissions report). Feasible and reasonable environmental management measures would be considered for each of the eligible receivers in accordance with the *NSW Road Noise Policy* (DECCW, 2011), *Noise Criteria Guideline* (Roads and Maritime Services, 2015a) and *Noise Mitigation Guideline* (Roads and Maritime Services, 2015b). In addition, the need for at-property treatments will consider the potential impact of proposed traffic calming measures on traffic volumes and speeds as required by revised environmental management measure ONV3 (refer to Table D2-1 of this submissions report). The owners of properties that are eligible for at-property treatments will be provided with a copy of all guidelines and procedures that will be used to determine at-property treatment for their property, in accordance with new environmental management measure ONV6 (refer to Table D2-1 of this submissions report).

Within 12 months of the commencement of the operation of the project, actual operational noise performance will be compared to predicted operational noise performance (as reviewed during detailed design), as per environmental management measure ONV2 (refer to Table D2-1 of this submissions report). Additional reasonable and feasible mitigation will be considered where any additional receivers are identified as qualifying for consideration of noise mitigation under the *Noise Mitigation Guideline* (Roads and Maritime Services, 2015b).

B11.11 Air quality

B11.11.1 Construction air quality management – general

Issue raised

Page 22

Northern Beaches Council recommends the environmental management measures implemented prior to and during construction should comply with Council's standard air and odour conditions.

Response

Best management practice construction air quality mitigation and management measures will be implemented during construction and outlined in the air quality management plan (to be developed as detailed in Table D1-1 of this submissions report). The air quality management plan will also be supplemented by the requirements of the environment protection licence issued for the project and conditions of approval set by the Department of Planning, Industry and Environment, should the project be approved. Environmental management measures that will be included in the air quality management plan include but are not limited to (refer to Table D2-1 of this submissions report):

- Dust suppression and/or management measures where appropriate (revised environmental management measure AQ1)
- Selection of construction equipment and/or materials handling techniques that minimise the potential for dust generation (revised environmental management measure AQ1)
- Management measures to minimise dust generation during the transfer, handling and on site storage of spoil and construction materials (revised environmental management measure AQ1)
- Adjustment or management of dust generating activities during unfavourable weather conditions, where appropriate (revised environmental management measure AQ1)
- Minimisation of exposed areas during construction (revised environmental management measure AQ1)
- Measures for managing odour generation likely to result in odour impacts at sensitive receivers in the vicinity during the disturbance, handling and storage of potentially odorous materials, including any contingency measures (revised environmental management measure AQ1)
- Internal project communication protocols to ensure dust-generating activities in the same area are coordinated and mitigated to manage cumulative dust impacts of the project (revised environmental management measure AQ1)
- Site inspections to monitor the effectiveness of implemented measures and identify any additional measures to be implemented (revised environmental management measure AQ1)
- Regular maintenance of construction vehicles and plant to ensure compliance with relevant emissions standards (revised environmental management measure AQ1)
- Managing dust and air quality complaints and taking corrective actions where required (environmental management measure AQ3).

B11.11.2 Construction air quality management – dust on roads

Issue raised

Page 22

Northern Beaches Council recommends managing fine particle dust at the source since experience on previous road projects indicates that road sweepers do not address this issue adequately.

Response

Dust related impacts on receivers will be minimised through the implementation of best management practices during surface construction works, in accordance with environmental management measures AQ1 and SG9 in Table D2-1 of this submissions report. Practices will include:

- Dust suppression and/or management measures, including the use of water tanks and/ or carts, sprinklers, site exit controls (eg wheel washing systems and rumble grids), stabilisation of exposed areas or stockpiles and surface treatments where appropriate
- Erosion and sediment control measures will be implemented at all temporary construction support sites and surface road upgrades in accordance with the principles and requirements in *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004), *Managing Urban Stormwater: Soils and Construction - Volume 2D Main Road Construction* (DECC, 2008) and relevant guidelines, procedures and specifications of Transport for NSW
- Management measures to minimise dust generation during the transfer of spoil and construction materials (such as sand, aggregates or fine materials) (eg the covering of vehicle loads)
- Adjustment or management of dust generating activities during unfavourable weather conditions, where appropriate
- Minimisation of exposed areas during construction
- Site inspections will be carried out to monitor the effectiveness of implemented measures and identify any additional measures to be implemented.

These measures will be incorporated into the air quality management plan that will be prepared as a sub-plan to the construction environmental management plan for the project (refer to Table D1-1 of this submissions report). In addition, the monitoring and management of dust emissions during construction would be regulated under an environment protection licence.

B11.11.3 Communication and complaints

Issue raised

Page 22

Northern Beaches Council recommends that liaison/communication lines be established between the construction contractor/s, Transport for NSW, the Environmental Health division of Council and the appropriate regulatory authority to manage dust, odour and air quality complaints.

Response

Dust, odour and air quality impacts during construction will be minimised through the implementation of best management practice construction air quality mitigation and management measures detailed in revised environmental management measure AQ1 in Table D2-1 of this submissions report.

The community consultation framework provided in Appendix E provides the framework to engage and consult with the community and stakeholders on the project and to receive and respond to feedback during project delivery (refer to environmental management measure SE3 in Table D2-1 of this submissions report). Should the project be approved, the community consultation framework would be developed into a community communication strategy, that would describe in detail Transport for NSW's liaison and engagement process with stakeholders and consultation activities for the project development, delivery and operation.

Complaints regarding dust, odour and air quality impacts will be managed in accordance with the overarching complaints handling process for the project outlined in Section 3 of Appendix E (Community consultation framework) and environmental management measure AQ3 in Table D2-1 of this submissions report. The complaints management system would be developed and implemented before the start of construction and would establish and maintain a range of communication mediums to register complaints, including a toll free project hotline which would operate 24/7 during construction and continue for 12 months after the project opens. A complaints

and enquiry register would also be established to record the details, response and outcome of complaints and enquiries received. All complaints will be investigated and appropriate corrective actions, if required, will be taken to reduce emissions or odours in a timely manner.

B11.11.4 Operational air quality management

Issue raised

Page 22

Operational air quality management is still a concern for the community in Balgowlah and Seaforth. Northern Beaches Council noted there would be variations between tunnel emissions at Balgowlah and Seaforth and at Cammeray due to traffic heading southbound at Cammeray during the AM peak and traffic heading northbound at Balgowlah and Seaforth during the PM peak.

Council recommends further data collection on ambient vehicle emissions be carried out around the local catchments in Balgowlah and Seaforth prior to, during and after construction, to allow for a robust assessment of the approved ventilation systems and to allow the operator to provide additional filtration measures if required.

Response

The project tunnel infrastructure has been designed in such a way that the generation of pollutant emissions by traffic using the tunnel is minimised, as outlined in Section 12.7.2 of the environmental impact statement. Tunnel design provisions would include minimal gradients as far as reasonably practicable, a large tunnel cross-sectional area to reduce the pollutant concentration for a given emission into the tunnel volume and increased height of the tunnel to reduce the risk of incidents involving high vehicles blocking the tunnel and disrupting traffic.

In addition, the tunnel ventilation system has been designed and would be operated so it would be effective at maintaining local air quality and ensuring zero portal emissions. The ventilation system would be automatically controlled using real-time air velocity and air quality sensor data to ensure in-tunnel conditions are managed effectively in accordance with the agreed criteria. Furthermore, specific ventilation modes would be developed to manage breakdown, congested and emergency situations.

The project tunnel and its associated ventilation systems would be built and operated in compliance with any conditions of approval set by the Department of Planning, Industry and Environment, should the project be approved. The monitoring of ventilation outlet emissions during operation would be regulated under an environment protection licence prescribed under the *Protection of the Environment Operations Act 1997*.

During operation, air quality will be continuously monitored within the ventilation outlets and tunnel 24 hours a day. Real-time air quality data will be used to ensure air quality criteria are met and the data will be made publicly available on a dedicated webpage. In addition, ambient air quality monitoring will likely be carried out for 12 months before, and a set period of time, likely at least 24 months, after the tunnel opens to ensure air quality standards are met. Should the project be approved, it is likely conditions of approval will require the project establish an Air Quality Community Consultative Committee which would be comprised of representatives from Transport for NSW, local councils, the local community and the tunnel operator. The location of the ambient air quality monitors and the duration of monitoring would be informed by consultation with the committee.

Various operational measures will also be implemented to manage in-tunnel emissions and air quality, including traffic management, incident detection, public information and advice and cleaning the tunnel regularly to reduce concentrations of small particles.

B11.12 Human health

B11.12.1 Adequacy and accuracy

Issue raised

Page 13

Northern Beaches Council is of the view the environmental impact statement does not provide adequate information about the potential impacts on the wellbeing of children that would result from additional heavy vehicle movements along Sydney Road and Frenchs Forest Road through Seaforth Village (Seaforth Centre), residential areas and beyond Seaforth Public School.

Response

Additional heavy vehicle movements along Sydney Road and Frenchs Forest Road during construction and the potential for impacts on the wellbeing of the community, including children, has been considered in Chapter 13 (Human health) of the environmental impact statement and Appendix I (Technical working paper: Health impact assessment). Wellbeing impacts could result from increased exhaust emissions, increased noise from construction vehicles and potential safety risks if unmitigated.

The potential impact of increased exhaust emissions from construction vehicles on the health of the community is discussed in Section 13.4.1 of the environmental impact statement. Air quality impacts during construction from exhaust emissions would be minor and unlikely to have a noticeable impact on the surrounding environment, with the implementation of regular maintenance practices.

The potential impact of construction noise due to the movement of construction vehicles on the health of the community is discussed in Section 13.4.2 of the environmental impact statement, where potential increases in noise at sensitive receivers due to construction traffic have been assessed separately from other construction activities.

Temporary construction support sites have been configured for heavy vehicles involved in construction to generally travel via the existing main State and regional road network, with minimal use of local roads. Where feasible and reasonable, unless compliance with the relevant traffic noise criteria can be achieved or alternative arrangements have been agreed with affected receivers, construction vehicle movements will not occur on local roads beyond those required for direct access to temporary construction support sites (refer to environmental management measure CNV6 in Table D2-1 of this submissions report). In addition, road traffic noise levels around temporary construction support sites are unlikely to increase by more than 2 dB(A) due to construction vehicle movements to and from the temporary construction support sites, which represents a minor impact that is likely to be barely perceptible.

Potential impacts resulting from changes in traffic on the safety and wellbeing of the community are discussed in Section 13.4.3 of the environmental impact statement. Temporary increased construction traffic on roads in Balgowlah and surrounds could lead to longer travel times and potentially impact on community perceptions of safety for children cycling and walking to and from child care, pre-school or school if not appropriately managed. Traffic impacts would be managed through standard communication and traffic control management measures, which would limit delays and disruptions to road users as well as ensuring the safety of motorists, cyclists and pedestrians, in consultation with the relevant road authorities. Ongoing consultation will be carried

out with Northern Beaches Council, emergency services and bus operators to minimise traffic and transport impacts in Balgowlah and surrounds (refer to environmental management measure CTT6 in Table D2-1 of this submissions report). Construction road traffic will be managed to minimise queuing and impacts of movements during peak periods where feasible and reasonable (in accordance with environmental management measures CTT8 and CTT13 in Table D2-1 of this submissions report) and to ensure pedestrian, cyclist and road user safety (in accordance with environmental management measures CTT9, CTT10 and CTT15 in Table D2-1 of this submissions report). In addition, the community will be notified in advance of any proposed transport network changes as required by environmental management measure CTT7 (refer to Table D2-1 of this submission report).

The above measures will be incorporated into the traffic management plan, prepared as a sub-plan to the construction environmental management plan for the project (refer to Table D1-1 of this submissions report). The traffic management plan would be prepared in accordance with *Traffic Control at Work Sites Technical Manual* (Transport for NSW, 2020g). Section 4 of the manual requires a number of inputs be considered including that the needs of specific road users must be understood and managed, including but not limited to, pedestrians (refer to Section 4.4.2 of the manual) and cyclists (refer to Section 4.4.3 of the manual). This consideration would ensure site-specific controls are identified and implemented to mitigate project impacts on the wellbeing of the community, including children, along Sydney Road and Frenchs Forest Road through Seaforth Centre, residential areas and beyond Seaforth Public School.

In addition, a noise and vibration management plan will be developed in accordance with the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a) and implemented for the duration of construction, as required by revised environmental management measure CNV1 in Table D2-1 of this submissions report. This will ensure that impacts from noise and vibration, including from construction traffic, are minimised during construction. Further detail on the key issues to be addressed by the noise and vibration management plan are provided in Table D1-1 of this submissions report.

B11.12.2 Managing impacts to human health during construction

Issue raised

Page 22

Northern Beaches Council recommends consideration be given to the management of potential impacts to human health during construction from:

- Noise, dust and contaminated soils impacts
- Social impacts, including impacts to social cohesion and visual amenity, impacts of relocation caused by property acquisition and the impact of construction fatigue, especially in the immediate area surrounding the tunnelling sites.

Council recommends implementing a suite of mitigation measures to address both regulatory requirements and community needs, especially near the surface work sites and along the main transport routes into the sites.

Response

Environmental management measures will be implemented to manage human health related impacts during construction and to ensure that the project complies with relevant guidelines, policies and criteria. As the impacts can be varied and overlap with a number of environmental aspects, Section 13.6 of the environmental impact statement identifies other chapters within the environmental impact statement which are also relevant to managing human health impacts. The

environmental management measures specific to managing the human health impacts identified by Northern Beaches Council are provided in Table D2-1 of this submissions report and include:

- Construction noise management measures (refer to environmental management measures CNV1-CNV6, CNV8-CNV11, and CNV13-CNV15)
- Dust management measures (refer to environmental management measures AQ1 and AQ3)
- Contamination management measures (refer to environmental management measures SG8, SG10-SG13 and SG20)
- Property acquisition and relocation services (refer to environmental management measure LP3)
- Social impact management measures (refer to environmental management measures SE1-SE3)
- Visual amenity measures during construction (refer to environmental management measures V2-V13)
- Construction fatigue measures (refer to environmental management measures CI1-CI4).

In addition to the above, Section D1 of this submissions report identifies the framework for the management of key issues through the construction environmental management plan, including a number of the issues raised by Council. Table D1-1 provides the likely sub-plans, along with the relevant guidelines or requirements of each plan, which would support the implementation of the construction environmental management plan.

B11.12.3 Managing impacts to human health of less mobile and older pedestrians

Issue raised

Page 22

Northern Beaches Council recommends consideration be given to the impacts of construction works on the health and movements of less mobile or older pedestrians.

Response

The potential impacts of construction works on the health of pedestrians, including less mobile or older pedestrians, due to impacts on their movements are described in Section 13.4.3 of the environmental impact statement.

Potential impacts resulting from changes to traffic, access and connectivity, on pedestrian movements during construction include:

- Temporary changes to road conditions, which could include diversions and access changes, the removal of some on-street parking and reductions in speed limits and changes to property accesses
- Temporary increased construction traffic on roads leading to longer travel times and potentially impacting on community perceptions of safety for pedestrians if not appropriately managed
- Temporary disruptions to public transport services, changes to road conditions and the temporary relocation of some bus stops near construction works for safety, resulting in possible delays and disruptions for bus users and changes in bus access for some people
- Temporary changes to pedestrian access near construction works, resulting in possible disruptions which may result in delays for commuters
- Temporary changes to property access near construction works, with suitable access arrangements to be implemented

- Temporary changes and diversions to pedestrian networks that the potential to affect travel durations, movement patterns and accessibility.

These impacts have the potential to result in short-term increased levels of stress and anxiety for pedestrians and road users, as outlined in Section 13.4.3 of the environmental impact statement.

Impacts to traffic, access and connectivity will be managed through communication and traffic control environmental management measures which will limit delays and disruptions to road users whilst ensuring the safety of pedestrians (refer to Table D2-1 of this submission report). Ongoing consultation will be carried out with Northern Beaches Council, emergency services and bus operators to minimise traffic and transport impacts in the Northern Beaches, as required by environmental management measure CTT6 (refer to Table D2-1 of this submission report).

Construction road traffic will be managed to ensure pedestrian and road user safety and mitigation will include, as required, detours, manual supervision, physical barriers and directional signage, in accordance with environmental management measures CTT9, CTT10 and CTT15. In addition, the community will be notified in advance of any proposed transport network or bus stop changes as required by environmental management measures CTT7 and CTT12.

The above measures will be incorporated into the traffic management plan, prepared as a sub-plan to the construction environmental management plan (refer to Table D1-1 of this submissions report). The traffic management plan would be prepared in accordance with *Traffic Control at Work Sites Technical Manual* (Transport for NSW, 2020g), and would consider the needs of vulnerable road users, including less mobile or older pedestrians. This would include site specific controls to be implemented for the duration of works as required, including maintaining safe travel paths for vulnerable road users and ensuring the placement of the work vehicles, plant and equipment does not put at risk vulnerable road users.

B11.13 Non-Aboriginal heritage

B11.13.1 Manly Dam and Surrounds Conservation Area

Issue raised

Page 23

Northern Beaches Council is of the opinion that widening of Wakehurst Parkway and the construction of the proposed shared user path along the western boundary of Manly Dam and Surrounds Conservation Area would result in long term impacts on the conservation area due to the reduction in the landscape buffer area between the roadway and the conservation area. Council is concerned that other visual impacts from the associated roadworks, ventilation facilities, land retention and stabilisation, noise walls, vegetation removal and signage may also add to the perception of impacts on the conservation area, even if they are located within the road reserve.

Response

Permanent direct physical impacts to the Manly Dam and Surrounds Conservation Area have been largely avoided through the design of the project and would be limited to a small section of the curtilage along Wakehurst Parkway, which is required to maintain access to an existing maintenance track and easement. This would represent less than one per cent of the heritage item and the impact is considered to be negligible. Direct physical impacts may also occur during construction due to the use of machinery and vehicles within or in close proximity to the heritage item. Standard construction measures, such as fencing of active construction areas and delineation of ‘no-go’ areas, would be implemented to manage this risk.

Temporary and permanent visual impacts would occur at the common boundary of the Manly Dam and Surrounds Conservation Area within the construction footprint, due to temporary works at the Wakehurst Parkway east construction support site (BL13) and Wakehurst Parkway south construction support site (BL12), the removal of vegetation to widen Wakehurst Parkway and the location of operational motorway facilities such as the ventilation facility.

Temporary visual impacts during construction due to roadworks and other construction activities will be minimised through the implementation of a range of environmental management measures included in Table D2-1 of this submissions report, including:

- Developing the temporary construction support sites to minimise visual impacts to the extent reasonably practicable (revised environmental management measure V2)
- Using neutral designs and colours for site hoardings to help them blend into the surround environment (environmental management measure V4)
- Retaining existing trees adjacent to the works where possible (environmental management measure V9)
- Protecting or pruning trees rather than removing them (revised environmental management measure V10)
- Restoring all areas disturbed by construction and not required for operation of the project as soon as practicable to their existing condition or in accordance with the urban design and landscape plan where applicable (environmental management measure V11)
- Planting vegetation early to provide a screening buffer that has time to mature before the project is fully operational (environmental management measure V12).

Permanent visual impacts from the operational ancillary infrastructure (including motorway facilities and ventilation outlets) have been minimised through the architectural design, by integrating the infrastructure with the local bushland environment through the appropriate selection of materials and screen planting. The operational ancillary infrastructure would be subject to ongoing design development during future project design stages to further integrate the infrastructure into the landscape. Views of Manly Dam would remain unaffected and the view of the heritage item from the widened roadway should be unobstructed as indicated in Table 5-20 of Appendix J (Technical working paper: Non-Aboriginal heritage). The heritage significance of the heritage item would also not be directly or indirectly impacted by construction and operation of the project, as none of the significant built heritage elements are within close proximity to the proposed construction works or operational infrastructure.

An urban design and landscape plan will be prepared during further design development and implemented in accordance with the strategic urban design framework for the project in order to minimise temporary and permanent visual impacts during construction and operation (refer to environmental management measure V1 in Table D2-1 of this submissions report). The urban design and landscape plan will detail built and landscape features to be implemented during construction, as well as the rehabilitation of disturbed areas during construction of the project. The urban design and landscape plan will be made available to the public for feedback.

Additionally, urban design requirements for the Wakehurst Parkway precinct (refer to Section 4.9.5 of Appendix V (Technical working paper: Urban design, landscape character and visual impact)) would assist with the integration of the operational infrastructure with the Manly Dam and Surrounds Conservation Area. These include:

- Contextual selection of material and finish for the motorway facilities to reflect the local bushland, in accordance with the urban design and landscape plan (refer to environmental management measure V1 in Table D2-1 of this submission report)

- Articulation of building form for the motorway facilities including elevations and ventilation outlet profile
- Recessive and complimentary design of motorway facilities supporting infrastructure to ensure they read as part of the main structure
- Retaining screening vegetation to the south of the motorway facilities and vegetation proposed to the north
- Ensuring visible retaining walls are faced with a high quality finish such as natural sandstone to assist with integrating the roadway into local landscape setting
- Reinstating vegetation removed during the construction period with appropriate native species, in accordance with Northern Beaches Council guidelines.

Appropriate heritage interpretation will also be incorporated into the urban design, in accordance with the *NSW Heritage Manual* (NSW Heritage Office and Department of Urban Affairs and Planning, 1996), *Interpreting Heritage Places and Items: Guidelines* (NSW Heritage Office, 2005a), and the *Heritage Interpretation Policy* (NSW Heritage Council, 2005) (refer to environmental management measure NAH1 in Table D2-1 of this submission report).

With the implementation of the management measures and strategies described above, including the urban design requirements for the Wakehurst Parkway precinct, the level of impact on the Manly Dam and Surrounds Conservation Area heritage item is expected to be negligible and not result in a long term impact as suggested by Council.

Potential direct and indirect visual and physical impacts on the Manly Dam and Surrounds Conservation Area heritage item are identified in Section 5.4.14.3 of Appendix J (Technical working paper: Non-Aboriginal heritage).

B11.13.2 Wakehurst Parkway east construction support site (BL13)

Issue raised

Page 23

Northern Beaches Council noted that clearing of land for Wakehurst Parkway east construction support site (BL13) would be temporary and reversible and considers it to be a tolerable temporary impact upon the Manly Dam and Surrounds Conservation Area and its heritage significance as long as a land restoration and vegetation replanting strategy is implemented to ensure the heritage significance of the conservation area can be restored.

Council recommends that full restoration of the reserve and conservation area be carried out, with plantings of locally native and endemic species compatible with the values of the conservation area, before the land is returned to Council. Council recommends that where possible, landscaping interventions along Wakehurst Parkway and at the Wakehurst Parkway east construction support site (BL13) adopt a more natural response, such as replanting of vegetation and landscaped batters over materials with a harsher man-made aesthetic such as concrete. Where retaining structures are unavoidable, the possibility of colouring or cladding in natural materials such as sandstone, which better relates to the exposed sandstone rocky outcrops within this area, is to be considered. The predominant urban design approach in this area should be to minimise the visual impacts of the tunnel, rather than to accentuate them and to screen them with vegetation to preserve the existing character of the landscape as much as possible.

Response

As noted for the above response, the vast majority of the Manly Dam and Surrounds Conservation Area heritage item would not be impacted by the project, beyond the single small section of the

boundary along Wakehurst Parkway (less than on per cent of the heritage item). Additionally, this heritage item would not be directly or indirectly impacted by construction and operation of the project, as none of the significant built heritage elements are within close proximity to the Wakehurst Parkway east construction support site (BL13).

All areas disturbed by construction works at the Wakehurst Parkway east construction support site (BL13) (built and landscape elements) will be restored as soon as practicable to their existing condition or in accordance with the urban design and landscape plan and as required by environmental management measures B13 and V11 in Table D2-1 of this submission report. The urban design and landscape plan (environmental management measure V1) will be further developed during further design development, made available to the public for feedback and then implemented in line with the strategic urban design framework for the project and appropriate operational mitigation measures (refer to Appendix V (Technical working paper: Urban design, landscape character and visual impact)). Environmental management measure B13 provides a commitment to follow *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects* (Roads and Traffic Authority (RTA), 2011a) in re-establishing vegetation and using species of local provenance.

In addition, urban design requirements for the Wakehurst Parkway precinct are specified in Section 4.9.6 of Appendix V (Technical working paper: Urban design, landscape character and visual impact) and includes the requirement to reinstate removed vegetation with native species and to ensure species selection is in accordance with Northern Beaches Council guidelines.

Appropriate heritage interpretation will be incorporated into the urban design for the project in accordance with the *NSW Heritage Manual* (NSW Heritage Office and Department of Urban Affairs and Planning, 1996), *Interpreting Heritage Places and Items: Guidelines* (NSW Heritage Office, 2005a), and the *Heritage Interpretation Policy* (NSW Heritage Council, 2005) (refer to environmental management measure NAH1 in Table D2-1 of this submission report).

During construction, a number of other environmental management measures (outlined in Table D2-1 of this submission report) would also be implemented to minimise impacts to heritage items and native vegetation, including:

- Vegetation removal including the clearing of native vegetation and fauna habitat will be further minimised during further design development and construction planning to the extent reasonably practicable (revised environmental management measure B6)
- Delineating restricted zones to avoid inadvertent works occurring within the curtilage of heritage items (environmental management measure NAH11)
- Providing non-Aboriginal heritage awareness training for contractors prior to commencement of construction work to ensure understanding of potential heritage items that may be impacted by the project (environmental management measure NAH14)
- Protecting existing trees adjacent to the works where possible (environmental management measure V9)
- Protecting and pruning trees rather than removing them where possible (revised environmental management measure V10)
- Considering early planting where possible to provide a screening buffer that has time to mature before the project is fully operational (environmental management measure V12).

B11.13.3 Frenchs Bullock Track potential impacts

Issue raised

Page 24

Northern Beaches Council is of the view that the assessment of potential impacts on the Frenchs Bullock Track in the heritage impact assessment (Appendix J (Technical working paper: Non-Aboriginal heritage)) is preliminary at this stage since the route of the trail, location of any significant remnant features and proposed road alignment have not been confirmed and the impact from changes in elevation due to new road embankments or associated roadway facilities, such as detention basins, has not been assessed. Based on this, the stated potential 20 per cent impact to the alignment of the route and the visual impact of vegetation removal and road widening has not been clearly demonstrated.

Council recommends that potential impacts on the trail, including the visual impact of vegetation removal and road widening on the trail, be re-assessed once the existing trail alignment, any significant features along the trail and proposed road alignment have been confirmed.

Response

The statement of heritage impact for the Frenchs Bullock Track is provided in Section 5.4.11 of Appendix J (Technical working paper: Non-Aboriginal heritage) and potential impacts on the Track are discussed in Section 14.4.2 of the environmental impact statement.

Since exhibition of the environmental impact statement, and as a result of further design development, project refinements have been made to reduce potential impacts to the Frenchs Bullock Track. This is further described in Section A4.6 of this submissions report.

As a result of these refinements, as well as concerns raised by Northern Beaches Council, an updated assessment of the Frenchs Bullock Track has been carried out and is included in Appendix H of this submissions report. The updated impact assessment considers potential impacts in more detail than what was presented in the environmental impact statement based on the updated reference design for this area, and provides an assessment of potential visual impacts.

It should be noted that the curtilage of Frenchs Bullock Track is yet to be confirmed by site survey. For the purposes of the updated assessment provided in Appendix H of this submission report, survey data showing the location of the walking track referred to as the ‘Engravings Trail’ has been used. The alignment of the Engravings Trail closely follows the alignment of the local environmental plan listing boundary of Frenchs Bullock Track, and is potentially one and the same alignment, either physically, historically or both. Further detailed survey will be completed to confirm the heritage curtilage of the southern section of the Frenchs Bullock Track prior to construction to determine if this section will be directly impacted, in accordance with environmental management measure NAH9 (refer to Table D2-1 of this submissions report).

The updated impact assessment provided in Appendix H of this submissions report indicates that following the refinements made, there would be reduced likelihood of direct impact on Frenchs Bullock Track from the project. Compared to the design assessed during the environmental impact statement, there is now only likely impact to around 12 per cent of the Frenchs Bullock Track length (as physically manifested as the Engravings Trail) which is situated within the construction footprint, instead of the previously assessed 20 per cent. However as required by environmental management measure NAH9 (refer to Table D2-1 of this submission report), further detailed survey will be completed during further design development to confirm the curtilage of the Frenchs Bullock Track and impacts to the Track will be avoided where possible.

The project would require the removal of existing vegetation, and therefore the density of vegetation between the Track and the road would be reduced. This may have some impact on the setting and aesthetic significance of the Frenchs Bullock Track. However, vegetation removal would be further minimised during further design development and construction planning to the extent reasonably practicable in accordance with revised environmental management measure B6 (refer to Table D2-1

of this submission report). The visual impact assessment provided in Appendix H of this submissions report indicates that the refined design has likely reduced the level of visual intrusion of the road and associated infrastructure above the existing landscape from the design assessed in the environmental impact assessment. The retention of at least a narrow vegetation corridor would help to minimise the visual impacts. Future landscaping as part of the project would also assist in minimising visual impacts over the longer term.

The proposed work in the vicinity of Frenchs Bullock Track would still be of small and localised scale and of low intensity. Based on the updated assessment, there would be a reduced likelihood of impact to Frenchs Bullock Track, and the Frenchs Bullock Track would continue to display its historical and aesthetic significance. As such the level of impact on the heritage item would be minor, consistent with the conclusions from the assessment in Section 14.4.2 of the environmental impact statement. The management of direct impacts, potential direct impacts, and vibration impacts has not changed, and the environmental management measures presented in Table D2-1 of this submission report are considered to be appropriate to manage these impacts.

B11.13.4 Frenchs Bullock Track heritage management strategies

Issue raised

Page 24

Northern Beaches Council recommends that heritage management strategies be implemented to significantly reduce the impact of the roadworks on the Frenchs Bullock Track heritage item, including revegetation and measures to minimise elevation changes, roadway embankments or facilities.

Response

The recommendations from Northern Beaches Council to minimise impacts on Frenchs Bullock Track are noted. Opportunities have been identified for further investigation during further design development and construction planning to minimise and/or avoid the potential physical impact, as noted in Section 14.4.2 of the environmental impact statement and detailed in Section 5.4.11.2 of Appendix J (Technical working paper: Non-Aboriginal heritage), including:

- Northern section of Frenchs Bullock Track – further detailed survey and design development would be completed prior to construction to confirm if impacts can be either avoided or reduced further. Should this section of the Track remain impacted, it would be reformed as close as possible to the existing alignment (refer to environmental management measure NAH9 in Table D2-1 of this submission report)
- Southern section of Frenchs Bullock Track – further detailed survey and design development would be completed prior to construction to confirm if impacts can be either avoided or reduced further. Further design development would be used to determine if this section remains partially intact (noting the curtilage extends into the existing road corridor, based on available spatial data). However, impacts would be avoided if it is confirmed that the track in this location follows the Engravings Track, which would not be directly impacted.

For the remaining areas of Frenchs Bullock Track where it is within the construction footprint (but no permanent infrastructure is proposed), the Track would be avoided where possible to minimise the total length to be disturbed.

As discussed above in Section B11.13.3, since exhibition of the environmental impact statement further project refinements have occurred to reduce impacts on the Frenchs Forest Bullock Track. These are outlined in Section A4.6 of this submissions report. For the northern section of Frenchs Bullock Track, fill retaining walls have been introduced at the proposed combined drainage/fauna

underpass and proposed shared user underpass on the western side of the roadway, in order to remove the prior encroachment onto the Frenchs Bullock Track in this area. An updated assessment of impacts of Frenchs Bullock Track is provided in Section 4 of Appendix H of this submissions report. Further detailed survey will be completed to confirm the heritage curtilage of the southern section of Frenchs Bullock Track prior to construction to determine if this section would be directly impacted. Environmental management measure NAH9 (refer to Table D2-1 of this submissions report) remains unchanged and ongoing work to avoid impacts during further design development will still be carried out.

Other environmental management measures that would be implemented to minimise or mitigate impacts on the Frenchs Bullock Track are listed in Table D2-1 of this submission report and include:

- Appropriate heritage interpretation will be incorporated into the urban design for the project in accordance with the *NSW Heritage Manual* (NSW Heritage Office and Department of Urban Affairs and Planning, 1996), *Interpreting Heritage Places and Items: Guidelines* (NSW Heritage Office, 2005a), and the *Heritage Interpretation Policy* (NSW Heritage Council, 2005) (environmental management measure NAH1)
- An archival photographic recording of the Frenchs Bullock Track will be completed, in accordance with the guidelines *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage office, 2005b), prior to any works that have the potential to impact upon the items and provided to Northern Beaches Council during further design development (revised environmental management measure NAH2)
- Delineating restricted zones to avoid inadvertent works occurring within the curtilage of heritage items (environmental management measure NAH11)
- Providing non-Aboriginal heritage awareness training for contractors prior to commencement of construction work to ensure understanding of potential heritage items that may be impacted by the project (environmental management measure NAH14)
- Landscaping in accordance with the urban design and landscape plan (environmental management measure V1) which would include identification of vegetation species composition, planting layout and densities considerate of the location in accordance with the urban design principles in Section 4.9.5 of Appendix V (Technical working paper: Urban design, landscape character and visual impact)
- Protecting existing trees adjacent to the works where possible (environmental management measure V9)
- Protecting and pruning trees rather than removing them where possible (revised environmental management measure V10)
- Consideration of early planting where possible to provide a screening buffer that has time to mature before the project is fully operational (environmental management measure V12).

B11.13.5 Bantry Bay Reservoir and Bantry Bay Water Pumping Station

Issue raised

Page 24

Northern Beaches Council supports the conclusion that the majority of impacts on the Bantry Bay Reservoir (WS 0008) and Bantry Bay Water Pumping Station (WPS 122) would be temporary and reversible, subject to replacement planting and the restoration of the majority of the curtilage. Council recommends that a heritage strategy, outlining curtilage restoration and replacement plantings, be implemented after construction and before the land is returned to Council to ensure that the heritage values of the reservoir and pumping station are maintained. Locally native and

endemic species should be planted to represent vegetation communities in the surrounding Manly Warringah War Memorial State Park.

Response

The Bantry Bay Reservoir (WS 0008) and Bantry Bay Water Pumping Station (WPS 122) sites would be impacted due to site establishment works and operation of the Wakehurst Parkway east construction support site (BL13).

Transport for NSW notes Northern Beaches Council's support for the assessment outcome of potential impacts on the local heritage items Bantry Bay Reservoir (WS 0008) and Bantry Bay Water Pumping Station (WPS 122).

As described in Section B11.13.1 and B11.13.2, revegetation and rehabilitation of the Wakehurst Parkway east construction support site (BL13) would be in accordance with the urban design and landscape plan (refer to environmental management measure V1 in Table D2-1 of this submission report) and consistent with the urban design requirements for the Wakehurst Parkway precinct specified in Section 4.9.6 of Appendix V (Technical working paper: Urban design, landscape character and visual impact). Environmental management measure B13 provides a commitment to follow *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) in re-establishing vegetation and using species of local provenance.

In addition, appropriate heritage interpretation will be incorporated into the urban design for the project in accordance with the *NSW Heritage Manual* (NSW Heritage Office and Department of Urban Affairs and Planning, 1996), *Interpreting Heritage Places and Items: Guidelines* (NSW Heritage Office, 2005a), and the *Heritage Interpretation Policy* (NSW Heritage Council, 2005) (refer to environmental management measure NAH1 in Table D2-1 of this submission report).

B11.13.6 Balgowlah Golf Course

Issue raised

Page 24

Balgowlah Golf Course has been identified in the report as being of potential local significance, due to its historical (criterion A) and historical association (criterion B). It has also been identified as the site of substantial works that would significantly negatively affect those values, including the complete cessation of golf on site. The loss of significant heritage values from the proposed works is considered to be a regrettable loss, however it is acknowledged that the site is currently not listed and afforded statutory protection. It is also acknowledged that there is limited land within the area to support the tunnel or improved open space and recreation facilities. On balance, it is considered potentially supportable on the condition that recreational uses are continued on the site, including the reinstatement of the oval after construction has ceased.

Response

Transport for NSW note Northern Beaches Council's acknowledgement that Balgowlah Golf Course is not currently listed, and their statement that on balance they support the intended future use of new and improved open space and recreation facilities at Balgowlah.

As discussed at the end of Section 14.5 of the environmental impact statement, there are environmental management measures that would contribute to the mitigation and management of non-Aboriginal heritage impacts associated with the Western Harbour Tunnel and Beaches Link program of works, which are committed to within the submissions report for the Western Harbour Tunnel and Warringah Freeway Upgrade project. The implementation of these management

measures would also mitigate potential non-Aboriginal heritage impacts associated with this project. These include the preparation of a thematic heritage study of golf courses in Sydney for the region north of the Sydney Harbour, as follows:

> A thematic heritage study of golf courses in Sydney will be prepared for the region north of the Sydney Harbour. This study will assist in identifying other potential heritage items in the region that demonstrate the same or similar significance as the Cammeray Golf Course (Revised environmental management measure NAH8 from Western Harbour Tunnel and Warringah Freeway Upgrade submissions report).

The thematic study is currently being carried out as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project and includes consideration of Balgowlah Golf Course within its scope. Transport for NSW would make the study available to Northern Beaches Council once it has been finalised for information.

B11.13.7 Archival recording of Balgowlah Golf Course

Issue raised

Page 24

Northern Beaches Council recommends that a complete archival recording of the Balgowlah Golf Course site in Balgowlah, including the fairways, greens, club house and any other facility, be carried out in accordance with Heritage NSW's *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage Office, 2005b) before construction starts. Council recommends that an individual heritage interpretation strategy be prepared alongside any future plans for this space, to ensure the values of the site can be understood and communicated through a range of mediums.

Response

Archival recording of the Balgowlah Golf Course site will be carried out in accordance with the *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage Office, 2005b) guideline for areas/items subject to change within the site in accordance with revised environmental management measure NAH2 (refer to Table D2-1 of this submission report). Archival recording of the site will be completed prior to any works that have the potential to impact upon the areas/items and will be provided to Northern Beaches Council.

Appropriate heritage interpretation will be incorporated into the urban design for the Balgowlah Golf Course site, in accordance with the *NSW Heritage Manual* (NSW Heritage Office and Department of Urban Affairs and Planning, 1996), *Interpreting Heritage Places and Items: Guidelines* (NSW Heritage Office, 2005a), and the *Heritage Interpretation Policy* (NSW Heritage Council, 2005) (refer to environmental management measure NAH1 in Table D2-1 of this submission report).

As discussed in the response above, Balgowlah Golf Course will be included in the thematic heritage study of golf courses in Sydney for the region north of the Sydney Harbour which is currently being carried out as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project.

B11.13.8 Balgowlah Golf Course club house

Issue raised

Page 25

Northern Beaches Council is concerned that potential impacts on the heritage fabric or significance of the Balgowlah Golf Course club house have not been adequately assessed in the environmental

impact statement. The assessment appears to assume that this building will be demolished, even though it has been identified and recognised as a building designed by award-winning architect Frank L'Anson Bloomfield.

Council recommends that a significance assessment be prepared for the club house before any future consultation on the site is carried out. If the club house building is found to be of significance, grading of fabric significance should be carried out and a Conservation Management Plan should be prepared for the club house to inform future consultation on the club house and its potential uses.

Council strongly supports the preparation of the proposed thematic history of golf courses in the northern Sydney region, committed to within the submissions report for the Western Harbour Tunnel and Warringah Freeway Upgrade project. Council recommends that an assessment of the significance of the Balgowlah Golf Course club house be included in the thematic history and that it be made publicly available as soon as possible.

Response

Although the Balgowlah Golf Course (including club house) is not a listed heritage item, it has been conservatively assessed in Appendix J (Technical working paper: Non-Aboriginal heritage) as being of local significance.

The heritage item description and significance assessment is further detailed in Section A.9 of Annexure A of Appendix J (Technical working paper: Non-Aboriginal heritage). The significance assessment includes both the golf course and the club house and is referred to holistically as Item 10. The club house is located on Lot 2684 DP752038 which has been included in the significance assessment. The significance assessment recognises the original club house was designed by Frank L'Anson Bloomfield (Associate of the Royal Institute of Bristish Architects) in 1926, under Criterion C – Aesthetic significance.

The proposed works would be of large scale and major intensity, with large portions of the golf course being modified through the construction of the permanent access road, operational infrastructure and provision of new and improved open space and recreation facilities. The changes to the Balgowlah Golf Course would be permanent and irreversible as the heritage item would no longer demonstrate its original character as an interwar period golf course.

As stated in Section B11.13.6 above, Transport for NSW notes Northern Beaches Council's acknowledgement that Balgowlah Golf Course is not currently listed, and their statement that on balance they support the intended future use of new open space and recreation facilities at Balgowlah. For the purposes of the assessment, it has been assumed that the club house would be initially used as part of the temporary construction support site as a site office and later demolished so as to represent a conservative worst-case scenario to ensure that this option is fully assessed. However, further opportunities to retain and repurpose the club house building would be investigated with Northern Beaches Council during further design development and during the dedicated consultation process jointly led by Transport for NSW and Northern Beaches Council to give the community an opportunity to provide input into the final layout of the new and improved open space and recreation facilities at Balgowlah. This consultation will be separate to the consultation for the environmental impact statement. This process is expected to commence after planning approval and well in advance of construction starting. As part of this consultation process, a community reference group will be established, with representative stakeholder groups and the community, to support Transport for NSW and Northern Beaches Council with the development of this important public space. An expression of interest for participation in the consultation process is expected to be issued in early 2022.

As discussed in the response above, as the Balgowlah Golf Course site would be substantially changed by these works, an archival photographic recording of the heritage item will be carried out, in accordance with the guideline *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage Office, 2005b) as required by environmental management measure NAH2 (refer to Table D2-1 of this submission report). Archival recording will be completed prior to any works that have the potential to impact upon the items and provided to Council.

As discussed earlier in Section B11.13.6, a thematic heritage study of golf courses in Sydney for the region north of Sydney Harbour will also be prepared. This is further outlined in Table 5-16 of Appendix J (Technical working paper: Non-Aboriginal heritage) and at the end of Section 14.5 of the environmental impact statement. This study will assist in identifying other potential heritage items in the region that would demonstrate the same or similar significance as the Balgowlah Golf Course, therefore reducing the overall impact on that type of heritage item. The study will include the Balgowlah Golf Course and club house in the context of the thematic study. The thematic study is being carried out as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project and will be completed prior to the commencement of construction of the Beaches Link and Gore Hill Freeway Connection project (refer to revised environmental management measure NAH8 from the Western Harbour Tunnel and Warringah Freeway Upgrade project). The study would be provided to Northern Beaches Council once it has been finalised for information.

B11.13.9 Management of Burnie (House)

Issue raised

Page 25

Northern Beaches Council acknowledges that Burnie (House) at 16 Dudley Street, Balgowlah is not currently listed or subject to statutory heritage protection and can be demolished, however Council does not agree that the house does not have local heritage significance. Council recommends that a photographic record of the house be made, in accordance with Heritage NSW's *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage Office, 2005b), before it is demolished. The photographic record should be provided to Council for archival purposes.

Response

Burnie (House) is not listed on any heritage register or database. The significance assessment provided in Section 4 of Appendix J (Technical working paper: Non-Aboriginal heritage) states that Burnie (House) at 16 Dudley Street, Balgowlah does not meet significance criterion thresholds since it is not historically significant, does not demonstrate any aesthetic or architectural features at a high degree, and is not of social significance to any particular community group, in accordance with *Assessing Heritage Significance* (NSW Heritage Office 2001). Since Burnie (House) has been assessed as not having local heritage significance it has not been considered for photographic recording and Transport for NSW therefore do not consider this to be required or necessary.

However, prior to demolition, Transport for NSW could facilitate access to Burnie (House) for Northern Beaches Council representatives (if Northern Beaches Council requires this) to carry out their own photographic recording in accordance with Heritage NSW's *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage Office, 2005b).

B11.13.10 Consideration of Wakehurst Parkway Memorial, Killarney Heights

Issue raised

Page 25

Northern Beaches Council note that the Wakehurst Parkway Memorial as a potential item of heritage significance located along Wakehurst Parkway in Killarney Heights has not been identified within the environmental impact statement.

The Wakehurst Parkway Memorial commemorates Wakehurst Parkway and is comprised of an inscribed brass plaque that is attached to a short column of sandstone blocks (six courses high) on a concrete base. The memorial is located on a small hill on the western side of Wakehurst Parkway, approximately 130 metres northwest of the Wakehurst Parkway and Kirkwood Street intersection. The memorial would be located near the proposed tunnel portals and ventilation facilities and would be removed as part of the construction works. Council recommends that an assessment of the heritage significance of this item be carried out and that the item be reinstated within the same area after works have been completed. Council requests that the item and its context be photographically recorded before works begin and that a copy of this record be provided to Council.

Response

Following exhibition of the environmental impact statement, and in response to issues raised in the Northern Beaches Council submission, a supplementary non-Aboriginal heritage assessment has been prepared to consider the potential impacts of the project on the Wakehurst Parkway Memorial. The supplementary assessment is included in Appendix H of this submissions report. The significance assessment and statement of heritage impact for the Wakehurst Parkway Memorial are presented in Section 3.1 and Section 3.2 of Appendix H of this submissions report and have been summarised below.

The Wakehurst Parkway Memorial, Killarney Heights is not listed on any heritage register or database. For the purposes of the supplementary assessment provided in Appendix H of this submissions report, the Memorial has been assessed as being of significance at a local level.

The Wakehurst Parkway Memorial commemorates the NSW governorship of Lord Wakehurst during World War II, as well as the opening of Wakehurst Parkway. The Governor was known for his interest in the development of NSW and its natural beauty, with Wakehurst Parkway being the first road to have the term ‘parkway’ as part of its name, denoting its scenic nature and setting.

The location of the memorial in relation to project works is provided in Figure 3-16 of Appendix H of this submissions report. There would be direct physical impact to the Wakehurst Parkway Memorial from the project as it would be required to be removed to enable the realignment of Wakehurst Parkway and construction of the cut and cover and trough structure to connect the Beaches Link tunnel on and off ramps. It is not practicable to redesign the project in this location to avoid the Wakehurst Parkway Memorial, due to design and engineering constraints at this location of Wakehurst Parkway. However, the Memorial is of potential local heritage significance for its association with Wakehurst Parkway more broadly, rather than for its particular current location. The assessment findings are that the memorial could be situated elsewhere within the Northern Beaches Council local government area, in close proximity to Wakehurst Parkway, while still retaining its heritage values.

Following the supplementary assessment carried out for the Wakehurst Memorial, the project has committed to removing and retaining the Wakehurst Parkway Memorial and relocating it to a more appropriate publicly accessible location adjacent the shared user path on the eastern side of Wakehurst Parkway. Accordingly, a new environmental management measure NAH18 has been prepared to reflect this commitment (refer to Table D2-1 of this submissions report):

> Consultation with Northern Beaches Council will be carried out regarding options for an appropriate new location for the Wakehurst Parkway Memorial along Wakehurst Parkway. Where practicable, a location alongside Wakehurst Parkway at the southern end of the roadway

in a publicly accessible area will be investigated, so as not to intrude on the existing North Narrabeen Wakehurst Parkway Memorial at the northern end of the roadway.

Where relocation of the Wakehurst Parkway Memorial to the new location is deemed practicable, this will be carried out under the supervision of an appropriately qualified heritage consultant and an appropriately qualified and experienced stonemason.

In addition, the following new environmental management measure NAH19 has been developed to update the heritage register entry as follows (refer to Table D2-1 of this submissions report):

The entry for the two Wakehurst Parkway Memorials on the Monument Australia website (https://monumentaustralia.org.au/) will be updated to reflect the heritage assessment and the changed location of the Wakehurst Parkway Memorial at Killarney Heights.

An archival photographic recording of the Wakehurst Parkway Memorial will be carried out prior to any works that have the potential to impact upon the item and deposited with Northern Beaches Council, in accordance with the guidelines *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage Office, 2005b) (refer to revised environmental management measure NAH2 in Table D2-1 of this submissions report).

B11.13.11 Consideration of 'Canberra Bus Stop', Frenchs Forest

Issue raised

Page 25

Northern Beaches Council notes that the 'Canberra Bus Stop' as a potential item heritage significance located along Wakehurst Parkway in Frenchs Forest has not been identified within the environmental impact statement.

The concrete semi-circular bus stop shelter is located on the eastern side of Wakehurst Parkway, approximately 520 metres south of the Aquatic Drive intersection. The bus stop shelter is located just after the variable message sign at the head of the bus bay and is part of the 'Wakehurst Parkway opposite Yarraman Avenue Walkway Stop' (bus stop ID 208655). The bus stop shelter is a local example of the distinct 'Canberra style' bus stop that was constructed in large numbers in the 1970's throughout Canberra. Council considers the bus stop shelter to be in good condition, a good example of its type and to mark the evolution of bus stop design over time. Council recommends that an assessment of the heritage significance of this item be carried out and that the bus stop shelter be retained, either in its current location or in a similar nearby area, after works have been completed. Council requests that the item and its context be photographically recorded before works begin and that a copy of this record be provided to Council.

Response

Following exhibition of the environmental impact statement, and in response to issues raised in the Northern Beaches Council submission, a supplementary non-Aboriginal heritage assessment has been prepared to consider the potential impacts of the project on the Canberra Concrete Bus Shelter located on Wakehurst Parkway. The supplementary assessment is included in Appendix H of this submissions report. The significance assessment and statement of heritage impact for the Canberra Concrete Bus Shelter are presented in Section 2.1 and Section 2.2 of Appendix H of this submissions report and have been summarised below.

The Canberra Concrete Bus Shelter, Frenchs Forest is not listed on any heritage register or database. For the purposes of the supplementary assessment provided in Appendix H of this submissions report, the Canberra Concrete Bus Shelter has been assessed as being of significance at a local level.

The Canberra Concrete Bus Shelter is a good example of the brutalist architectural style, at a relatively small scale, and has a distinctive, landmark design that are instantly recognisable as being the bus shelters designed for Canberra, even when situated outside of the Australian Capital Territory. However, the Canberra Concrete Bus Shelter does not demonstrate an important historical course, pattern or process of importance to the history of the local area nor of NSW.

The location of the Canberra Bus Shelter in relation to project works is provided in Figure 2-9 of Appendix H of this submissions report. There would be direct physical impact to the Canberra Concrete Bus Shelter from the project as it would be required to be removed to enable the widening of Wakehurst Parkway. Since the Bus Shelter does not have potential local heritage significance due to its particular location along Wakehurst Parkway, the assessment findings are that it could be situated elsewhere within the Northern Beaches Council local government area while still retaining its heritage values.

Following the supplementary assessment carried out for the Canberra Concrete Bus Shelter, the project has committed to removing and retaining the Canberra Concrete Bus Shelter with the intention of reusing the shelter during the operation of the project, or otherwise repurposing the shelter, in consultation with Northern Beaches Council. Accordingly, a new environmental management measure NAH17 has been prepared to reflect this commitment (refer to Table D2-1 of this submissions report):

> Consultation with Northern Beaches Council will be carried out regarding options for an appropriate new location for the Canberra Concrete Bus Shelter located on Wakehurst Parkway. Where practicable, the Canberra Concrete Bus Shelter will be relocated to a suitable location on Wakehurst Parkway or otherwise within the Northern Beaches local government area, and ideally continue to be used as a bus shelter. Repurposing of the shelter to a use other than a bus stop shelter could be considered, with an appropriate use which retains its aesthetic significance.
>
> Where relocation of the Canberra Concrete Bus Shelter to a new location and/or repurposing of the Canberra Concrete Bus Shelter is deemed practicable, this will be carried out under the supervision of an appropriately qualified heritage consultant and with appropriate engineering advice.

An archival photographic recording of the Canberra Concrete Bus Shelter will be carried out prior to any works that have the potential to impact upon the item and deposited with Northern Beaches Council, in accordance with the guidelines *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage Office, 2005b) (refer to revised environmental management measure NAH2 in Table D2-1 of this submissions report).

B11.14 Aboriginal cultural heritage

B11.14.1 Potential submerged sites assessment

Issue raised

Page 26

The potential submerged sites assessment (refer to Annexure E of Appendix L (Technical working paper: Aboriginal cultural heritage assessment report)) identifies two Aboriginal Heritage Information Management System (AHIMS) sites near Clive Park that have incorrect mapping coordinates, namely 45-6-0645 (Northbridge, Mowbray Point) and 45-6-2222 (Clive Park 4, Northbridge). The Aboriginal Heritage Office (which is a partnership of councils, including Northern Beaches Council) has previously identified the correct locations for these sites. Section 15.3.3 of the environmental impact statement correctly notes that these sites are outside the study area.

Response

As a result of the issues raised by Aboriginal Heritage Office and Northern Beaches Council, a new search of the AHIMS register was carried in February 2021 to confirm site locations for Aboriginal cultural heritage sites along the project alignment. The results of this new search, additional site inspections and an updated impact assessment is included in Appendix A of this submissions report.

As a result of the new AHIMS search and an additional site inspection of AHIMS site 45-6-2111 (Clive Park 3, Northbridge) carried out in May 2021, Figure 15-1 to Figure 15-5 of Chapter 15 (Aboriginal cultural heritage) of the environmental impact statement and Figure 4-2 to 4-6 of Appendix L (Technical working paper: Aboriginal cultural heritage assessment report) have been updated to reflect the confirmed locations of the sixteen AHIMS sites located within the study area. The updated figures are shown as Figure 2-1 to Figure 2-5 of Appendix A of this submissions report and these figures now supersede those shown in the environmental impact statement.

With regard to AHIMS sites 45-6-0645 (Northbridge, Mowbray Point) and 45-6-2222 (Clive Park 4, Northbridge), Annexure E of Appendix L (Technical working paper: Aboriginal cultural heritage assessment report) did acknowledge these were incorrectly mapped within Middle Harbour. Figure 2-3 of Appendix A shows the correct location of these sites, and confirms they are outside of the study area.

B11.14.2 Adequacy and accuracy of AHIMS mapping

Issue raised

Page 26

The following two sites have been incorrectly identified in Appendix L (Technical working paper: Aboriginal cultural heritage assessment report) as being outside the study area:

- AHIMS Site ID 45-6-0271 (Rock engraving): The site is inaccurately mapped 250 metres to the northwest of its actual location in the AHIMS site card and is actually located next to 45-6-0654 (Clive Park 1, Northbridge).
- AHIMS Site ID 45-6-2111 (Shelter with rock engraving): The site is inaccurately mapped 170 metres to the northwest of its actual location in the AHIMS site card and is actually located 60 metres west of 45-6-0654 (Clive Park 1, Northbridge).

Since these sites were identified as being outside the study area, they have not been included in Chapter 15 (Aboriginal cultural heritage) of the environmental impact statement.

Northern Beaches Council requests for these sites to be assessed and included in the environmental impact statement. Cracking to the rock engraving (45-6-0271) should be evaluated in relation to the overall significance of the rock engraving. The shelter with rock engraving (45-6-2111) is in good condition and any cracking or roof collapse would have a detrimental impact on the item.

Response

As noted in Section B11.14.1, a new search of the AHIMS register was carried in February 2021 to confirm site locations for Aboriginal cultural heritage sites along the project alignment. The results of this new search, additional site inspections and an updated impact assessment is included in Appendix A of this submissions report.

The overall assessment results for potential impacts to AHIMS sites 45-6-0271 and 45-6-2111 are included in Table 15-7 of the environmental impact statement, and these have been updated in Table 5-1 in Appendix A of this submissions report.

For the environmental impact statement, the coordinates of AHIMS site 45-6-0271 (Clive Park, Northbridge) were located outside of the study area. It was therefore not realised that this site was a standalone site, and the site was inadvertently recorded as part of AHIMS site 45-6-0654 (Clive Park 1, Northbridge). Following exhibition of the environmental impact statement, a new AHIMS search was carried out on 19 February 2021 to confirm locations of AHIMS sites along the project alignment. The results of the updated search are included in Appendix A of this submissions report. An impact assessment of AHIMS site 45-6-0271 is now included in Section 5 in Appendix A of this submissions report. The risk of potential impacts at this site has been assessed as negligible.

AHIMS site 45-6-2111 (Clive Park 3, Northridge) was also identified in the environmental impact statement as being located outside of the study area. As stated above, following exhibition of the environmental impact statement, a new AHIMS search was carried out on 19 February 2021 to confirm locations of AHIMS sites along the project alignment and the results of the updated search are included in Appendix A of this submissions report. Updated mapping (using February 2021 AHIMS data) shows that the site is located immediately adjacent to the study area boundary line. The site was inspected on 20 May 2021 to confirm the site location and accurately record GPS coordinates. The GPS coordinates confirm that the site is located very close to the edge of the study area boundary line, but is just outside the study area. However, the site has still been assessed and this assessment is included in Section 5 in Appendix A of this submissions report. The risk of potential impacts at this site has been assessed as negligible.

B11.14.3 Potential impacts to Aboriginal heritage sites

Issue raised

Page 27

The Aboriginal Heritage Office acknowledges that the risks to Aboriginal sites associated with sandstone rock overhangs and platforms at Northbridge are considered to be small and that there appears to be limited measures that can be implemented to mitigate impacts from any unlikely or unexpected cracking or roof collapse. However, Northern Beaches Council is concerned that any damage to rock art or rock engraving sites, regardless of its low probability, could lead to irreversible damage.

Two rock shelters at Clive Park in Northbridge are subject to ongoing coastal erosion which is exacerbated by waves from boat traffic, rising sea level, storm events and human visitation. The Aboriginal Heritage Office considers these sites to be more at risk from vibration and settlement given these additional and increasing impacts.

The Aboriginal Heritage Office has also monitored significant recent vegetation and midden loss at AHIMS site 45-6-0654 (Clive Park 1, Northbridge) during the last 12 months. The accessible foreshore across this area is narrowing and during high tides there is increasing concentration of impacts by visitors leading to further erosion.

Response

The potential for indirect impacts to Aboriginal sites at Northbridge (located in the Willoughby City Council local government area) to occur during construction as a result of vibration and ground movement generated by nearby project works, are outlined in Section 15.4.1 of the environmental impact statement.

Preliminary ground movement predictions indicate that there may be potential surface settlement of between 25 to 30 millimetres at the Middle Harbour crossing (refer to Table 16-9 of the environmental impact statement). This is considered to have an impact of 'slight' severity at the surface near the Middle Harbour crossing according to Table 16-8 of the environmental impact statement.

The Sefton (1996) study into the effects of subsidence on rock shelters, referenced in Section 8.2.1.2 of Appendix L (Technical working paper: Aboriginal cultural heritage assessment report) showed that larger rock shelters (greater than 50 cubic metres) were at greater risk of impact. The study concluded that no rock shelter site less than 50 cubic metres was found to have been impacted by subsidence, and that impacts to larger shelters were also rare. The findings of Appendix L (Technical working paper: Aboriginal cultural heritage) are that all rock shelters within the study area are significantly smaller than 50 cubic metres, suggesting that harm from subsidence related impacts would be unlikely.

Following exhibition of the environment impact statement, and in response to issues raised, a clarification has been provided in Section 4.3 of Appendix A of this submissions report. The clarification includes correction of the referenced Sefton (1996) publication in Appendix L (Technical working paper: Aboriginal cultural heritage assessment report) to Sefton (2000), and correction of the statement that all rock shelters within the study area are less than 50 cubic metres. It has been clarified that all rock shelters within the study area are significantly smaller than 50 cubic metres, with the exception of AHIMS site 45-6-0654 (Clive Park 1, Northbridge) which has a volume of greater than 50 cubic metres. However, the significance of potential impact of minor remains unchanged for AHIMS site 45-6-0654 (Clive Park 1, Northbridge) as the large overhang and high significance of this site were considered and already increased the significance outcome of potential impact for this finding in Section 8.2.2 of Appendix L (Technical working paper: Aboriginal cultural heritage assessment report). The impact assessment for AHIMS site 45-6-0654 and management recommendations as described in the environmental impact statement are therefore still considered to be adequate and appropriate to manage potential risks associated with subsidence. As documented in Table 5-1 of Appendix A of this submissions report, vibration impacts for AHIMS site 45-6-0654 would be outside the minimum working distance for unsound structures and have been assessed as negligible.

A number of mitigation measures will be implemented to avoid and minimise potential impacts associated with Aboriginal sites with sandstone rock overhangs and platforms.

Prior to construction, Aboriginal site condition surveys will be completed at Aboriginal terrestrial sites within 50 metres of the project to determine which sites require vibration monitoring in accordance with environmental management measure AH2 (refer to Table D2-1 of this submission report). Vibration monitoring will be carried out at sites that have been identified as requiring monitoring, as per environmental management measure AH3 (refer to Table D2-1 of this submission report). Appropriate management protocols will be implemented where exceedances are recorded. Subsequent condition survey of sites will be carried out at the identified sites when vibration levels exceed 2.5 millimetres per second or after vibration intensive activities to identify and record any changes to the integrity of the site (refer to environmental management measure AH4 in Table D2-1 of this submission report).

In addition, vibration intensive works will be managed through the establishment of minimum working distances to achieve vibration screening levels. Where vibration levels are predicted to exceed the screening levels, the mitigation and management process outlined in environmental management measure CNV7 (refer to Table D2-1 of this submissions report) will apply:

Vibration generating activities will be managed through the establishment of minimum working distances to achieve vibration screening levels.

Where vibration levels are predicted to exceed the screening levels, a more detailed assessment of the impacted structure or heritage items would be carried out to assess the susceptibility of the structure to damage from vibration due to the project. Appropriate mitigation and management measures, such as equipment substitution and alternative methods, will be identified and implemented to avoid damage. Attended vibration monitoring will be carried out during vibration intensive activities in the vicinity to ensure vibration levels remain below appropriate limits for that structure.

For heritage items, the more detailed assessment will specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.

Detailed predictive settlement models will be developed for areas of concern where ground movement is expected to guide tunnel design and construction methodology, including the selection of options to minimise settlement where required (refer to environmental management measure SG4 in Table D2-1 of this submission report).

The potential impact of the project on the hydrodynamic environment of Middle Harbour, including tidal currents and tidal flushing, is described in Section 17.4.1 and Section 17.5.1 of the environmental impact statement. Hydrodynamic modelling indicates that changes to the hydrodynamic environment of Middle Harbour during construction and operation of the project would be small and less than those seen through natural variations such as wind driven circulation.

Impacts from visitation to Clive Park on AHIMS site 45-6-0654 (Clive Park 1, Northbridge) are noted but considered outside the scope of the project. Clive Park is under the management and control of Willoughby City Council, and they would be responsible for regulating visitor access. Project works would not have any direct impact to the Clive Park Aboriginal cultural heritage sites and no access for project personal to Clive Park would be required as part of the project, other than for monitoring at Aboriginal cultural heritage sites, as required.

B11.14.4 Protection of Clive Park Aboriginal heritage sites

Issue raised

Page 27

The Aboriginal Heritage Office suggests that a sea wall or coastal protection be considered at Clive Park, Northbridge to mitigate potential impacts to the following four recorded sites:

- AHIMS Site ID 45-6-0996
- AHIMS Site ID 45-6-0654
- AHIMS Site ID 45-6-0271
- AHIMS Site ID 45-6-3012.

Any coastal protection should be subject to approval by Transport for NSW, Willoughby City Council and all other relevant stakeholders, legislation, policies and guidelines.

Response

As noted in Section A5.1.12 of this submissions report, the overall assessment results for potential impacts to known Aboriginal cultural heritage sites have been updated and are included in Table 5-1 of Appendix A of this submissions report. Updated mapping (discussed in Section B11.14.2) shows that AHIMS sites 45-6-0996 and 45-6-0654 have both moved further away from tunnel alignment,

but still remain within the study area. Impacts at AHIMS sites 45-6-0996 and 45-6-3012 were found to be negligible and impacts at AHIMS site 45-6-0654 were found to be negligible to minor. The location of AHIMS site 45-6-0271 has been updated and is now located inside the study area. Potential impacts to this site were found to be negligible. This is further discussed in Section B11.14.2 above.

Changes to the hydrodynamic environment of Middle Harbour during construction and operation of the project would be small and less than those seen through natural variations such as wind driven circulation, as outlined in Section 17.4.1 and Section 17.5.1 of the environmental impact statement.

As such, construction of a sea wall or other coastal protection works as part of the project is not required and is outside the scope of the project.

Transport for NSW notes that construction of a sea wall or other coastal protection works could result in a wide range of unintended short and long term physical, social, environmental and economic impacts, as outlined in *Draft guidelines for assessing the impacts of seawalls* (DECCW, 2011a) and *Fact sheet 3: Coastal protection works – Coastal Management State Environmental Planning Policy* (NSW Department of Planning and Environment (DPE), 2018). These may include altered erosion and accretion along the shore from the wall, reduced recreational beach amenity, changes to property values and impacts on intertidal ecosystems and sensitive marine habitat identified in Appendix T (Technical working paper: Marine ecology).

B11.15 Geology, soils and groundwater

B11.15.1 General

Issue raised

Page 27

Northern Beaches Council reviewed Chapter 16 (Geology, soils and groundwater) of the environmental impact statement and found it to be consistent with environmental health assessments and recommendations regarding land contamination, acid sulphate soils, sediment and erosion controls. Council has no objections, subject to compliance with the environmental management measures specified in Table 16.9 of the environmental impact statement.

Response

The Northern Beaches Council comment is noted. Project works will be carried out in accordance with the environmental management measures listed in Table D2-1 of this submissions report.

B11.15.2 Erosion and sediment controls

Issue raised

Pages 11, 28, 30, 31, 40

Chapter 16 (Geology, soils and groundwater) of the environmental impact statement identifies the presence of Lambert soils along Wakehurst Parkway which have a high erosion potential, however, Section 16.4.1 of the environmental impact statement states that 'Standard management and mitigation measures are expected to be adequate in controlling any potential impacts'. Northern Beaches Council recommends that high quality erosion controls should be implemented along the entire construction footprint to minimise erosion and sedimentation impacts on Manly Dam and its sensitive bushland.

Council suggests hiring an erosion and sediment consultant during the design phase to ensure space is allocated for sediment basins and other erosion and sediment controls.

Council recommends that a working group should be established to manage sediment controls at construction sites and carry out periodic inspections to ensure controls have been maintained until surfaces are stabilised at the completion of the works.

In regard to environmental management measure FE2 included in Annexure D (Freshwater ecology impact assessment) of Appendix S (Technical working paper: Biodiversity development assessment report), Council has significant reservations about the efficacy of an erosion and sediment control plan, given numerous sediment control issues that have occurred as a result of Transport for NSW's Mona Vale Road upgrade project.

Council is of the view that erosion and sediment controls are ineffective during floods and significant storms. Council recommends that stockpiles should be located outside flood prone areas and waterfront land and be bunded and stabilised, with coverings provided for longer term piles. Stockpiles near waterways should be covered or spray sealed to prevent pollution due to runoff, where stockpiling near waterways is unavoidable.

Council notes that the Wakehurst Parkway north construction support site (BL14) at Warringah Road and Wakehurst Parkway was to be rehabilitated as part of the Northern Beaches Hospital road upgrade project. Since this site is to be converted from a temporary site facility to permanent tunnel support facilities as part of the project, Council recommends that erosion and sediment controls as well as spill containment systems be implemented at the site.

Council recommends that stormwater issues during construction needs to have a community hotline and a performance based response system, to address community concerns specifically related to erosion and sediment control matters.

Response

Erosion and sediment control measures

Erosion and sediment control measures will be implemented at all construction support sites and surface road upgrades in accordance with the principles and requirements in *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004), *Managing Urban Stormwater: Soils and Construction - Volume 2D Main Road Construction* (DECC, 2008) and relevant guidelines, procedures and specifications of Transport for NSW, as required by revised environmental management measure SG9 (refer to Table D2-1 of this submission report).

Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004) requires the consideration of site constraints when developing soil and water management measures to be applied, including but not limited to soil types, soil erodibility, soil erosion hazards and the dispersibility of soils. As such, erosion and sediment controls would be developed to consider and manage potential constraints along Wakehurst Parkway as identified by Northern Beaches Council in implementing revised environmental management measure SG9 (refer to Table D2-1 of this submissions report).

Erosion and sediment control would be carried out in compliance with any conditions of approval provided by the NSW Minister for Planning and Public Spaces, the requirements of the environment protection licence issued for the project, the soil and water management plan and the construction environmental management plan. The soil and water management plan will also contain erosion and sediment control plans, specific to each work site and work area. The effectiveness of implemented measures will be monitored regularly to identify any additional measures that need to be implemented (refer to Section D1 of this submissions report).

The construction footprint described in Section 6.8.1 of the environmental impact statement consists of the anticipated area needed for the project and includes temporary construction support sites and additional areas where work would be required to construct the project. This area also considers the space needed for installing the required environmental controls to manage construction impacts.

A number of erosion and sediment controls would be required to mitigate and manage potential erosion and sedimentation impacts from the project as discussed Section 6.5.1 of the environmental impact statement. The primary control would consist of temporary sediment basins where the erosion hazard exceeds 150 cubic metres/year (200 tonnes/year) of soil loss and would be supplemented by secondary controls as detailed in the abovementioned best management practice guidelines. The final location and size of all sediment basins would be determined during further design development and construction planning. Alternative erosion and sediment control measures would be implemented in locations where sediment basins cannot be provided because of site, soil and drainage constraints to constructing large scale sediment basins. For these catchments, smaller sediment basins, sediment sumps, mulch bunds, sediment fences or combinations of these would be used as appropriate. Further, to manage potential associated risks, these catchments would also be subject to enhanced erosion control measures and best management practice, such as limiting the size of disturbed land at any one time and ensuring disturbed areas are re-landscaped progressively.

Soil conservation specialist

A soil conservation specialist will be engaged for the duration of construction of the project to provide advice regarding erosion and sediment control including review of erosion and sediment control plans, in accordance with revised environmental management measure SG9 (refer to Table D2-1 of this submissions report).

Working group

Transport for NSW will continue to engage with Council throughout further design development and construction of the project as relevant, in accordance with the community consultation framework provided in Appendix E (Community consultation framework) and as required by environmental management measure SE3 (refer to Table D2-1 of this submissions report).

Any other consultation requirements regarding sediment controls would be determined in the project conditions of approval which is a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

Erosion and sediment controls during floods and storms

Section 4.3.2 of *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) and Section B.6 of *Managing Urban Stormwater: Volume 2D Main Road Construction* (DECC, 2008) include recommendations to site stockpiles away from waterways, to stabilise long term stockpiles and to protect stockpiles from runoff.

Spoil stockpiles will be located in areas which are not subject to frequent inundation by floodwater, ideally outside the 10 per cent AEP flood extent, in accordance with environmental management measure F8 (refer to Table D2-1 of this submission report). The exact level of flood risk accepted at stockpile sites will depend on the duration of stockpiling operations, the type of material stored, the nature of the receiving drainage lines and also the extent to which it would impact flooding conditions in adjacent development.

Erosion, sediment and spill controls at the Wakehurst Parkway north construction support site (BL14)

The site on the north-east corner of the intersection between Warringah Road and Wakehurst Parkway at Frenchs Forest is proposed to be used initially as a temporary construction support site (Wakehurst Parkway north construction support site (BL14)) and then as permanent tunnel support facilities, as shown respectively in Figure 6-42 and Figure 5-27 of the environmental impact statement.

The same site was used as the main construction support site for the Northern Beaches Hospital road upgrade project, which was completed in August 2020. Revegetation works were carried out within the Northern Beaches Hospital road upgrade project's main construction support site as part of decommissioning as discussed in Table 6-33 of the environmental impact statement. The revegetation works included planting with species consistent with the Duffys Forest endangered ecological community within the eastern section of the decommissioned construction support site. During site establishment of the Wakehurst Parkway north construction support site (BL14), this revegetated area would remain fenced off and protected from disturbance. As stated in Table 6-33, due to the timing of these recent revegetation works, the current site layout of the Wakehurst Parkway north construction support site (BL14) shown in Figure 6-42 of the environmental impact statement does not show the revegetation area. During further design development and construction planning, the temporary construction support site layout would be refined to show the revegetation area, and ensure it is avoided and protected during construction.

The new environmental management measure B41 (refer to Table D2-1 of this submissions report) requires that during site establishment of the Wakehurst Parkway north construction support site (BL14), the project will ensure that the revegetated area within the eastern section of the site (planted as part of the Northern Beaches Hospital Road Upgrade project with species consistent with Duffys Forest endangered ecological community) is fenced adequately so that it is avoided and protected from disturbance during construction. During operation, this revegetation area will continue to be protected and managed.

As noted by Council, towards the end of construction, the Wakehurst Parkway north construction support site (BL14) would be repurposed as permanent operational tunnel support facilities (refer to Section 5.2.7 of the environmental impact statement). The need for and type of environmental sediment and erosion controls required for the permanent facilities would be determined during further design development. Due to the services provided (ie a maintenance facility, incident recovery centre and materials storage), the facility is likely to include water quality and spill containment infrastructure.

Community concerns on erosion and sediment control

Transport for NSW will implement the water quality environmental management measures in Table D2-1 of this submissions report to manage risks to water quality during construction and operation of the project.

Transport for NSW would develop and implement a complaints management system before the start of construction activities for the project as detailed in Section 3 of Appendix E (Community consultation framework). The complaints management system would include establishing and maintaining a toll-free 24 hour telephone number, a postal address to which written complaints and enquires may be sent, an email address to which electronic complaints and enquiries may be transmitted, and a mediation system for complaints unable to be resolved. The complaints management system would be maintained during construction and for 12 months after the project is completed.

The project would also comply with relevant project conditions of approval in relation to complaints management.

B11.15.3 Managing contamination risks

Issue raised

Pages 28, 30

Northern Beaches Council notes that any contamination identified in sites that are under Council's care, control and management during the course of the project will be the responsibility of Transport for NSW and will have to be remediated in accordance with the *Contaminated Land Management Act 1997*.

Both Warringah Road and Mona Vale Road projects included asbestos in excavations and subsequent stockpiles. Council recommends that all excavated spoil be tested for asbestos and appropriate measures implemented to prevent the spread of contaminants.

Response

Potentially contaminated areas directly affected by the project will be further investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the *Contaminated Land Management Act 1997*, as required by revised environmental management measure SG8 (refer to Table D2-1 of this submission report). For the Northern Beaches local government area, this includes, but is not limited to, further investigation in potential areas of environmental interest within the project footprint, including Balgowlah Golf Course, Balgowlah and Wakehurst Parkway (from Seaforth to Frenchs Forest).

Subject to the outcomes of the further investigations, a Remediation Action Plan will be implemented in the event that site remediation is warranted. The Remediation Action Plan will be prepared in accordance with *Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998). If Remediation Action Plan(s) are required for works at the Balgowlah Golf Course (BL10) construction support site and surface works and construction support site locations along Wakehurst Parkway (BL12, BL13 and BL14), these will be developed with consideration of environmental management measure WM9. An independent NSW Environment Protection Authority Accredited Site Auditor will be engaged where contamination is complex to review applicable contamination reports and evaluate the suitability of sites for a specified use as part of the project. Examples of complex contamination could be where there is significant groundwater contamination, contamination that requires specialised remediation techniques or contamination that requires ongoing active management during and beyond construction.

Any contaminated material disturbed during construction would be separated from uncontaminated material on site to prevent cross contamination. Contaminated material would be encapsulated on site where possible, and in accordance with relevant regulatory requirements. Any material that is not suitable for encapsulation would be loaded into sealed and covered trucks for disposal at a suitably licensed facility. Further site investigations during the design development and construction planning phases would inform contamination management including determining where encapsulation is appropriate.

Asbestos handling, management and disposal will be carried out in accordance with relevant legislation, codes of practice and Australian standards, as required by environmental management measure SG10. It should be noted that learnings from similar recent works, especially on the Mona Vale Road project, have already been considered and carried through into planning for the project contamination investigations to be carried out during further design development (refer to revised environmental management measure SG8 above). Methods to manage any potential contamination, especially the historical fly tipping of asbestos on Wakehurst Parkway, have also been considered

Other measures that will be implemented to minimise potential contamination risks, including risks associated with asbestos, within the Northern Beaches local government area are specified in Table D2-1 of this submission report and include:

- A hazardous materials assessment will be carried out prior to and during the demolition of structures. Demolition works will be carried out in accordance with the relevant Australian Standards and relevant SafeWork NSW Work, Health and Safety Codes of Practice (revised environmental management measure SG11)
- A Construction Waste Management Plan will be prepared and implemented during construction that will include, but not be limited to, procedures for handling and storing potentially contaminated substances (environmental management measure SG12).
- Further investigations will be carried out at the Flat Rock Drive (BL2), Balgowlah Golf Course (BL10) construction support sites and surface works and construction support site locations along Wakehurst Parkway (BL12, BL13 and BL14) to determine the feasibility of encapsulation of contaminated materials on site. Where contaminated soils and other materials are to be encapsulated on-site, encapsulation will be designed in accordance with the requirements detailed in the *Guidelines for the Assessment of On-site Containment of Contaminated Soil* (Australian and New Zealand Environment and Conservation Council (ANZECC), 1999) (environmental management measure WM9)
- The discovery of previously unidentified contaminated material will be managed in accordance with an unexpected contamination discovery procedure, as outlined in the *Guideline for the Management of Contamination* (Roads and Maritime Services, 2013a) (environmental management measure SG13)
- Prior to ground disturbance in high risk acid sulfate areas at Middle Harbour, testing will be carried out to determine the presence of acid sulfate soils. If acid sulfate soils are encountered, they will be managed in accordance with the *Acid Sulfate Soil Manual* (Acid Sulfate Soils Management Advisory Committee, 1998) (environmental management measure SG14)
- Any surplus material requiring offsite disposal to land, including marine sediments unsuitable for offshore disposal, will be classified in accordance with *Waste Classification Guidelines* (EPA, 2014b) (environmental management measure WM3).

B11.15.4 Groundwater drawdown and reduced baseflows

Issue raised

Pages 28, 32

Northern Beaches Council is of the view that the classification of risks to baseflow of surface water features and groundwater dependent ecosystems due to potential groundwater drawdown as 'low' in the environmental impact statement does not seem to be in agreement with the groundwater modelling report (provided in Annexure F of Appendix N (Groundwater)), that predicts significant levels of drawdown, lowering of the water table, impacts to creek baseflows and ground settlement.

Council is concerned that mitigation measures proposed to reduce groundwater drawdown and impacts on the baseflow to Burnt Bridge Creek during construction, including groundwater monitoring, may not be effective and only consider the worst case scenario. Council is of the view that lining of the tunnel would be the most effective measure to minimise groundwater drawdown, as groundwater monitoring and the development of mitigation during construction, such as discharging groundwater into creeks, may not be effective or unsatisfactory if groundwater is discharged into a different catchment.

Council supports mitigation measures to maintain baseflow into the creeks and recommends investigation of the following measures: additional pumping of treated wastewater to the upper

reach of Burnt Bridge Creek, slow release of water through adequate detention schemes (eg a wetland network) into the catchment to promote slow release, implementation of a water-sensitive urban design strategy in the catchment affected by the drawdown to promote stormwater infiltration, a wetland to maintain the baseflow of Burnt Bridge Creek at the Balgowlah Golf Course, groundwater injection and catchment balancing.

Response

Classification of risks from reduced baseflows

As noted throughout Appendix N (Technical working paper: Groundwater) and the associated groundwater modelling report (Annexure F of Appendix N), as an assessment requirement from the Department of Planning, Industry and Environment, groundwater modelling was based on conservative (worst case) assumptions of no designed tunnel linings installed and that there would be continuous saturation (and hydraulic connectivity) between the tunnel and the shallow water table. Under these assumptions, all drawdown at tunnel depth would be realised at the surface, which could result in baseflow reduction in watercourses. In reality, however, stratification in the hydrogeological units would limit connectivity between the tunnel and the shallow water table, which would reduce vertical movement of groundwater. This means that not all drawdown at the tunnel would be realised at the surface and therefore, predicted drawdown in the vicinity of watercourses might be substantially reduced, or might not occur at all, which would reduce actual baseflow reductions compared to the predictions. Where the hydraulic connectivity between the tunnel and the shallow water table is poor, the presence or absence of tunnel linings might not have a large effect on overall drawdown.

An environmental risk analysis was carried out for the project which considered the key environmental issues identified in the Secretary's environmental assessment requirements as well as the results of the impact assessment conducted in chapters 8 to 28 of the environmental impact statement (refer to Appendix C (Environmental risk analysis)). Two ratings of risk were assessed: those being the initial risk prior to the implementation of mitigation measures and the residual risk, following implementation of the proposed mitigation measures and the likely effectiveness of those measures.

The potential impacts of groundwater drawdown, and related issues of baseflow reduction and ground settlement was assessed for both the construction and operational phases of the project. The results of the analysis are provided in Table 5 of Appendix C (Environmental risk analysis) and consider the effects of groundwater drawdown within the categories of geology, soils and groundwater as well as biodiversity.

During construction, under the category of geology, soils and groundwater, the effects of groundwater drawdown are considered an initial medium risk which reduces to low risk following the implementation of environmental management measures SG1, SG2, SG3, SG6, SG18 and SG19 (refer to Table D2-1 of this submissions report). Ground movement impacts are considered an initial low risk which remains unchanged following the implementation of proposed environmental management measures SG4, SG5 and SG7 (refer to Table D2-1 of this submissions report).

During operation, the effects of groundwater drawdown are considered to be an initial medium risk which reduces to low risk following the implementation of proposed environmental management measures SG1, SG2, SG3, SG16, SG18 and SG19 (refer to Table D2-1 of this submissions report). Ground movement impacts are considered to be an initial low risk which remains unchanged following the implementation of proposed environmental management measures SG4, SG5 and SG7 (refer to Table D2-1 of this submissions report).

During construction and operation, under the category of biodiversity, the impacts on groundwater dependent ecosystems and threatened ecological communities are considered an initial high risk which reduces to medium risk following the implementation of proposed environmental management measures SG1, SG2, SG6 and SG16 (refer to Table D2-1 of this submissions report).

The potential impacts of groundwater drawdown to surface water features and groundwater dependent ecosystems during construction and operation of the project are discussed in the following sections of the environmental impact statement:

- Potential impacts on groundwater dependent ecosystems due to saltwater intrusion, contaminant migration and activation of acid sulfate soils: Section 16.4.5 and Section 16.5.2 of the environmental impact statement
- Potential impacts of groundwater drawdown on groundwater dependent ecosystems: sections 16.4.5, 16.5.2 and 19.5.4 of the environmental impact statement and Section 5.6 of Appendix S (Technical working paper: Biodiversity development assessment report)
- Reduction in groundwater baseflow to surface water features: Section 17.4.5 and Section 17.5.6 of the environmental impact statement.

Reduced baseflow to Burnt Bridge Creek

As discussed above, the maximum groundwater drawdowns and associated impacts predicted by the groundwater modelling, including baseflow reductions, are considered to be conservative and actual impacts are likely to be less than described in the environmental impact statement. It should be noted that baseflow is only one component of streamflow. Streamflow, or surface water flow, is made up of a number of components including baseflow, which is sourced from groundwater aquifers, and quickflow, which is sourced from surface runoff. The boundary between each of these sources of water can be difficult to distinguish in practice. In general terms baseflow represents river flow sourced from groundwater aquifers. Groundwater and surface water interaction can occur from the stream to groundwater, vice versa or in both directions at different times, depending on river and groundwater levels and hydrogeologic conditions. In practice, only part of the upstream river reaches may be receiving baseflow, while other reaches may be losing water to groundwater (*Australian Rainfall and Runoff, Revision Project 7: Baseflow for Catchment Simulation* (Engineers Australia, 2009)).

Annexure D of Appendix S (Technical working paper: Biodiversity Development Assessment Report) notes that Burnt Bridge Creek is a highly modified creek, and all reaches of Burnt Bridge Creek were found to not be sensitive receiving environments. Flow in the project affected areas of Burnt Bridge Creek appeared to be intermittent with significant flow typically associated with stormwater runoff events. Downstream of the project area, Burnt Bridge Creek enters a concrete lined water canal (a stormwater system) and passes through an industrial estate and golf course (Manly Golf Club) before emptying into Manly Lagoon, which is estuarine and not reliant on freshwater inflows (streamflow and baseflow).

The *Manly Lagoon Flood Study* (BMT WBM, 2013) indicates the Burnt Bridge Creek receives stormwater flows from a large catchment of about 380 hectares, which will supplement flows even in low rainfall (refer to Section 17.3.1 of the environmental impact statement), indicating a ready supply of streamflow to help maintain water in the creek and offset any impacts from baseflow reduction. In addition, groundwater inflows to the tunnel will be collected, treated and discharged to Burnt Bridge Creek during construction, which is expected to largely offset baseflow reductions during construction, as the additional creek flows could partially feed the surrounding groundwater system.

Due to concerns raised by the community and agencies regarding the potential impact of the project on groundwater drawdown and in particular resulting baseflow reductions, revised groundwater

modelling has been carried out since exhibition of the environmental impact statement as discussed in Section A5.1.15 of this submissions report. Further information on predicted groundwater baseflow reductions and related environmental impact assessment based on the revised groundwater modelling is provided in Appendix E of this submissions report. Additional field survey of Burnt Bridge Creek was carried out to assess the nature of the creeks streambed and the potential for interaction between creek surface waters and groundwater, this information was used in the revised groundwater modelling. Revised predicted reductions in groundwater baseflow after 100 years of operation of 60 per cent in Burnt Bridge Creek are detailed in Table 3-3 of Appendix E of this submissions report, compared to a reduction of 96 per cent predicted in Table 6-10 of Appendix N (Technical working paper: Groundwater). Less baseflow reduction is predicted with the revised groundwater modelling because it includes the presence of creek linings observed during the field survey. The revised predicted reductions in baseflow has been expressed as a proportion of streamflow in Table 3-4 of Appendix E of this submissions report. The revised predicted reduction in baseflow at Burnt Bridge Creek after 100 years of operation would result in an about one per cent reduction in streamflow based on streamflow measurements made in May 2018 during the 2017 to 2019 drought period. These and other findings of the revised groundwater modelling and associated aquatic ecology, groundwater dependent ecosystem, surface water quality and socio-economic impact assessments are consistent with the findings of the environmental impact statement and confirm that the environmental management measures presented in the environmental impact statement would be sufficient to manage likely impacts.

Actual baseflow reductions would not be better known until more detailed groundwater modelling is carried out that considers more accurate information regarding the underlying hydrogeology and detailed design. Transport for NSW is currently planning additional geotechnical investigations and monitoring at key locations to gather additional hydrogeological data and the contractor/s would also carry out more detailed geotechnical assessments to inform further groundwater modelling. Updated groundwater modelling, based on the detailed design and more detailed hydrogeological information, including confirmation of tunnel lining requirements, are likely to reduce the magnitude of any potential impacts.

As more information becomes available on groundwater levels through ongoing groundwater monitoring during construction (refer to environmental management measure SG1 in Table D2-1 of this submission report), groundwater modelling will be updated during further design development to refine predictions and identify any requirements for further groundwater monitoring during the operational phase, as per revised environmental management measure SG2 (refer to Table D2-1 of this submission report). In accordance with revised environmental management measure SG2, inflow predictions will be updated prior to finalising detailed design and will include designed tunnel linings. The detailed design will then be updated based on the updated operational inflow and impact predictions. If refined predictions of groundwater levels and drawdown indicate that impacts would be greater than the impacts presented in the environmental impact statement, feasible and reasonable mitigation measures will be incorporated into the detailed design and implemented.

Following completion of revised environmental management measure SG2, a focussed study will be carried out in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Group) to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems. Where ecological impacts are predicted to be worse than that presented as part of the environmental impact statement/submissions report, feasible and reasonable mitigation measures to address the impacts will be identified in consultation with a suitably qualified and experienced specialist, incorporated into the detailed design, and implemented during construction.

The mitigation measures considered will include tunnel linings (refer to revised environmental management measure SG6 in Table D2-1 of this submission report).

In addition, measures will be implemented during tunnel construction to ensure that groundwater inflows into each tunnel during the operation phase do not exceed one litre per second per kilometre across any given kilometre (refer to revised environmental management measure SG16 in Table D2-1 of this submission report).

With the implementation of these management measures, the measures proposed in Table D2-1 of this submission report are considered to be effective in minimising potential groundwater drawdown and its associated impacts.

During operation, there would be one water treatment plant, and this would be located next to the Gore Hill Freeway (refer to Figure 17-12 of the environmental impact statement). Groundwater inflows to the tunnels during operation would be collected at the tunnel low point under Northbridge, pumped to Artarmon, treated and discharged to Flat Rock Creek from the Gore Hill Freeway wastewater treatment plant. There is no planned operational discharges into Burnt Bridge Creek.

Opportunities for water sensitive urban design will be considered during the development of the design for the stormwater management system for the new and upgraded road infrastructure and during development of the urban design and landscape plans. Identified water sensitive urban design features will be implemented where practical and with consideration to best management practice guidelines including Transport for NSW's *Water Sensitive Urban Design Guideline: Applying Water Sensitive Urban Design Principles to NSW Transport Projects* (Roads and Maritime Services, 2017a) in accordance with environmental management measure WQ5 (refer to Table D2-1 of this submissions report).

As discussed in Section B11.15.5, groundwater re-injection is not proposed by the project; instead, treated wastewater would be discharged into the local stormwater system where it would ultimately discharge to various creeks depending on the location.

Some of the other measures mentioned by Northern Beaches Council may require more land than is currently available to the project and/or disturbance of additional areas and would therefore not be practical to implement.

B11.15.5 Management of extracted and treated groundwater

Issue raised

Pages 28, 29

Northern Beaches Council is of the view that discharging extracted and treated groundwater directly into creeks will increase flows and exacerbate the impacts of wet weather flows. Council recommends addressing the stabilisation of at-risk creek banks and investigating the detainment of treated water to avoid discharge during peak flood flows and reduce downstream impacts.

Council recommends that all extracted and treated groundwater should firstly be re-injected into the source groundwater aquifer, and secondly be discharged to creeks fed from the groundwater aquifer. Council suggests that groundwater should not be extracted from one groundwater system and discharged to another, as this would cause a significant alteration of the water balance of the system.

Response

The reuse of wastewater generated during construction from groundwater infiltration, rainfall runoff, wash down runoff or heat and dust suppression would be maximised during construction works (eg

dust suppression and compaction of earthworks and pavements), as outlined in Section 17.4.3 of the environmental impact statement. Collected wastewater would be tested and treated in accordance with relevant guidelines at construction wastewater treatment plants prior to reuse or discharge.

Surplus treated wastewater that cannot be reused would be discharged to Willoughby Creek, Flat Rock Creek and Burnt Bridge Creek via the local stormwater network and to Wakehurst Golf Course dam via a constructed drainage line, as outlined in Table 17-15 of the environmental impact statement. All of these waterways currently receive stormwater inflows and have modified channels which avoid erosion. Anticipated flows in these waterways from the additional discharges of treated wastewater would be minor compared to a two-year average recurrence interval (ARI) event (refer to Section 17.4.4 of the environmental impact statement). It was concluded that the susceptibilities of the waterways to degradation as a result of increased flows is considered low based on assessment of their current stability and the relatively low level of discharges anticipated compared to existing flows.

During operation, groundwater and stormwater intercepted by the tunnel drainage systems would be collected and pumped to the Gore Hill Freeway wastewater treatment plant in the Willoughby City Council local government area for treatment. Discharge volumes from the operational wastewater treatment plant at the Gore Hill Freeway would be ultimately received by Flat Rock Creek via the local stormwater system at a flow rate of about 16 litres per second. This rate is lower than the creek flow rate under a two-year ARI flood event (20 litres per second). It is therefore considered that the Flat Rock Creek bed and banks would be resilient to the expected wastewater treatment plant flow rates without impacting the creek form and geomorphic processes (refer to Section 17.5.5 of the environmental impact statement).

Scour protection would be considered and installed where a risk of erosion is predicted as a result of the culvert/instream drainage infrastructure. The potential for scour and erosion of watercourse bed and banks will be considered during the design of new discharge outlets for both construction and operation, in accordance with revised environmental management measure WQ8 (refer to Table D2-1 of this submission report). Construction work activities within or next to the watercourses and drainage lines will be minimised as much as reasonably practical to minimise disturbance of sediments in or near the waterway.

Further design development will confirm the capacity of local stormwater systems and/or receiving waterways capacity to receive construction and operational wastewater treatment plant inflows, as required by revised environmental management measure WQ9 (refer to Table D2-1 of this submission report). If there is a stormwater infrastructure capacity issue with existing infrastructure, mitigation measures such as storage detention to control water outflow during wet weather events will be considered and implemented within the construction footprint where feasible and reasonable.

Groundwater re-injection is not proposed by the project. The net extraction of groundwater for the project represents a very small proportion of the available groundwater resource in the Hawkesbury sandstone aquifer. Therefore, the net water balances within the sandstone aquifer system are not expected to be substantially affected by the project.

B11.16 Hydrodynamics and water quality

B11.16.1 Surface water runoff management near Manly Warringah War Memorial State Park

Issue raised

Page 9

Northern Beaches Council requests that run-off from the upgraded Wakehurst Parkway and new shared path be drained away and not be allowed to sheet flow into Manly Warringah War Memorial State Park.

Response

There are currently no existing water quality controls along the section of Wakehurst Parkway being realigned and upgraded as part of the project, except for controls that form part of the Northern Beaches Hospital road upgrade project at the northern extent of the construction footprint. As a result, the existing road formation allows for sheet flow into the Manly Warringah War Memorial State Park catchment due to the lack of a pit and pipe network.

The pavement drainage system for Wakehurst Parkway as described in Section 6.2.1.4 of Appendix O (Technical working paper: Surface water quality and hydrology) has been designed to introduce a pit and pipe network that discharges stormwater to water quality basins or treatment swales before draining into the natural creeks that ultimately discharge to Bantry Bay in Middle Harbour or Manly Dam. At the northern and southern ends of the project area, pavement runoff would be discharged into the existing council drainage system. It is therefore not proposed to allow sheet flow from the project into Manly Warringah War Memorial State Park.

Transport for NSW is aware of its obligations to protect waterways in Manly Warringah War Memorial State Park and will design, plan and carry out the construction and operation of the project to meet these obligations.

Opportunities for water sensitive urban design will be considered during the development of the design for the stormwater management system and preparation of the urban design and landscape plans, in accordance with environmental management measure WQ5 (refer to Table D2-1 of this submissions report). Identified water sensitive urban design features will be implemented where practical and with consideration of best management practice guidelines including Transport for NSW's *Water Sensitive Urban Design Guideline: Applying Water Sensitive Urban Design Principles to NSW Transport Projects* (Roads and Maritime Services, 2017a).

Water quality treatment controls for stormwater will meet the design targets, where possible, in accordance with environmental management measure WQ6 (refer to Table D2-1 of this submissions report). Where the design targets cannot be met due to site constraints, water quality treatment controls will be provided to meet or improve existing surface water quality.

B11.16.2 Water pollution complaints management

Issue raised

Page 22

Northern Beaches Council recommends that a liaison/communication line be established between the contractor/s, Transport for NSW, Council's Environmental Health team and the appropriate regulatory authority for water pollution complaints. This approach is more efficient and is currently working well with other Environment Protection Authority regulated/licensed sites, such as Mona Vale Road works.

Response

Transport for NSW will implement the water quality environmental management measures in Table D2-1 of this submissions report to manage risks to water quality during construction and operation of the project.

Communication strategies for the project will be managed consistently across the NSW Government transport portfolio and in accordance with the community consultation framework for the project, as required by environmental management measure CI3 (refer to Table D2-1 of this submissions report). As part of the development of the communication strategy, Transport for NSW would engage with Council to determine appropriate communication pathways on key issues. In addition, an interface agreement would be established between Transport for NSW and Council and would provide further details on consultation protocols.

Transport for NSW would develop and implement a complaints management system before the start of construction activities for the project as detailed in Section 3 of Appendix E (Community consultation framework). It would include establishing and maintaining a toll-free 24 hour telephone number, a postal address to which written complaints and enquires may be sent, an email address to which electronic complaints and enquiries may be transmitted, and a mediation system for complaints unable to be resolved. The complaints management system would be maintained during construction and for 12 months after the project is completed. Appendix D (Utilities management strategy) also includes information on protocols for community consultation and notification of proposed utility works.

Consultation requirements regarding complaints would be determined in the project conditions of approval which is a matter for the Department of Planning, Industry and Environment to consider during its assessment of the project.

B11.16.3 Risk rating of sediment pollution

Issue raised

Page 30

Northern Beaches Council recommends that sediment pollution should be listed as ‘high’ risk as Council think that it has been the single most consistent (and poorly managed) form of pollution from other roadworks projects in the area. It should also not be listed as ‘low’ or ‘unlikely’.

Response

Soil erosion and off site sedimentation during construction has been assessed as having a ‘medium’ initial risk rating in Table 5 of Appendix C (Environmental risk analysis). With the implementation of the environmental management measures in Table D2-1 of this submissions report, any potential short-term impacts are unlikely to have any material impact on ambient water quality within the receiving waterways, as discussed in Section 17.4.6 of the environmental impact statement. The residual risk to sensitive receiving environments is expected to be ‘low’ once the management measures in Table D2-1 of this submissions report are implemented, maintained and monitored.

Transport for NSW will manage this potential impact by implementing erosion and sediment control measures at all construction support sites in accordance with revised environmental management measure SG9 (refer to Table D2-1 in this submissions report). As part of this requirement, Transport for NSW will also engage a soil conservation specialist for the duration of construction of the project to provide advice regarding erosion and sediment control including review of erosion and sediment control plans.

B11.16.4 Sedimentation of local waterways

Issue raised

Page 30

Northern Beaches Council notes that once sediment leaves work sites and enters local creeks, the contractor has no further responsibility and Council must bear the cost of clearing sediment from the waterways – a significant expense for each distinct site. Contractors on previous projects have refused to rectify the damage done by allowing sediment to enter local creek systems in the Narrabeen, Warriewood and Frenchs Forest areas. The community regularly complain about sediment build-up in creeks, as it exacerbates flood risk.

Response

Transport for NSW will implement erosion and sediment control measures at all construction support sites in accordance with revised environmental management measure SG9 (refer to Table D2-1 of this submissions report). As part of this requirement, Transport for NSW will engage a soil conservation specialist for the duration of construction of the project to provide advice regarding erosion and sediment control on site including review of erosion and sediment control plans.

Sediment basins will also be used to manage surface water runoff from the project. Sediment basins will be sized and designed in accordance with the criteria presented in Table 8-2 of Appendix O (Technical working paper: Surface water quality and hydrology) and the requirement of the environment protection licence that would be issued for the project. Sediment basins would discharge in accordance with the conditions of the environment protection licence. Sediment basin discharge impact assessments, commensurate with the potential risk and consistent with the Australian Government National Water Quality Management Strategy guidelines and *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) will be prepared to inform the criteria for discharge from sediment basins in accordance with environmental management measure WQ14 (refer to Table D2-1 of this submissions report).

B11.16.5 Sediment basin discharge

Issue raised

Page 30

Northern Beaches Council notes that sediment basin discharge is stated as being consistent with *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004), which permits total suspended solids concentrations up to 50 milligrams per litre. Council requests that discharge into sensitive receiving waters (such as Manly Creek) meet the more stringent total suspended solids criteria of section 120 of the *Protection of the Environment Operations Act 1997*.

Response

Transport for NSW will use temporary construction phase sediment basins to manage surface water runoff from the project. Sediment basins would be sized and designed in accordance with the criteria presented in Table 8-2 of Appendix O (Technical working paper: Surface water quality and hydrology) and the requirements of the environment protection licence issued for the project, whichever is more stringent.

The design criteria presented in Table 8-2 of Appendix O (Technical working paper: Surface water quality and hydrology) is consistent with the design requirements of the Soils and Construction guidelines, *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) and *Volume 2D* (DECC, 2008). The 5-day, 80th or 85th percentile rainfall depth would be used to size

the temporary construction phase sediment basins as per the requirements of *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) and *Volume 2D* (DECC, 2008). Sediment basins will discharge in accordance with the conditions of the environment protection licence. Sediment basin discharge impact assessments, commensurate with the potential risk and consistent with the Australian Government National Water Quality Management Strategy guidelines and *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004), will be prepared to inform the criteria for discharge from sediment basins in accordance with environmental management measure WQ14 (refer to Table D2-1 of this submissions report).

The temporary construction phase staging of surface works would be formalised and confirmed during the detailed planning phase of the project by the contractor/s. Until these staging works are confirmed, the sizing and location of temporary basins cannot be confirmed.

B11.16.6 Water discharges and environment protection licences

Issue raised

Page 31

Northern Beaches Council requests that, in the absence of an environment protection licence issued by the Environment Protection Authority, water discharged from work sites must be of the same quality, or better, than the quality of the receiving waters at the time of discharge.

Response

The construction contractor/s will need to obtain an environment protection licence for road construction in accordance with Chapter 3 of the *Protection of the Environment Operations Act* 1997, as noted in Section 2.2.1 and Table 17-2 of the environmental impact statement. Construction work sites are an ancillary activity to road construction and would therefore be addressed by the requirements of the environmental protection licence.

Erosion and sediment control measures will be implemented at all construction support sites and surface road upgrades in accordance with the principles and requirements in *Managing Urban Stormwater – Soils and Conservation, Volume 1* (Landcom, 2014), *Managing Urban Stormwater: Soils and Construction - Volume 2D Main Road Construction* (DECC, 2008) and relevant guidelines, procedures and specifications of Transport for NSW as outlined in revised environmental management measure SG9 (refer to Table D2-1 of this submissions report).

Included in the principles of these documents is the diversion of clean water and the capture and management of sediment laden water from the site. Temporary construction sediment basins would be used in catchments where the erosion hazard exceeds 150 cubic metres/year (200 tonnes/year) of soil loss, as discussed in Section 6.5.1 of the environmental impact statement. The final location and size of all sediment basins would be determined during further design development and construction planning. Alternative erosion and sediment control measures would be implemented in locations where sediment basins cannot be provided because of site, soil and drainage constraints to constructing large sediment basins. For these catchments, smaller sediment basins, sediment sumps, mulch bunds, sediment fences or combinations of these would be used. However, to manage potential associated risks, these catchments would also be subject to enhanced erosion control measures and best management practice, such as limiting the size of disturbed land at any one time and ensuring disturbed areas are re-landscaped progressively.

Water discharged from sediment basins will be in accordance with the conditions of the environment protection licence. Sediment basin discharge impact assessments, commensurate with the potential risk and consistent with the Australian Government National Water Quality Management Strategy guidelines and *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004)

will be prepared to inform the criteria for discharge from sediment basins in accordance with environmental management measure WQ14 (refer to Table D2-1 of this submissions report).

B11.16.7 Impact of wastewater flow on creek geomorphology and water quality at Burnt Bridge Creek and Wakehurst Parkway

Issue raised

Page 33

Northern Beaches Council requests that the overall impact of the wastewater flow on the catchment's creeks geomorphology and water quality (at Burnt Bridge Creek and Wakehurst Parkway) be considered, in addition to capacity and flood risk.

Response

Impacts on geomorphology and water quality from the construction and operation of the project are considered in Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement.

Proposed construction wastewater treatment plants are described in Table 17-15 and shown in Figure 17-7 of the environmental impact statement. Construction wastewater treatment plants are proposed at locations including the Balgowlah Golf Course construction support site (BL10) and Wakehurst Parkway east construction support site (BL13). These plants would respectively discharge to Burnt Bridge Creek and Wakehurst Golf Course dam for reuse by the golf course.

Potential surface water quality impacts including from construction wastewater treatment plants are discussed in Section 17.4.3 of the environmental impact statement. The construction wastewater treatment plants at the Balgowlah Golf Course construction support site (BL10) and the Wakehurst Parkway east construction support site (BL13) will treat wastewater generated from tunnelling activities to a standard suitable for discharge based on the ANZG (2018) and Australian and New Zealand Environment and Conservation Council/ Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) (2000) guidelines as described in revised environmental management measure WQ11 (refer to Table D2-1 of this submissions report). Construction wastewater treatment plants would be designed to maintain the water quality outcomes of the receiving ambient environment so that water quality objectives are achieved and impacts on water quality of affected catchments would be low compared to the existing pollutant loads.

Potential impacts to geomorphology during construction including from construction wastewater treatment plants are discussed in Section 17.4.4 of the environmental impact statement. Average daily treated wastewater discharges into Burnt Bridge Creek would be about 0.005 kilolitres per second for about four years. This flow is considered negligible when compared to creek flows experienced during a two-year ARI event (29.7 kilolitres per second) and is not expected to change the stability or form of Burnt Bridge Creek channel or banks. Most of the treated wastewater generated at the Wakehurst Parkway east construction support site (BL13) wastewater treatment plant would be reused. The small amount discharged would be into the drainage channel to be formed at the eastern section of the site which would naturally drain towards the Wakehurst Golf Course and golf course dam. Therefore, geomorphology impacts from treated wastewater discharges at the Wakehurst Parkway east construction support site (BL13) are not expected.

Operational wastewater treatment of water intercepted by the tunnel drainage system would occur at the Gore Hill Freeway wastewater treatment plant only. Treated wastewater would be discharged to Flat Rock Creek (in the Willoughby City Council local government area), as discussed in Section 17.5.4 and shown in Figure 17-12 of the environmental impact statement. There would be no

discharge of wastewater from the operation of the project in the Northern Beaches local government area.

B11.16.8 Operational water quality at Wakehurst Parkway

Issue raised

Page 31

Northern Beaches Council notes that the project's operational water quality design targets would not be achieved at Wakehurst Parkway. A high number of constraints have been identified, mainly related to space along this part of the project, as the road runs along the ridge line between Garigal National Park and Manly Warringah War Memorial State Park. Council recommends that off-corridor solutions be investigated to manage the quality of water discharged from the site into these sensitive catchments.

Response

There are currently no existing water quality controls along this section of Wakehurst Parkway, except for controls that form part of the Northern Beaches Hospital road upgrade project at the northern extent of the project footprint. The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model results for the Wakehurst Parkway stormwater catchments show that the project would result in a reduction in annual total suspended solids and total phosphorous loads but an increase in total annual nitrogen loading when compared to existing conditions. The MUSIC model results are detailed in full in Appendix O (Technical working paper: Surface water quality and hydrology) and Table 6-6 of Appendix O provides the results for the combined Wakehurst Parkway catchments. Some assumptions in the water quality model are conservative in the absence of field tests, which would be carried out during further design development, as described in Section 6.2.1.4 of Appendix O (Technical working paper: Surface water quality and hydrology).

Based on the overall Wakehurst Parkway catchment results, the impact on downstream locations is not considered to represent a potential adverse water quality impact and the project would not decrease the water quality of the Garigal National Park drainage lines, Bantry Bay, Manly Dam or Manly Creek.

The MUSIC model results for the two proposed water quality basins at Wakehurst Parkway are provided in Table 6-7 of Appendix O (Technical working paper: Surface water quality and hydrology). These results are consistent with the overall results for Wakehurst Parkway, ie a reduction in annual total suspended solid and total phosphorous loads, but an increase in total annual nitrogen loading, however, at a lesser scale than the overall Wakehurst Parkway catchments.

Opportunities for water sensitive urban design will be investigated during detailed design as described in environmental management measure WQ5 (refer to Table D2-1 of this submissions report).

While it is not appropriate to commit to other additional water quality treatment controls until detailed design and further refinement of the model has been carried out, additional controls could include inline proprietary water quality devices upstream of the basin. However, the final selection of the specific water quality treatment controls and the benefits they could provide will be subject to considerations including ongoing maintenance requirements, land use and property impacts and biodiversity impacts (ie additional clearing).

B11.16.9 Runoff to Trefoil Creek catchment during operation

Issue raised

Page 31

Northern Beaches Council notes that runoff from Wakehurst Parkway, north of Warringah Road, flows into Trefoil Creek and uses existing treatment and management devices installed as part of the Northern Beaches Hospital road upgrade project, which will need to be assessed to determine if they have capacity for any new works.

Response

The location of the Trefoil Creek catchment in relation to the project is shown in Figure 17-1 of the environmental impact statement. The northern portion of Beaches Link (Frenchs Forest) is in the Trefoil Creek catchment as noted in Table 17-7 of the environmental impact statement.

The existing water quality controls that form part of the Northern Beaches Hospital road upgrade project at the northern end of the project footprint are noted in Section 17.3.4 of the environmental impact statement and Section 6.2.1.4 of Appendix O (Technical working paper: Surface water quality and hydrology).

Pavement runoff from the northern end of the project area would be discharged into the existing council drainage system as noted in Section 6.2.1.4 of Appendix O (Technical working paper: Surface water quality and hydrology).

North of Warringah Road, there would be no changes to the existing areas outside the kerb lines installed by the Northern Beaches Hospital road upgrade project. There would therefore be no changes in flows to the creek at this location as a result of the project. Accordingly, no adjustment to the stormwater systems in the area north of Warringah Road would be necessary.

B11.16.10 Additional MUSIC modelling of operational water quality impacts

Issue raised

Page 32

Northern Beaches Council requests additional MUSIC investigation to progress the understanding of the project's water quality requirement to meet standards. Clarifications of the MUSIC model methodology in pre and post development scenario is requested with clear representation of the existing conditions. Council recommends a neutral or beneficial approach if the existing/post development are not meeting the pollutant reduction targets.

Response

Transport for NSW's approach to surface water quality controls for the project is consistent with Northern Beaches Council's recommendation for a neutral or beneficial approach where the design targets cannot be met.

The MUSIC modelling results presented in the environmental impact statement are preliminary and subject to further design development, as noted in Section 6.2.1 of Appendix O (Technical working paper: Surface water quality and hydrology).

Transport for NSW's approach to surface water quality controls for the project is described in Section 6.2.1 of Appendix O (Technical working paper: Surface water quality and hydrology). Where possible, water quality controls have been proposed that would meet the operational water quality design targets listed in Table 6-3 of Appendix O (Technical working paper: Surface water quality and hydrology). These targets are as described in the *Draft Managing Urban Stormwater: Council*

Handbook (Environment Protection Authority, 1997). The eWater Water Quality MUSIC model was used to predict water quality treatment outcomes.

The MUSIC model uses recorded historical rainfall data (not design events) together with user defined parameters on catchments, land use, event mean concentrations and other input parameters. Rainfall designed events are not used in the MUSIC model as the required outputs need to represent the long term impacts that are best described by the use of long term rainfall data and these outputs are expressed as average annual pollutant loads.

Where the design targets cannot be met due to site constraints, water quality treatment is proposed that would meet or improve existing conditions to ensure that there is no impact on surface water quality as a result of the project. The approach also includes the provision of accidental spill containment of up to 40 cubic metres and gross pollutant traps, where possible.

In identifying suitable surface water quality controls, site constraints have been considered including practical spatial constraints, existing structures and utilities, maintenance access and safety considerations, environmental sensitivity and clearing impacts.

Opportunities for water sensitive urban design will be investigated during detailed design as described in environmental management measure WQ5 (refer to Table D2-1 of this submissions report).

B11.16.11 Suitability and design of operational phase water quality controls

Issue raised

Pages 32, 33

Northern Beaches Council recommends land management to guarantee suitable water quality devices are installed, especially in relation to the widened Wakehurst Parkway.

Council recommends that water quality treatment should be designed with water sensitive urban design principles. Treatment chains should be sized accordingly and promote infiltration in the catchment where possible. Maintenance and access shall be integrated in the water quality structures. All swales should be vegetated and include access for maintenance.

Council requests to be involved in the design of the permanent water quality treatment device system.

Response

Good land management practices such as consideration of landform grades, soil erodibility, groundcover and rehabilitation of exposed areas can contribute to the selection of suitable water quality devices.

The requirement for stable landform grades/batters will form part of the urban design and landscape plan (refer to environmental management measure V1 in Table D2-1 of this submissions report). Selection of suitable groundcover will also form part of this plan. As required by environmental management measure V1, the urban design and landscape plan will be further developed during further design development and implemented in line with the strategic urban design framework for the project and appropriate operational mitigation measures (Appendix V (Technical working paper: Urban design, landscape character and visual impact)). The urban design and landscape plan will detail built and landscape features to be implemented during construction and rehabilitation of disturbed areas during construction of the project. The urban design and landscape plan will be made available to the public for feedback.

Land subject to temporary use, including areas of public open space, will be rehabilitated as soon as practicable to an appropriate condition in accordance with environmental management measure LP5 (refer to Table D2-1 of this submissions report).

Surface water quality controls are discussed in Section 6.2.1 of Appendix O (Technical working paper: Surface water quality and hydrology). Water quality control measures that form part of the project would include:

- New or modified drainage along modified or new surface roads at Balgowlah, Killarney Heights and Frenchs Forest
- New water quality basins within the new and improved open space and recreation facilities at Balgowlah and along Wakehurst Parkway.

The final suite of water quality controls for the project would be confirmed during further design development. Permanent surface water quality controls will be designed in accordance with the water quality environmental management measures listed in Table D2-1 of this submissions report.

The final design for the stormwater harvesting water quality basin at Balgowlah to replace the existing Balgowlah Golf Course stormwater dam will be developed during further design development in consultation with Northern Beaches Council, as required by revised environmental management measure WQ1 (refer Table D2-1 of this submissions report). A suitable alternate location and size for the basin will be determined as part of the dedicated consultation and follow on design process associated with the final layout of the new and improved public open space and recreation facilities at Balgowlah. The new stormwater basin at Balgowlah will be constructed and operational prior to the decommissioning of the existing Balgowlah Golf Course stormwater dam.

Opportunities for water sensitive urban design will be considered during the development of the design for the stormwater management system and preparation of the urban design and landscape plans, in accordance with environmental management measure WQ5 (refer to Table D2-1 of this submissions report). Identified water sensitive urban design features will be implemented where practical and with consideration to best management practice guidelines including Transport for NSW's W*ater Sensitive Urban Design Guideline: Applying Water Sensitive Urban Design Principles to NSW Transport Projects* (Roads and Maritime Services, 2017a). These guidelines include guidance on vegetation, maintenance and access.

Transport for NSW will continue to engage with Northern Beaches Council in relation to the design of permanent water quality controls throughout further design development and construction of the project as relevant, in accordance with the community consultation framework provided in Appendix E (Community consultation framework) as required by environmental management measure SE3 (refer to Table D2-1 of this submissions report).

B11.16.12 Operational phase water quality controls at Balgowlah

Issue raised

Page 32

Northern Beaches Council recommends that the water quality system effectiveness should not be compromised by the proposed open space and recreation facilities footprint at Balgowlah Golf Course, and states that there are opportunities at this location for significant benefits to be provided for creek management.

Response

The project would impact the Balgowlah Golf Course stormwater dam, and underground gross pollutant trap, as part of constructing the new access road between Sydney Road and Burnt Bridge

Creek Deviation, as discussed in Section 17.4.5 of the environmental impact statement. The stormwater dam currently functions with a dual purpose as stormwater flood detention and as a stormwater harvesting dam for the golf course. The environmental impact statement states that the Balgowlah Golf Course stormwater dam would initially be retained and maintained for construction water and irrigation of Balgowlah Oval by Northern Beaches Council. As construction progresses, the stormwater harvesting dam would be removed and the ongoing need for a stormwater harvesting water quality basin at Balgowlah would be assessed and determined during further design development.

Following consultation with Council that has occurred since exhibition of the environmental impact statement, it has been confirmed that there is an ongoing need for the existing stormwater harvesting scheme. A project refinement has been developed to reflect this change, as described in Section A4.8 of this submissions report. The existing Balgowlah Golf Course stormwater dam will not be decommissioned (although it may be slightly modified to allow construction of the whole Access Road alignment) until the new basin is commissioned, in order to:

- Continue to provide water harvesting for Balgowlah Oval irrigation
- Provide construction water for surface works
- Perform flood detention functions.

The final design for a stormwater harvesting water quality basin at Balgowlah to replace the existing Balgowlah Golf Course stormwater dam will be developed during further design development in consultation with Northern Beaches Council, as required by revised environmental management measure WQ1 (refer to Table D2-1 of this submissions report). A suitable alternate location and size for the basin will be determined as part of the dedicated consultation and follow on design process associated with the final layout of the new and improved public open space and recreation facilities at Balgowlah. The new stormwater basin will be constructed and operational prior to the decommissioning of the existing Balgowlah Golf Course stormwater dam.

The dedicated consultation process will be in accordance with revised environmental management measure LP4 (refer to Table D2-1 of this submissions report).

B11.16.13 Riparian reconstruction on Burnt Bridge Creek banks

Issue raised

Page 32

Northern Beaches Council recommends that a riparian reconstruction on Burnt Bridge Creek banks should be considered.

Response

Riparian zones refer to the vegetated lands immediately next to aquatic habitats and include riverbank vegetation. Environmental management measure B27 (refer to Table D2-1 of this submissions report) requires that aquatic habitats will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) and the *Policy and guidelines for fish habitat conservation and management* (NSW Department of Primary Industries (DPI), 2013).

During construction, the drainage and minor adjustment works associated with Burnt Bridge Creek will be staged in accordance with environmental management measure WQ13 (refer to Table D2-1 of this submissions report). This will ensure creek flows and velocities are not substantially changed and avoid downstream erosion and bed and bank stability impacts.

Following redesign of the tunnel portal location at Balgowlah, only a small area of riparian vegetation would now be removed for the localised adjustment and drainage works at Burnt Bridge Creek, as identified in Table 17-14 of the environmental impact statement. Riparian vegetation directly affected during construction would be restored where practicable to ensure that impacts to downstream aquatic habitats are minimised.

The localised adjustment of Burnt Bridge Creek will be designed in accordance with environmental management measure WQ4 (refer to Table D2-1 of this submissions report). Consideration will be given to the existing channel conditions and hydrology to minimise alterations to, and erosion of, the bed and banks. The gradient, sinuosity and channel capacity will be consistent with upstream and downstream sections. The extension to the existing culvert will be designed with a low gradient and scour protection to minimise impacts to geomorphology. Where required, the adjustment will include grade controls and bank stabilisation works to manage anticipated high velocity conditions.

Therefore, at this stage of the design, Transport for NSW is not considering a riparian reconstruction of the banks of Burnt Bridge Creek and project works would be limited to what has been described above.

B11.16.14 Assessment of operational water quality impacts to Manly Lagoon

Issue raised

Page 33

Northern Beaches Council recommends that the consideration of any environmental impacts from the proposed works should not be limited to the immediate creek environment in proximity to the works site, and should include Manly Lagoon itself, which harbours a diverse population of marine and estuarine fish species, and the final receiving waters, being Queenscliff and Manly Beach. Both beaches support large numbers of local and visiting recreational users all year round. Due to its tidal connection to the ocean, any discharges from Manly Lagoon have the potential to impact water quality on Queenscliff Beach and the Manly Beach area, consisting of the North Steyne and South Steyne beaches.

Response

Manly Lagoon is shown in Figure 4-1 of Appendix O (Technical working paper: Surface water quality and hydrology). Inflows to the lagoon come from the Burnt Bridge Creek, Manly Creek (including Manly Dam) and Brookvale Creek catchments. However, the construction footprint of the project is within the Burnt Bridge Creek and Manly Creek catchments only.

The operational surface water quality assessment at Balgowlah and Wakehurst Parkway was carried out using MUSIC modelling of the areas likely to be directly affected by the project. The model results for the combined stormwater catchments associated with the surface connections at Balgowlah indicate that the water quality of Burnt Bridge Creek would not be decreased as a result of the operation of the project. Similarly, the MUSIC model results for the Wakehurst Parkway surface road works indicate they would not decrease the water quality of Manly Dam or Manly Creek.

On this basis, the project is also not expected to worsen water quality in downstream areas such as at Manly Lagoon, Queenscliff or Manly beaches.

B11.16.15 Consideration of operational stormwater flows

Issue raised

Page 33

Northern Beaches Council recommends that not only does the capacity of the stormwater system need to be considered, but also the quantity of flows.

Response

In response to Northern Beaches Council concern about the condition and capacity of local stormwater infrastructure to receive operational flows, a new environmental management measure WQ19 (refer to Table D2-1 of the environmental impact statement) is proposed as below:

> The condition and capacity of local stormwater infrastructure to receive operational flows from the motorway component of the project will be reviewed during detailed design and as necessary, adjustments made to ensure sufficient capacity is provided. Any potential downstream stormwater/flooding impacts associated with the new and improved open space and recreation facilities at Balgowlah will be reviewed when the facilities to be constructed are agreed through the dedicated consultation process. Reasonable and feasible mitigation measures will be applied to ensure downstream impacts are minimised.

As described in Section 6.2.1.3 of Appendix O (Technical working paper: Surface water quality and hydrology), the new and improved open space and recreation facilities at Balgowlah are subject to confirmation through further community consultation and the final agreed facilities may change the final MUSIC modelling for this area and the required stormwater management design. As such, the condition and capacity of local stormwater infrastructure to receive operational flows from the new and improved open space and recreation facilities would be confirmed following the dedicated community consultation and the final agreed facilities.

B11.16.16 Inclusion of first flush areas in operational water quality basins

Issue raised

Page 47

Northern Beaches Council requests that where stormwater detention basins are constructed, they are to include a 25,000 litre first flush area that can be isolated in the event of a significant fuel or chemical incident prior to the flows entering the sensitive downstream catchments. Standard exclusion of flammable/hazardous goods within the tunnel can potentially manage this issue through the majority of the project, however, this should be considered in all surface sections of the project.

Response

Operational water quality design targets have been set for the project and include a target for up to 40 cubic metres (ie 40,000 litres) of spill containment where possible for environmentally sensitive areas (refer to Table 17-4 of the environmental impact statement). This spill containment capacity will be provided within the inlet section of the water quality/detention basin. Details would be finalised during further design development.

While the tunnel has been designed to prohibit the passage of dangerous vehicles, the tunnel design does provide some management strategies for the passage of errant dangerous good vehicles through the tunnel eg active traffic monitoring, automatic incident detection systems, fixed fire suppression, etc. With regard to the management provisions for the passage of dangerous goods on the surface roads surrounding the tunnel, in Australia, the transport of any dangerous goods on any road or rail network must be carried out in accordance with the *Australian Code for*

the Transport of Dangerous Goods by Road and Rail, Edition 7.7 (National Transport Commission, 2020). Any vehicles on surface roads associated with or adjacent to the Beaches Link tunnel and carrying dangerous goods must comply with this code.

Any spill associated with a dangerous good vehicle on any road in Australia would need to be treated by the Emergency Services in accordance with the above Code, as well as their own operational incident response plans for the classification of the goods or product spilt at the time of the incident.

Operational spill containment controls along surface roads will be confirmed during further design development in accordance with environmental management measure WQ2 (refer to Table D2-1 of this submissions report). The design of operational spill containment controls will consider:

- The environmental sensitivity of the receiving waterways
- The likelihood of vehicle accidents informed by the annual average daily traffic loading along the surface road
- Where implementation of control measures may have a negative impact on other areas of environmental importance, such as biodiversity and heritage.

B11.17 Flooding

B11.17.1 Consideration of design elements in flood modelling

Issue raised

Page 33

Northern Beaches Council is of the view that the quantitative flood impact assessment is at a preliminary concept stage. The hydraulic modelling of the proposed scenario appears to be based on the operational layout of the finalised concept design. With detailed design yet to be carried out, it is unclear whether the flood impact assessment includes detailed design elements that have the potential to impact the flood regime, such as stormwater infrastructure upgrades, noise abatement walls, retaining structures and bulk earthworks.

Response

The project design described in Chapter 5 (Project description) of the environmental impact statement was used as the input to the hydraulic models and to determine the effects of the project on flooding behaviour. Section 18.6.2 of the environmental impact statement provides a summary of the project impact on flood behaviour with further details provided in Appendix R (Technical working paper: Flooding). The flooding assessment has found that the project would generally result in a neutral or beneficial effect on flood behaviour external to the road corridor for design floods up to the 1% Annual Exceedance Probability (AEP) design flood, based on the project design as described in Chapter 5 (Project description) of the environmental impact statement.

Section 28.3 of the environmental impact statement notes that flood behaviour during operation is a project uncertainty that would have to be resolved during further design development. Further flood modelling would be carried out during further design development to confirm the level of predicted impacts and ensure appropriate mitigation measures identified for areas where higher flooding is predicted, for example the provision of flood walls and/or increased flood storage capacity, as stated in Table 28-2 of the environmental impact statement. Revised environmental management measure F2 commits to confirming, during further project development, the impact of the project on flood behaviour during operation (refer to Table D2-1 of this submission report). Further flood modelling will also include the consideration of future climate change and a partial blockage of the local

stormwater drainage system. The project will be designed such that the flood hazard in existing residential development during floods larger than 1% AEP would not be significantly increased such that there would be an increased risk to life.

B11.17.2 Blockage parameters

Issue raised

Page 34

Northern Beaches Council believes the assessment is sound with regard to tunnel entry portals being protected up to the Probable Maximum Flood (PMF) level. However, Council recommends that appropriate blockage parameters, as per the requirements of *Australian Rainfall Runoff: A Guide to Flood Estimation* (ARR 2019) (Ball et al., 2019), be included in the assessment of the flood regime, to ensure a degree of conservatism has been applied due to the potential risk to life of tunnel inundation.

Response

ARR 2019 was released during the preparation of the environmental impact statement. As a result, the procedures set out in *Australian Rainfall and Runoff: A Guide to Flood Estimati*on (ARR 1987) (Institution of Engineers Australia, 1987) have been used as the basis of carrying out the flooding investigation for the project, noting the approach is consistent with the flood studies that have been carried out to date in the catchments through which it runs. A sensitivity analysis carried out as part of the flooding assessment indicated that the adoption of the procedures set out in ARR 1987 represents a worse-case scenario in terms of assessing flood behaviour in the vicinity of the project.

The assessment of the impact that a partial blockage of the local stormwater drainage system may have on flood behaviour is provided in Section 6.6 of Appendix R (Technical working paper: Flooding). The assessment is based on the requirements of Willoughby City Council's *Technical Standard No. 3* entitled *Attachment 22 – Floodplain Management technical standard* in the *Willoughby Development Control Plan* (Willoughby City Council, 2006). This was considered a reasonable approach to apply across the project given the absence of any similar Northern Beaches Council policies.

In regard to the impact that a partial blockage would have on flood behaviour for a 1% AEP design storm event, Willoughby City Council (2016) requires a 50 per cent blockage factor to be applied to the pipes and box culverts comprising the local stormwater drainage system. This represents a case well beyond a blockage scenario which could reasonably be expected to occur.

B11.17.3 Construction impacts at Balgowlah

Issue raised

Page 34

Northern Beaches Council notes that the assessment of the construction activities on the flood regime is of a qualitative nature since the detailed design elements and construction staging and layouts are yet to be determined. However, Council is of the view that there is the likelihood of a significant rainfall event occurring during construction, considering the construction timeframe and scale of the project, and that the current assessment is therefore inadequate.

Council notes that the flooding assessment (Appendix R (Technical working paper: Flooding)) states that works at the Balgowlah Golf Course have the greatest potential for adverse impacts on flood behaviour and further notes 'Without mitigation the construction of the project has the potential to result in changes in flood behaviour that may result in social and economic cost impacts to the

community by exacerbating the impact of flooding to property and infrastructure as well as disruption to the community'.

Council recommends that a quantitative assessment of at least the 10% AEP design flood during major construction stages should be carried out to identify the potential impact on flooding for private properties and how this can be effectively mitigated.

Response

The assessment of flood risk provided in Appendix R (Technical working paper: Flooding) and Chapter 18 (Flooding) of the environmental impact statement has been prepared in accordance with the Secretary's environmental assessment requirements and consistent with contemporary standards of other recent major project infrastructure projects in NSW. This includes a qualitative impact of potential effects of flooding during the construction stage.

Section 5.2 of Appendix R (Technical working paper: Flooding) notes that while the findings of the assessment provide an indication of the potential impacts of construction activities on flood behaviour without mitigation, further investigation would need to be carried out during detailed design as layouts and staging diagrams are further developed. The assessment further states that consideration would also need to be given to setting an appropriate hydrologic standard for mitigating the impacts of construction activities on flood behaviour, taking into account their temporary nature and therefore the reduced likelihood of a flood of a given AEP occurring during the construction period.

A range of measures which will be implemented to mitigate the potential construction related impacts of the project on flood behaviour are outlined in Table D2-1 of this submission report. In accordance with environmental management measure F5, detailed construction planning will consider flood risk at construction sites and temporary construction support sites. This will include:

- A review of site layout and staging of construction activities to avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required
- Identification of measures to not worsen flood impacts on the community and on other property and infrastructure during construction up to and including the 1% AEP flood event where reasonable and feasible
- Measures to mitigate alterations to local runoff conditions due to construction activities.

Specifically, the final landform of the new and improved open space and recreation facilities at Balgowlah is subject to community consultation, as required by revised environmental management measure LP4 (refer to Table D2-1 of this submission report). Construction staging and planning at Balgowlah would be subject to the final form of this site. It is noted that the localised adjustment of Burnt Bridge Creek to facilitate an extension of the existing box culvert crossing of Burnt Bridge Creek Deviation would be staged so that flood impacts on the community and property are not worsened. As the works are all located on the downstream side of the road corridor, provided the conveyance capacity of the watercourse is not reduced at any one time by the project, then the drainage works would not result in adverse flooding conditions being experienced in the existing residential development that is located on the upstream side of the road corridor.

The impacts that are shown to occur at the Balgowlah Golf Course are a function of the assessed changes in the landform. Provided these works do not obstruct the overland flow which discharges onto the golf course from upslope areas, the project would not adversely impact flood behaviour in the existing development bordering this area.

B11.17.4 Flood risk at construction support sites

Issue raised

Page 35

The temporary construction support sites and associated facilities in Balgowlah are located within the floodplain and are exposed to a degree of flood hazard. Northern Beaches Council recommends that detailed flood emergency response plans be prepared for each site as part of the construction environmental management plan and where possible, the risk mitigated or reduced to ensure an acceptable level of flood risk, for the safety of construction personnel and other associated infrastructure.

Response

Flood emergency management measures for construction and operation of the project will be prepared in consultation with State Emergency Services and relevant councils, and incorporated into relevant environmental and/or safety management documentation, in accordance with environmental management measure F3 (refer to Table D2-1 of this submission report).

As noted above, detailed construction planning will consider flood risk at construction sites and temporary construction support sites, in accordance with environmental management measure F5 (refer Table D2-1 of this submission report). This will include:

- A review of site layout and staging of construction activities to avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required
- Identification of measures to not worsen flood impacts on the community and on other property and infrastructure during construction up to and including the 1% AEP flood event where reasonable and feasible
- Measures to mitigate alterations to local runoff conditions due to construction activities.

In addition, a soil and water management plan would likely be prepared as a sub-plan to the construction environmental management plan (refer to Part D1 of this submissions report) which would incorporate the construction flood emergency management measures mentioned above and include requirements for temporary construction support sites to manage risks to adjoining properties.

B11.17.5 Operational impacts on private property

Issue raised

Page 33

Northern Beaches Council concurs with the comprehensive requirements outlined in the Secretary's environmental assessment requirements for flooding, however, is concerned about the level of detail included in the assessment of flood risk and the potential operational impacts of the project on flooding to private properties and how this can be mitigated.

Response

The assessment of flood risk provided in Chapter 18 (Flooding) of the environmental impact statement and Appendix R (Technical working paper: Flooding) has been prepared in accordance with the Secretary's environmental assessment requirements, as outlined in Table 18-1 of the environmental impact statement. The flooding assessment (Appendix R (Technical working paper: Flooding)) therefore assesses the impacts of flooding behaviour during operation for flood events up to the PMF event, including any mitigation measures required to offset potential flood risks.

The project would generally result in a neutral or beneficial effect on flood behaviour external to the road corridor for design floods up to the 1% AEP design flood, as stated in Section 18.6.2 of the environmental impact statement. There are a few exceptions, but they do not involve inundation above floor level at any buildings.

Floor level surveys will be carried out at residential, commercial and/or industrial buildings where the peak levels of the 1% AEP design flood are predicted to increase as a result of operation of the project, in accordance with environmental management measure F1 (refer to Table D2-1 of this submission report). If the survey indicates existing buildings would experience above floor inundation during a 1% AEP event as a result of the project, further refinements will be made (as required) to the design of permanent project components to minimise the potential for impacts.

The impact of the project on flood behaviour during operation will also be confirmed during further design development to minimise flooding impacts to properties as far as practicable (refer to revised environmental management measure F2 in Table D2-1 of this submission report). This will include the consideration of future climate change and a partial blockage of the local stormwater drainage system. The project will be designed such that the flood hazard in existing residential development during floods larger than 1% AEP would not be significantly increased such that there would be an increased risk to life.

B11.17.6 Operational impacts at Burnt Bridge Creek

Issue raised

Pages 34, 35

The flood modelling for the project (refer to Appendix R (Technical working paper: Flooding)) indicates that the operational phase of the project would have significant impacts on the flood regime in both the 10% AEP and PMF events at Burnt Bridge Creek. The flooding assessment in the environmental impact statement identifies that along the main arm of Burnt Bridge Creek downstream of the Kitchener Street bridge, peak 10% AEP flood levels would be increased at six residential properties in the range of 10 to 50 millimetres. Northern Beaches Council is not supportive of the current operational impact on the flood regime. Any increase in flooding in the 10% AEP design flood to private property is not acceptable and should be mitigated prior to finalising the concept design.

The flooding assessment (Appendix R (Technical working paper: Flooding)) notes that the project has the potential to increase the depth of flooding by up to 600 millimetres in a PMF event at six residential properties located along the northern side of Kitchener Street and at the western end of Balgowlah Road, with no mitigation proposed to manage the increased residual risk above the 1% AEP flood level. Northern Beaches Council has adopted an adverse impact threshold of increasing flood depths by more than 50 millimetres for private property and is concerned that the current impacts far exceed this threshold.

Although the PMF is not used for setting design floor levels, the level is used by Council for setting and designing shelter in place refuges for private property, and for flood emergency response planning. The current flood depth increases are significant and pose an unacceptable increased flood risk to life.

Council requests that Transport for NSW undertake further modelling with flood mitigation infrastructure or amended reference designs so that there is no more than 50 millimetres increase in flood depths in a PMF event for private property.

Transport for NSW needs to confirm the extent of property acquisition in Dudley Street, Balgowlah, as the works would result in significant potential increases in flood levels for current private

properties in this area. Remaining properties not acquired require any adverse flooding impacts as a result of the project to be eliminated through effective mitigation.

Response

Flooding at Burnt Bridge Creek

The expected extent and depth of flooding in the vicinity of Burnt Bridge Creek for the 10% AEP, 1% AEP and the PMF events during operation of the project is shown in Figure 6.4 (Sheet 5 of 5), Figure 6.5 (Sheet 5 of 5) and Figure 6.6 (Sheet 5 of 5) of Appendix R (Technical working paper: Flooding) respectively. Figure 6.4 (Sheet 5 of 5) and Figure 6.6 (Sheet 5 of 5) of Appendix R (Technical working paper: Flooding) respectively have been updated to include an inset at a larger scale and property lines to more clearly show potential impacts at Burnt Bridge Creek, and is included in Appendix G of this submissions report.

Along the main arm of Burnt Bridge Creek downstream of the Kitchener Street bridge, peak 10% flood levels would experience a minor increase at six residential properties in the range 10-50 millimetres, as outlined in Section 6.2.1.1 of Appendix R (Technical working paper: Flooding). Minor increases of up to 50 millimetres in peak flood levels would be experienced at 15 residential properties that are located on either side of the road corridor in Boronia Street, Myrtle Street and Kitchener Street during a PMF event. Larger increases of up to about 600 millimetres could potentially be experienced at six residential properties that are located along the northern side of Kitchener Street and at the western end of Balgowlah Road, noting these larger impacts are confined to the immediate vicinity of Burnt Bridge Creek where it runs through the affected properties (as shown in the updated Figure 6.6 (Sheet 5 of 5) provided in Appendix G of this submissions report).

During more extreme storm events at greater intensity than 1% AEP, the project has the potential to increase peak flood levels by up to about 0.5 metres in up to six existing dwellings that are located immediately upstream of the Burnt Bridge Creek Deviation crossing of Burnt Bridge Creek, as outlined in Section 6.2.1.2 of Appendix R (Technical working paper: Flooding). While floor level survey would be required in order to assess whether the project would significantly increase the flood hazard in the six affected dwellings, it is noted that the depth of above-ground inundation associated with three of the affected dwellings exceeds two metres in a PMF event under present day conditions

Transport for NSW is obliged to ensure that the impact of the project on flood behaviour during events greater than 1% AEP in magnitude does not result in:

a) Adverse impacts on critical infrastructure (such as hospitals) and vulnerable development (such as aged care facilities and schools), and

b) Significant increases in the hazardous nature of flooding that would lead to an increased risk to life.

No land uses listed under point a) above are being adversely impacted by the project during events greater than 1% AEP. In regard to point b) above, it is considered that the impacts attributable to the project in the PMF event does not present a significant increase in the hazardous nature of flooding, with the possible exception of six residential dwellings that are located upstream of Burnt Bridge Creek Deviation.

Transport for NSW is committed to minimising and/or eliminating adverse impacts in residential developments located upstream of Burnt Bridge Creek deviation. Following exhibition of the environmental impact statement, Transport for NSW is carrying out further refinement of the Reference Design to reduce road levels at the existing creek crossing of Burnt Bridge Creek so that,

subject to final detailed design and final flood modelling, the impacts upstream of Burnt Bridge Creek Deviation can be minimised to the greatest extent possible.

Flooding impacts in other areas are considered to be minor or confined to areas where there is no development. Notwithstanding, during further design development, Transport for NSW would include appropriate mitigations within the design to ensure that there would not be an unacceptable increase in flood hazard in existing development and therefore risk to life during floods larger than 1% AEP.

It should also be considered that the final landform and associated flood modelling results downstream of the creek crossing of Burnt Bridge Creek Deviation is not final and subject to further consultation with the community and stakeholders regarding final agreed features associated with the new and improved open space and recreation facilities at Balgowlah. As such, final detailed design, including the modified basin to replace the existing golf course dam, will be subject to further consultation, final detailed design and final flood modelling. The intention would be for the new and improved open space and recreation facilities and basin to be designed to minimise where possible impacts downstream and to the northwest within North Balgowlah, once the final landform of the former Balgowlah Golf Course has been determined.

To reflect Transport for NSW's commitment to not significantly increase flooding hazard, environmental management measure F2 (refer to Table D2-1 of this submissions report) has been updated as follows:

> Impact of the project on flood behaviour during operation will be confirmed during further project development. This will include the consideration of future climate change and a partial blockage of the local stormwater drainage system. **The project will be designed such that the flood hazard in existing residential development during floods larger than 1% AEP would not be significantly increased such that there would be an increased risk to life.**

Further, new environmental management measure F10 has been developed to reflect Transport for NSW's commitment to minimise/eliminate adverse flooding impacts in residential development upstream of the Burnt Bridge Creek Deviation crossing of Burnt Bridge Creek:

> Opportunities to minimise and/or eliminate adverse impacts in residential development that is located upstream of the Burnt Bridge Creek Deviation for events greater than the 1% AEP event will be investigated during further design development. This would include refinement of road levels at the existing creek crossing of Burnt Bridge Creek, and detailed design of the new stormwater basin at Balgowlah.

This refinement is described in Section A4.10 of this submissions report.

Transport for NSW will develop a community communication strategy as outlined in Appendix E (Community consultation framework) and Section B11.6.2. Northern Beaches Council and other relevant stakeholders would be consulted regarding the outcomes of flood investigations carried out to support further design development and construction planning.

Further, flood emergency management measures for construction and operation of the project will be prepared in consultation with State Emergency Services and relevant councils and incorporated into relevant environmental and/or safety management documentation, in accordance with environmental management measure F3 (refer to Table D2-1 of this submission report).

<u>Flooding at Dudley Street</u>

Properties to be acquired in Balgowlah are outlined in Table 20-2 and shown in Figure 20-8 of the environmental impact statement. Several properties have already been acquired and other private residential properties are in the process of being acquired in Dudley Street, Balgowlah. Properties at

the southern end of Dudley Street that would not be acquired are not likely to be impacted by the 10% AEP or PMF design floods. If impacted, the indicative depth would be less than 10 millimetres.

B11.17.7 Impact on flood emergency response arrangements

Issue raised

Page 34

The project has the potential to impact the flood regime during the PMF event with increased depths of flooding for other infrastructure, such as local roads. Northern Beaches Council requests that additional investigation is carried out to determine the impact of the project on flood emergency response arrangements. This is to include an investigation of the potential impact on evacuation potential, the flood immunity of local roads, any increase in duration of inundation and the flood emergency response classification of the floodplain.

Response

In accordance with the Secretary's environmental assessment requirements, the environmental impact assessment provides an assessment of impacts that the development may have upon existing community emergency management arrangements for flooding. Section 18.6 of the environmental impact statement provides an assessment of the proposed works and its impact on transport infrastructure that may be relied upon as part of community emergency management arrangement. Further, Transport for NSW held a briefing with State Emergency Services on 17 January 2020 to brief them on the project in accordance with the Secretary's environmental assessment requirements. No issues were raised during this consultation.

During further design development, flood emergency management measures for construction and operation of the project will be prepared in consultation with State Emergency Services and relevant councils and incorporated into relevant environmental and/or safety management documentation, in accordance with environmental management measure F3 (refer to Table D2-1 of this submission report).

B11.18 Biodiversity

B11.18.1 Native vegetation impacts and increased habitat fragmentation along Wakehurst Parkway

Issue raised

Pages 8, 35, 37

Northern Beaches Council is concerned about land clearing impacts (approximately 15 hectares), most of which are associated with the construction footprint along Wakehurst Parkway.

Council is concerned about the increases in habitat fragmentation (creating a further barrier to fauna movement between east and west of Wakehurst Parkway) and indirect impacts to native vegetation adjoining the new Wakehurst Parkway roadside edge.

Response

Northern Beaches Council's concern regarding direct and indirect impacts to native vegetation and increases in habitat fragmentation as a result of project is noted.

The project design development process has considered a number of opportunities to avoid or minimise biodiversity impacts through selection of the preferred corridor and refinement of the preferred corridor design as described in Section 19.4 of the environmental impact statement.

Further detail on the opportunities to avoid or minimise biodiversity impacts is provided in Section 4 of Appendix S (Technical working paper: Biodiversity development assessment report).

The project includes the realignment and upgrade of the Wakehurst Parkway which would require the clearing of vegetation in road reserve areas along the Wakehurst Parkway. Vegetation removal, including the clearing of native vegetation and fauna habitat at Wakehurst Parkway, will be further minimised during further design development and construction planning to the extent reasonably practicable, as required by revised environmental management measure B6 (refer to Table D2-1 of this submissions report).

The realignment and upgrade of Wakehurst Parkway would increase existing fragmentation of nearby vegetation, which would potentially adversely affect the movement patterns of some fauna species. Impacts associated with increasing the existing habitat fragmentation as a result of the realignment and upgrade of Wakehurst Parkway would be minimised through the proposed fauna exclusion fencing, fauna underpasses and rope crossings which would be replaced or constructed as part of the project for the safe crossing of fauna beneath or over the road. The proposed fauna exclusion fencing along both the eastern and western edge of the realigned and upgraded Wakehurst Parkway would prevent fauna from accessing the road and being subjected to vehicle strike.

Fauna connectivity measures will be designed during further design development in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) and taking into account best available knowledge, as required by revised environmental management measure B2 (refer to Table D2-1 of this submissions report).

New edges would be created in native vegetation adjacent to the widened Wakehurst Parkway, expanding edge effects into new areas. The extent of the existing edge effects in native vegetation adjoining Wakehurst Parkway was assessed in Section 5.5.2 of Appendix S (Technical working paper: Biodiversity development assessment report). This assessment found that edge impacts such as increased weed cover and reduced native ground and shrub cover are largely limited to the area within 20 metres of the road edge.

A number of environmental management measures will be implemented to minimise potential edge impacts from the project, including re-establishment of vegetation within the construction footprint where feasible (environmental management measure B13), weed management (environmental management measure B25) and pathogen management (revised environmental management measure B26) (refer to Table D2-1 of this submissions report). The re-establishment of vegetation will be supported by the implementation of the urban design and landscape plan as required by environmental management measure V1 (refer to Table D2-1 of this submissions report). Landscaped areas of the project would be maintained by Transport for NSW, unless arrangements have been made to transfer the landscaped area to an alternative party at which point it would be responsibility of the alternative party to maintain the landscaped area.

The biodiversity offset requirements for the project are discussed in Section 19.6.1 of the environmental impact statement and detailed in Section 7 of Appendix S (Technical working paper: Biodiversity development assessment report). This includes consideration of offset requirements where impacts to native vegetation remain unavoidable, in addition to offsets for indirect impacts, such as new edge impacts. Offsets for indirect impacts are in addition to *Biodiversity Assessment Method Operational Manual – Stage 2* (NSW DPIE, 2019a) credit obligations and are at the discretion of the Minister for Planning and Public Spaces.

B11.18.2 Operational lighting impacts on fauna

Issue raised

Page 36

Northern Beaches Council requests that the project addresses the impact on fauna as a result of upgrading both the street and pedestrian lighting along the Wakehurst Parkway corridor. In addition, smart lighting systems and time-of-night lighting solutions should also be considered.

Response

The project would not include the provision of street lighting on Wakehurst Parkway, however lighting would be provided for the shared user path and underpass/shared user bridge lighting. Provision of lighting would be consistent with guidelines published by Austroads and Transport for NSW, as well as the relevant and applicable Australian Standards as described in Section 5.2.7 of the environmental impact statement.

Artificial light impacts will be minimised to the extent reasonably practicable where the project adjoins tracts of fauna habitat (eg along Wakehurst Parkway) consistent with the requirements of Australian Standard *AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting* (Standards Australia, 2019a), as required by revised environmental management measure B4 (refer to Table D2-1 of this submissions report).

In addition, while environmental management measure B4 would assist for general light impacts on fauna, designing the fauna crossings in accordance the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) as required by revised environmental management measure B2 (refer to Table D2-1 of this submissions report), would provide further consideration of the need for additional light mitigation. This may include, but not be limited to, the use of light hoods, consideration of vertical height of the lights and/or vegetation screens.

B11.18.3 Construction impacts to Grey-headed Flying-fox

Issue raised

Page 7

Northern Beaches Council is concerned about the potential indirect impacts to the Grey-headed Flying Fox Camp located immediately downstream of the Balgowlah construction footprint, such as noise and failure of riparian vegetation that might occur due to changes in hydrology.

Response

The tunnel connection to and from Burnt Bridge Creek Deviation and associated surface works was redesigned to include for various enhancements in response to community and stakeholder feedback received prior to finalisation of the environmental impact statement. As a consequence, the tunnel portal was moved further to the south which eliminated some potential noisy works, including the previously proposed demolition and reconstruction of the Kitchener Street Bridge, thereby reducing noise impacts in the immediate vicinity of the Grey-headed Flying-fox camp.

The residual construction noise impacts on the Grey-headed Flying-fox camp located in the vegetated area between Balgowlah Road and the Burnt Bridge Creek Deviation, have been assessed in Section 5.2.3.2 of Appendix S (Technical working paper: Biodiversity development assessment report). The assessment of construction noise impacts at Balgowlah determined that typical noise levels of key noise-generating construction activities during the day would be similar to, or less than, noise levels generated by existing day time road traffic noise on the Burnt Bridge Creek

Deviation. While some noise-generating construction activities are predicted in a worst case scenario to exceed existing day time road traffic noise levels on the Burnt Bridge Creek Deviation, it is anticipated that potential impacts will be minimised through the implementation of environmental management measures (refer to Table D2-1 of this submissions report) including:

- Mitigation measures such as quieter construction methods or the use of temporary noise barriers in close proximity to the construction activities will be used wherever feasible and reasonable to minimise noise impacts to the Grey-headed Flying-fox camp. For the Kitchener Street construction support site (BL11), the arrangement of the site layout will maximise acoustic shielding (ie locations of site sheds, offices and fixed structures) to minimise noise impacts from within the site to the direction of the Grey-headed Flying-fox camp (revised environmental management measure B17)
- Where feasible and reasonable, noise intensive works with the potential of impacting the Grey-headed Flying-fox camp (ie demolition involving rock hammering or resurfacing works) will be programmed to avoid September to February (revised environmental management measure B18)
- A person experienced in flying-fox behaviour, (ie able to identify each stage of the reproductive cycle, ABLV-vaccinated and trained to rescue flying-foxes if required) will monitor disturbance levels within the Grey-headed Flying-fox camp at Balgowlah during construction activities that result in noise levels at the camp that exceed the preconstruction ambient noise levels. Monitoring would occur at representative periods (eg fortnightly) while pups are being carried (August-February) (environmental management measure B19)
- Adaptive management measures to minimise impacts on Grey-headed Flying-foxes will be developed in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science) and an appropriately qualified expert in Grey-headed Flying-fox biology and behaviour, if Grey-headed Flying-fox behaviour during monitoring suggests that disturbance levels are high (environmental management measure B20).

Due to concerns raised by the community and agencies regarding the potential impact of the project on groundwater drawdown and in particular resulting reductions in baseflow to creeks, revised groundwater modelling has been carried out since exhibition of the environmental impact statement as discussed in Section A5.1.15 of this submissions report. In conjunction with this revised groundwater modelling, a more detailed ecological assessment has been carried out of the potential effects on aquatic ecosystems due to predicted reductions in baseflow at Burnt Bridge Creek 100 years after the project starts operation (refer to Annexure A of Appendix E of this submissions report). It concludes that none of the riparian zones of Burnt Bridge Creek are dependent, either entirely or in part, on the presence of groundwater for their health and/or survival and that they are most likely supported by rainfall and hence groundwater drawdown would not be expected to affect these vegetation communities.

B11.18.4 Fauna crossings along Wakehurst Parkway

Issue raised

Pages 35, 36

Northern Beaches Council understands that Transport for NSW is securing the opportunity to include fauna crossings, (eg fauna underpasses) within the design given the extremely high costs associated with retrofitting a structure. Council considers the ongoing viability of the Wakehurst Parkway Wildlife Corridor to be critical to a number of locally significant and regionally threatened species that occur within both Manly Warringah War Memorial State Park and Garigal National Park.

Council would like the opportunity to be involved in the design planning for underpasses, so that wildlife movement and genetic flow of non-flying fauna are maintained. Underpass design should service future connectivity for threatened and locally significant fauna, as well as ecosystem engineers (eg Swamp Wallaby), ie an approximate minimum height of 1.5 metres, and appropriate underpass 'habitat furniture' to encourage use and minimise predation.

Response

Impacts to terrestrial fauna connectivity have been minimised by providing a number of dedicated fauna crossings spanning Wakehurst Parkway that would provide fauna connectivity between Garigal National Park to the west and Manly Warringah War Memorial State Park to the east. Fauna fencing would be provided for the length of Wakehurst Parkway to reduce the risk of vehicle strike and fauna mortality, and guide fauna towards crossing structures.

In summary, the fauna crossings provided (or replaced) by the project as part of the realigned and upgraded Wakehurst Parkway include:

- Three new fauna underpasses (one dedicated structure and two combined drainage/fauna underpass structures)
- Three new rope crossing structures
- Three replacement rope crossing structures.

Since the exhibition of the environmental impact statement, Transport for NSW has carried out further investigations and development of the design to refine the location and type of fauna underpasses. This included investigating opportunities to optimise their location to provide a more even spread of crossings along Wakehurst Parkway and to determine if any of the combined drainage/fauna underpasses could become dedicated fauna underpasses. This was done in the context of biodiversity, design and topographical constraints. Further detail on the above fauna crossings and design refinement carried out since the exhibition of the environmental impact statement is provided in Section A4.4 of this submissions report.

The minimum height of the fauna underpasses proposed as part of the project is 1.8 metres and is provided for the combined drainage/fauna underpass at Chainage 11290 (about 1000 metres north of Kirkwood Street). The other two underpasses would have heights of 2.4 metres. The Swamp Wallaby (*Wallabia bicolor*) is one of a number of target species identified for the proposed fauna underpasses (refer to Table A4-3 of this submissions report).

Fauna connectivity measures will be designed during further design development in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) and taking into account best available knowledge as required by revised environmental management measure B2 (refer to Table D2-1 of this submissions report). This would include detailing any fauna furniture to be included to encourage use.

In addition, the design specifications of the fauna exclusion fence will be developed during further design development in accordance with revised environmental management measure B3 (refer to Table D2-1 of this submissions report), based on best available knowledge from other Transport for NSW projects (eg Pacific Highway upgrade projects) and in consultation with NSW National Parks and Wildlife Service and Northern Beaches Council.

Through the implementation of the proposed fauna connectivity measures, fauna exclusion fencing and environmental management measures proposed in Table D2-1 of this submissions report, the project would help to maintain the ongoing viability of the Wakehurst Parkway Wildlife Corridor.

B11.18.5 Fauna overpass/land bridge at Wakehurst Parkway

Issue raised

Page 36

Northern Beaches Council suggests that the project considers the inclusion of a vegetated fauna overpass or 'land-bridge' incorporated into the design of Wakehurst Parkway, in addition to the proposed fauna underpasses, to maintain the flora and fauna connectivity between the Manly Warringah War Memorial State Park and the Garigal National Park to ensure the continuing biodiversity of both areas. Studies of fauna crossing structures on arterial roads (Bond & Jones, 2008; Jones & Bond, 2010), have shown the functional importance of fauna overpasses to medium-large mammals and small woodland bird species recorded using overpasses in preferences to underpasses, or to flying over the road in the case of woodland birds.

Response

The topography along the section of Wakehurst Parkway to be realigned and upgraded provides a number of constraints to construct a land bridge for fauna connectivity. In contrast to the proposed fauna underpasses, the construction of a land bridge across Wakehurst Parkway would:

- Significantly extend the construction footprint and increase impacts on either side of the roadway to allow the land bridge to gain the necessary height to traverse Wakehurst Parkway and maintain vehicle clearances beneath, with major modifications to the landform required. The existing landform and Wakehurst Parkway alignment generally follow a ridge line with a lack of deep cuttings. As such, large connecting batters would be required to facilitate construction of a land bridge. The expansion of the construction footprint would also result in removal of additional native vegetation and threatened species habitat
- Require the roadway to be excavated to a lower level to allow the land bridge at about the existing ground level. This would significantly increase construction noise, haulage, flood mitigation works, construction costs and long-term drainage costs
- Be significantly more costly to deliver than fauna and shared user underpass solutions. As such, inclusion of a landbridge would reduce the number of other fauna crossings able to be delivered and locations where improved connectivity for fauna and shared users could be provided, thereby reducing overall effectiveness.

A review of a potential land bridge for fauna connectivity was carried out during project development. This review involved consideration of threatened species information provided in Appendix S (Technical working paper: Biodiversity development assessment report), review of the design and fauna connectivity measures proposed for the project and technical advice from suitably qualified and experienced ecologists with familiarity of Pacific Highway upgrade projects. The following is a summary of the review findings:

- Terrestrial fauna previously recorded nearby that are most likely to cross Wakehurst Parkway have been proven to successfully use fauna underpasses at various Pacific Highway upgrade projects and other Transport for NSW projects (refer to Section B4.7 of this submissions report on efficacy of fauna connectivity measures)
- Arboreal fauna previously recorded near Wakehurst Parkway (or comparable species) have all been proven to successfully use rope crossings as evidenced on various Pacific Highway upgrade projects
- Given the above, most fauna species previously recorded nearby that are likely to cross Wakehurst Parkway should be able to successfully use the rope crossings and fauna underpasses proposed for the project, especially as fauna exclusion fencing will guide terrestrial

fauna towards the underpasses, as required by revised environmental management measure B3 (refer to Table D2-1 of this submissions report)

- Landscaping of the land bridge and large connecting batters would also likely require several years to be established. As such, initial use of a land bridge would likely be reduced compared to the proposed fauna underpasses.

Given the proven success of underpasses and rope crossings and potential further impacts associated with constructing a land bridge, construction of a land bridge for fauna connectivity is not considered justified.

Transport for NSW considers that the installation of multiple fauna underpass and rope crossings as proposed for the project the best opportunity to provide safe and effective fauna connectivity along the upgraded and realigned Wakehurst Parkway. Fauna connectivity measures will be designed during further design development in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c) and taking into account best available, as required by revised environmental management measure B2 (refer to Table D2-1 of this submissions report).

B11.18.6 Post-construction monitoring of the fauna underpasses

Issue raised

Page 36

Northern Beaches Council requests a Post Completion Monitoring Study to determine the effectiveness of the fauna underpasses in allowing migration of fauna across the corridor given the relative uncertainty on impacts to genetic flow. This study should run for a period of not less than two years from practical completion, and capture data through video and visual assessment of the movement through the structures and overhead corridors. All stakeholders, including Council and NSW National Parks and Wildlife Service, are to be consulted on the formation of the study working group and the parameters for the investigative processes.

Response

An ecological monitoring program would be developed in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science) and Northern Beaches Council to determine the effectiveness of the proposed fauna connectivity measures and fauna exclusion fencing.

A new environmental management measure B44 has been developed as follows to reflect this commitment (refer to Table D2-1 of this submissions report):

Monitoring will occur during pre-construction, construction and post-construction phases of the project to determine the effectiveness of the proposed fauna connectivity measures and exclusion fencing to be provided as part of the project.

Pre-construction baseline monitoring will commence prior to project construction works impacting fauna habitat adjacent to the Wakehurst Parkway and include adequate sampling of threatened and protected targeted fauna species in line with relevant guidelines.

A construction/post-construction ecological monitoring program will be developed prior to construction in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Group) and Northern Beaches Council. The program will include monitoring of targeted fauna species, threatened or protected species, and pest species, in addition to key performance criteria that trigger the need for and feasibility of potential corrective actions. The program will consider the pre-construction baseline monitoring results

and ecological monitoring data collected for the Northern Beaches Hospital road upgrade project where relevant.

Post-construction monitoring will extend for 10 years after the opening of the project.

B11.18.7 Fauna exclusion fencing

Issue raised

Pages 36, 37

Northern Beaches Council notes that in a previous study commissioned by Transport for NSW, Wakehurst Parkway was identified as a Wildlife Roadkill Hotspot (SMEC, 2011), impacting upon Swamp Wallaby, bandicoots, birds, possums, lizards and snakes. Habitat for threatened fauna including the Heath Monitor and Eastern Pygmy-Possum were also identified within the study, suggesting these species may be victims of roadkill. Habitat modelling of these threatened species (species polygons) provided within Appendix S (Technical working paper: Biodiversity development assessment report) also supports this.

Efforts to minimise fauna roadkill are supported by Council, in particular fauna exclusion fencing along the entire alignment of the Wakehurst Parkway Wildlife Corridor, as proposed within the environmental impact statement.

Council suggests that the project includes detail of the design, location of the proposed fauna fencing, or the interaction between fencing and the underpass structure. It is assumed this information will become available at the detailed design stage of the Project for Council to provide a commentary on. Given the significance of the Wakehurst Parkway Wildlife Corridor, Council requests the opportunity to be involved in the strategic planning and design of fencing.

Response

Transport for NSW notes Northern Beaches Council's support for the proposed fauna exclusion fencing to be installed along Wakehurst Parkway as part of the project.

As noted by Council, the design specifications of the fauna exclusion fence would be developed during further design development; this would be done based on best available knowledge from other Transport for NSW projects, and in consultation with NSW National Parks and Wildlife Service and Council. This is captured in revised environmental management measure B3 (refer to Table D2-1 of this submissions report):

> Fauna exclusion fencing ~~**would**~~ **will** be designed to exclude small fauna species from the road corridor such as Eastern Pygmy-possum and will be installed for the full extent of the Wakehurst Parkway within the construction footprint. **In addition, frog fencing will be added to the fauna exclusion fencing within identified Red-crowned toadlet habitat.** The design specifications of the fauna exclusion fence will be developed during further design development including the need for access gates to manage any fauna on the **road side** ~~**roadside**~~ of the fauna exclusion fence based on best available knowledge from other Transport for NSW projects**, and in consultation with NSW National Parks and Wildlife Service and Northern Beaches Council**.

In addition, to minimise impacts to fauna during construction of project near the fauna exclusion fencing installed as part of the Northern Beaches Hospital road upgrade project, new environmental management measure B39 has been developed (refer to Table D2-1 of this submissions report):

> Removal of the existing fauna fencing installed as part of the Northern Beaches Hospital road upgrade project will be avoided where possible in overlapping construction areas. Where this is

not possible, temporary fauna fencing will be installed during construction so fauna are guided to existing underpasses and away from construction areas and/or live traffic.

Fauna connectivity measures will be designed during further design development in accordance with the *Wildlife Connectivity Guidelines: Managing wildlife connectivity of road projects* (Draft) (Roads and Maritime Services, 2011c), taking into account best available knowledge, and consider measures to facilitate the crossing of native fauna as required by revised environmental management measure B2 (refer to Table D2-1 of this submissions report). In developing the design specifications of the fauna exclusion fence as part of revised environmental management measure B3 (refer to Table D2-1 of this submissions report), further design development would include integrating fauna crossing structures with fauna exclusion fencing to guide animals towards the crossing structure and prevent access to the road. Retaining walls may be used as a barrier if they are of sufficient height and designed to avoid animals climbing the wall. In addition, at the ends of the fauna exclusion fencing, a 'return area' would be provided to guide animals back into habitat rather than onto the road.

Transport for NSW will continue to engage with Council throughout further design development and construction of the project as relevant.

B11.18.8 Installation of artificial microbat roosting habitat

Issue raised

Page 37

Northern Beaches Council notes that built structures, including culverts and bridges are potential microbat roosting habitat identified within Appendix S (Technical working paper: Biodiversity development assessment report). The impact of the reconstruction of these man-made structures has been identified as 'negligible' within Section 5.4.2 of Appendix S (Technical working paper: Biodiversity development assessment report), based on the re-establishment of this habitat following completion of construction works.

It is Council's preference that appropriate, newly constructed structures incorporate in-built microbat roosting habitat, targeting cave-dwelling microbats as implemented on other Transport for NSW projects.

Response

A diurnal inspection of accessible potential microbat roosting sites located within the study area was carried out in different locations as described in Section 2.6.2.2.2 of Appendix S (Technical working paper: Biodiversity development assessment report), which included assessment of built structures, such as culverts, within the construction footprint. Inside each structure, wall cavities, ceiling cavities, crevices and any other areas considered to contain potential microbat roosting habitat (for species known to roost in human made structures) were inspected. These areas were examined for signs of past or current microbat use (evidence of guano) and their value as roosting habitat was assessed. The outside of each structure was examined for potential microbat entry and exit points.

While there is potential for built structures within the construction footprint, including culverts and bridges, to provide potential microbat roosting habitat, surveys of these structures did not detect the presence of any roosting microbats as described in Section 3.6.2.4 of Appendix S (Technical working paper: Biodiversity development assessment report). As such, it is not considered to be required to install artificial roosting habitat for microbats in new structures built as part of the project as known roosting sites would not be impacted.

The potential risk of impacting microbats roosting within built structures impacted by the project will be managed by carrying out pre-clearing surveys of human made structures that have been

identified as potentially providing habitat for microbats and are subject to demolition or modification. This will be carried out in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a), as required by revised environmental management measure B14 and environmental management measure B23 (refer to Table D2-1 of this submissions report).

B11.18.9 Opportunities for habitat re-use

Issue raised

Page 38

Northern Beaches Council requests that the project identify opportunities for habitat reuse and augmentation in accordance with *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a), including:

- Re-use of timber for habitat enhancement and rehabilitation work. Retained timber should be for habitat augmentation within reserves in the Northern Beaches local government area
- Reuse of suitable root balls for environmental rehabilitation projects. Transport for NSW should consult with relevant stakeholders (NSW National Parks and Wildlife Service, Department of Primary Industries (Fisheries), Northern Beaches Council) to identify opportunities to re-use significant root balls for re-snagging creeks or other waterways prior to pursuing other disposal options
- Transport for NSW should explore donation of canopy leaves to conservation groups such as Taronga Zoo for Koala feed to supplement the loss of feed trees in the wake of the 2019/20 bush fires
- Any hollows removed within the Northern Beaches local government area should be salvaged and reinstalled in preference to using nest boxes. If habitat cannot be salvaged, nest boxes should be used incorporating a suitable number designed for Eastern Pygmy-possum.

Response

The potential opportunity to reuse salvaged logs from clearing activities for fauna connectivity structures and habitat enhancement measures is discussed in Section 24.3.2 of the environmental impact statement. Transport for NSW's commitment to investigating opportunities for reuse is reflected in revised environmental management measure WM8 (refer Table D2-1 of this submissions report):

> Where reasonable and feasible, salvaged logs from the clearing process will be reused on site and/or reused as part of the fauna connectivity structures with consideration of the *Guide 5: Re-use of woody debris and bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). **Prior to clearing, local community restoration/rehabilitation groups, Landcare groups, relevant councils and National Parks and Wildlife Service will be consulted with to determine if there is an interest in the reuse of suitable timber and root balls not used by the project for habitat enhancement and rehabilitation work. If there is an interest, Transport for NSW will facilitate collection of native trees (greater than 25-30 centimetres in diameter and three metres in length) and root balls where reasonable and feasible.**

Northern Beaches Council's suggestion to reuse hollows as nest boxes for the project is noted. The project would impact two hollow-bearing trees as discussed in Section 19.5.2 of the environmental impact statement. As such, a nest box program would not be implemented as part of the project due to minimal impacts to hollows. However, native vegetation impacts, including fauna habitat loss, will be offset through the provision of credits under the *Biodiversity Assessment Method Operational*

Manual – Stage 2 (NSW DPIE, 2019a) requirements (refer to Section 19.6.1 of the environmental impact statement).

B11.18.10 Offset requirements at Wakehurst Parkway north construction support site (BL14)

Issue raised

Page 11

Northern Beaches Council understands that the Wakehurst Parkway north construction support site (BL14) at Warringah Road and Wakehurst Parkway was to be rehabilitated as part of the Northern Beaches Hospital road upgrade project. Since this site is to be converted from a temporary site facility to a permanent fixture as part of the project, Council recommends that appropriate biodiversity offsets be included elsewhere.

Response

The assessment of the temporary construction support site used as part of the Northern Beaches Hospital road upgrade project, where Wakehurst Parkway north construction support site (BL14) would be established, is provided in the *Northern Beaches Hospital Road Connectivity and Network Enhancements Project Concept Proposal and Stage 1: Submissions Report/Preferred Infrastructure Report* (Roads and Maritime Services, 2015e).

On completion of the Northern Beaches Hospital Road upgrade project in August 2020 revegetation works were carried out and the eastern section of the site was planted with species consistent with the Duffys Forest endangered ecological community as described in Chapter 6 (Construction work) and Chapter 19 (Biodiversity) of the environmental impact statement. The current site layout, as identified in Figure 6-42 of the environmental impact statement, does not show the revegetated area. However, during further design development and construction planning, the temporary construction support site layout would be refined to show the revegetation area, so it is avoided and protected during construction.

Accordingly, a new environmental management measure B41 has been prepared to reflect this commitment, in addition to continuing to protect and manage the revegetation area during operation (refer to Table D2-1 of this submissions report):

> During site establishment of the Wakehurst Parkway north construction support site (BL14), the project will ensure that the revegetated area within the eastern section of the site (planted as part of the Northern Beaches Hospital road upgrade project with species consistent with Duffys Forest endangered ecological community) is fenced adequately so that it is avoided and protected from disturbance during construction. During operation, this revegetation area will continue to be protected and managed.

As noted above, the existing revegetation of the site by the Northern Beaches Hospital Road upgrade project will be protected and managed during operation. Any offset requirement for vegetation impacted by the Northern Beaches Hospital Road upgrade project has been included within *Northern Beaches Hospital Connectivity and Network Enhancements Biodiversity Offset Package – Stage 3 Report* (SMEC, 2020). Biodiversity offsets required for the Beaches Link and Gore Hill Freeway Upgrade project under the NSW Biodiversity Offsets Scheme are summarised in Section 19.6.1 of the environmental impact statement. No offsets would be required for the Wakehurst Parkway north construction support site (BL14), as shown in Figure 7-1 of Appendix S (Technical working paper: Biodiversity development assessment report).

B11.18.11 Securing biodiversity offsets for the project

Issue raised

Page 37

Northern Beaches Council notes that biodiversity offsets are to be secured for the project where impacts cannot be avoided and minimised in accordance with the *Biodiversity Assessment Method Operational Manual – Stage 2* (NSW DPIE, 2019a).

Council believes that the offsets should be secured locally (ie within Northern Beaches), such that the management of these species and vegetation communities are allocated to the same or equivalent threatened entities, and their ongoing conservation is funded. Council requests that Transport for NSW undertakes significant investigation to secure offsets locally, instead of paying into the Biodiversity Conservation Trust fund.

Council understands that offset credits for several Plant Community Types (PCTs) (ecosystem) and species credits required by the project are available within Biobanking/Stewardship Sites that are located within the Northern Beaches Council local government area. Alternatively, additional credits required by the project could be retired by Transport for NSW establishing a new Stewardship Site within the Northern Beaches Council local government area.

Response

The biodiversity offset requirements for the project are discussed Section 19.6.1 of the environmental impact statement and detailed in Section 7 of Appendix S (Technical working paper: Biodiversity development assessment report).

Transport for NSW's approach to the delivery of the offsets required under the NSW Biodiversity Offsets Scheme is discussed in Section 7.3 of Appendix S (Technical working paper: Biodiversity development assessment report). It is noted the options for offsetting under the NSW Biodiversity Offsets Scheme and available to the project include one or more of the following:

- Purchase and retirement of an appropriate number and class of like-for-like biodiversity credits from landholders participating in the Biodiversity Offset Scheme
- Payment to the NSW Biodiversity Conservation Fund administered by the Biodiversity Conservation Trust. Under this model the Biodiversity Conservation Trust takes on the responsibility for purchasing the required credits.

Northern Beaches Council is within the Sydney Bioregion and the Pittwater subregion (SYB07). As at 30 July 2021, there are no ecosystem credits of any kind available for purchase within the Pittwater subregion.

Transport for NSW understands that Council has initiated discussions with the Crown Lands Division of the Department of Planning, industry and Environment and the Biodiversity Conservation Trust in April 2021 with the aim of investigating the feasibility of entering a Biodiversity Stewardship Agreement over crown land under the care, control and management of Council. Key issues being addressed include credit generation over lands with existing conservation obligations (known as additionality considerations) and reconciling existing reserve purposes (eg public recreation) within the Biodiversity Stewardship Agreement framework. As at 21 July 2021, Transport for NSW understands that preliminary discussions established that further work is required to determine whether the Biodiversity Stewardship Agreement mechanism would be appropriate for any crown lands currently in the care control and management of Council in order for the Biodiversity Stewardship Agreement application to be prepared and for the Biodiversity Stewardship Agreement

to be put in place by the Biodiversity Conservation Trust. Transport for NSW understands the timeframes for this work would extend beyond 18 months.

Consistent with the requirements of Section 7.14(4) of the *Biodiversity Conservation Act 2016*, offsets must be achieved prior to the commencement of construction impacts on biodiversity values. Consequently, Transport for NSW would make payment into the Biodiversity Conservation Fund so there are no delays to the construction and operation of the project.

Transport for NSW encourages Council to continue discussions with the Biodiversity Conservation Trust and Crown Lands with a view to establishing Biodiversity Stewardship Agreements and generating biodiversity credits. Council could then sell credits to the Biodiversity Conversation Trust who may be able to use them to meet the offset requirements resulting from Transport for NSW's Biodiversity Conservation Fund payment.

B11.18.12 Consideration of the Burnt Bridge Creek exclusion zone as part of offset calculations

Issue raised

Page 38

Northern Beaches Council notes that an 'exclusion zone' has been established at Burnt Creek Bridge in Balgowlah, which contains two threatened flora species, *Callistemon linearifolius* (Netted Bottle Brush) and *Syzygium paniculatum* (Magenta Lilly Pilly).

Council supports the establishment of the proposed exclusion zone for the purpose of minimising impacts and retaining native vegetation (including known occurrences of threatened flora). However, given the high level of fragmentation and edge effects that the exclusion zone would be subject to, it is the preference that this area is offset using the same indirect impact methodology applied in Appendix S (Technical working paper: Biodiversity development assessment report) and that additional mitigation measures are applied inclusive of supplementary planting.

Response

Transport for NSW acknowledges the support provided by Northern Beaches Council for the establishment of the proposed exclusion zone adjoining Burnt Bridge Creek.

The individuals of the two threatened species identified in this area, *Callistemon linearifolius* (Netted Bottle Brush) and *Syzygium paniculatum* (Magenta Lilly Pilly), are planted as described in Table 19-5 of the environmental impact statement. Planted threatened species are not considered to be of conservation significance and are not required to be offset under the *Biodiversity Assessment Method Operational Manual – Stage 2* (NSW DPIE, 2019a).

Further, with the addition of the exclusion zone around the riparian vegetation adjoining Burnt Bridge Creek (adjacent to the surface road works at Balgowlah), there would be minimal new edges created for this already fragmented vegetation. While it is acknowledged that some new edges may be created close to the localised adjustment to Burnt Bridge Creek, the impact is not comparable to that likely to be experienced at Wakehurst Parkway (discussed in Section 5.2.2 and Section 7 of Appendix S (Technical working paper: Biodiversity development assessment report)) as the vegetation is already fragmented and has been previously disturbed.

All areas disturbed by the project that are not required for operation, would be restored to their existing condition or in accordance with the urban design and landscape plan required by environmental management measure V1 where applicable, consistent with environmental management measure V11 (refer to Table D2-1 of this submissions report). *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing*

biodiversity on RTA projects (RTA, 2011a) will also be followed as required by environmental management measure B13 (refer to Table D2-1 of this submissions report). This would facilitate the use of an appropriate landscape treatment for any disturbed areas outside of the exclusion zone adjoining Burnt Bridge Creek. It is also noted that an urban design requirement for Burnt Bridge Creek is also to restore riparian corridor vegetation where required through appropriate selection of endemic riparian species (refer to Section 4.8.5 of Appendix V (Technical working paper: Urban design, landscape character and visual impact)).

B11.18.13 Adequacy of freshwater ecology impact assessment

Issue raised

Page 38

Northern Beaches Council suggests that a field survey is carried out to characterise freshwater ecology in the study area, as the project only includes a desktop assessment using descriptions from Appendix O (Technical working paper: Surface water quality and hydrology).

Response

The freshwater ecology impact assessment included as Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report) was prepared to address requirement 6(8) of the Secretary's environmental assessment requirements and in accordance with the following guidelines which are included as 'Current Guidelines' in the Secretary's environmental assessment requirements:

- *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW Department of Primary Industries (NSW DPI), 2013)
- *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge, 2003)
- *Aquatic Ecology in Environmental Impact Assessment – EIA Guideline Series* (Lincoln Smith, 2003).

As such, the assessment in Annexure D (Freshwater ecology impact assessment) of Appendix S (Technical working paper: Biodiversity development assessment report) is considered appropriate for the purposes of the environmental impact statement.

While no fish or macroinvertebrate sampling was carried out as part of the freshwater ecology impact assessment, aquatic habitat surveys were carried out in 2018 to assess the upstream and downstream aquatic habitat for waterways potentially impacted by the project and define their key fish habitat type and fish passage classification as described in Table 1 and Table 2 of *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013). Additional field surveys were carried out in 2020 to include waterways not included as part of the 2018 surveys.

The occurrences of aquatic fauna species have been predicted based on the availability of suitable habitat as described in Section 2 of Annexure D (Freshwater ecology impact assessment) of Appendix S (Technical working paper: Biodiversity development assessment report). This approach is consistent with the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) and a detailed aquatic survey was not considered required for the purposes of the environmental impact statement.

Notwithstanding, further field investigations of freshwater habitats and biota in Burnt Bridge Creek were carried out in May 2021 and interpreted in combination with more recent modelling of groundwater drawdown and predicted changes to baseflows to re-evaluate potential impacts to aquatic ecology (refer to Appendix E of this submissions report). The results of these investigations

indicated that upstream of the Burnt Bridge Creek Deviation the riparian corridor could be considered quasi natural. This area has evidence of active bush regeneration and is dominated by native trees and shrubs with frequent long deep pools, riffles and cascades. The riparian condition of the middle and downstream areas of the creek is either partially or highly modified. The freshwater sections of Burnt Bridge Creek were found to have severely or extremely impaired assemblages of macroinvertebrates, no native fish species and generally very few, if any, native macrophytes.

B11.18.14 Ecological impacts from reduced baseflow of Burnt Bridge Creek

Issue raised

Pages 7, 33, 39, 40

Northern Beaches Council requests that the environmental impact assessment addresses all potential hydrological and ecological impacts to Burnt Bridge Creek. Council is of the view that a reduction in baseflow of up to 96 per cent would result in permanent loss of aquatic habitat and the disappearance of associated biotic communities.

Council believes that the waterway would become a series of disconnected pools with poor water quality able to recolonise ephemeral pool habitat.

During dry periods, Council is concerned that there is the potential for these pools to dry entirely and therefore, would not function as refugia. Other possible impacts include effects of groundwater drawdown/reduced baseflow on riparian vegetation and other terrestrial flora and fauna reliant to some degree on available freshwater or aquatic communities (eg possibly microbats, insectivorous birds, etc).

Council believes that the assessment of inter-dependencies between the stormwater system and natural assets needs to consider impacts to macroinvertebrate communities in Burnt Bridge Creek, particularly as the creek is a source of food for local bat communities in Balgowlah. Pooling of the creek due to reduced baseflows could result in a change in taxa, with taxa that prefer flowing water and riffles being impacted and a subsequent increase in pollutant tolerant pool-loving taxa such as worms and snails.

Council has raised concerns with the following environmental management measures included in Annexure D (Freshwater ecology impact assessment) of Appendix S (Technical working paper: Biodiversity development assessment report):

- Environmental management measure FE1 – Permanent Loss of Freshwater Habitat: Northern Beaches Council believes that this measure does not address the potential permanent loss of freshwater habitat in Burnt Bridge Creek that could occur due to the predicted 96 per cent reduction in baseflow
- Environmental management measure FE3 – Alternations to geomorphology and natural flow regimes: Council believes that this measure does not address changes to the natural flow regime of Burnt Bridge Creek as a result of the project
- Environmental management measure FE6 – Loss of Riparian Vegetation: If subsequent analysis determines that loss of surface flow and groundwater drawdown will impact on riparian vegetation, then FE6 should reflect any mitigation measures adopted (if possible).

Council is also concerned about downstream impacts on coastal wetlands and habitats, including Manly Golf Course (located about one kilometre east of the project) that are partly fed by Burnt Bridge Creek, and may be adversely impacted by a reduction of up to 96 per cent of surface water.

Council recommends further assessment of reduced baseline flows in Burnt Bridge Creek on hydrology and ecology of downstream Manly Lagoon estuary and its associated/fringing terrestrial vegetation communities (which include endangered ecological communities).

Response

Impacts to Burnt Bridge Creek aquatic ecology

As noted throughout Appendix N (Technical working paper: Groundwater) and the associated groundwater modelling report (Annexure F of Appendix N), as an assessment requirement from the Department of Planning, Industry and Environment, groundwater modelling was based on conservative assumptions of no designed tunnel linings installed and that there would be continuous saturation (and hydraulic connectivity) between the tunnel and the shallow water table (refer to Section B11.15.4 for further discussion). Under these assumptions, all drawdown at tunnel depth would be realised at the surface, which could result in baseflow reduction in watercourses.

In reality, however, stratification in the hydrogeological units would limit connectivity between the tunnel and the shallow water table, which would reduce vertical movement of groundwater. This means that not all drawdown at the tunnel would be realised at the surface, and therefore predicted drawdown in the vicinity of watercourses might be substantially reduced, or might not occur at all, which would reduce actual baseflow reductions compared to the predictions. Where the hydraulic connectivity between the tunnel and the shallow water table is poor, the presence or absence of tunnel linings might not have a large effect on overall drawdown.

During construction, the predicted discharge quantity to Burnt Bridge Creek from the Balgowlah Golf Course construction support site (BL10) would be 428 kilolitres per day (refer to Table 5-3 of Appendix O (Technical working paper: Surface water quality and hydrology)). Based on this, the project discharges to Burnt Bridge Creek from the Balgowlah Golf Course construction support site (BL10) wastewater treatment plant would offset the loss in baseflow during construction.

As a result of the submissions received and discussions with the Department of Planning, Industry and Environment, revised groundwater modelling was carried out for the project to address concerns regarding predicted groundwater drawdown and baseflow reductions at Burnt Bridge Creek during operation (refer to Appendix E of this submissions report). As part of the revised groundwater modelling, supplementary freshwater ecology surveys were carried out to facilitate a more detailed analysis of the effect of altered baseflows on freshwater ecology as a result of predicted groundwater drawdown during construction and operation of the project (refer to Annexure A of Appendix E of this submissions report). The results of these surveys indicated that upstream of the Burnt Bridge Creek Deviation the riparian corridor could be considered quasi natural. This area has evidence of active bush regeneration and is dominated by native trees and shrubs with frequent long deep pools, riffles and cascades. The riparian condition of the middle and downstream areas of the creek is either partially or highly modified. The freshwater sections of Burnt Bridge Creek were found to have severely or extremely impaired assemblages of macroinvertebrates, no native fish species and generally very few, if any, native macrophytes.

The revised groundwater modelling indicates there would be a 60 per cent reduction in groundwater baseflow at Burnt Bridge Creek after 100 years of operation of the project, which is less than the 96 per cent groundwater baseflow reduction predicted for this creek in Table 6-10 of Appendix N (Technical working paper: Groundwater), based on the presence of creek linings observed during field surveys carried out for the revised assessment. Considering groundwater baseflow at Burnt Bridge Creek is predicted to be only two per cent of the estimated total streamflow in the creek (based on the available streamflow data collected in May 2018), the predicted reduction in groundwater baseflow to Burnt Bridge Creek after 100 years of operation would only result in about a one per cent reduction in streamflow, which is a negligible impact. The revised predicted reduction

in baseflow to Burnt Bridge Creek would not substantially alter the flow regime to the extent that it would alter instream habitat to already depauperate assemblages of aquatic macroinvertebrates, fish and macrophytes, and it was concluded that the project would not significantly impact the aquatic ecology of Burnt Bridge Creek (refer to Annexure A of Appendix E of this submissions report).

Burnt Bridge Creek is an urban intermittent waterway which receives multiple inflows of stormwater from a catchment of about 380 hectares consisting of a wide variety of land-uses, as outlined in Section 17.3.1 of the environmental impact statement. The water quality of Burnt Bridge Creek has been heavily impacted by urban development through stormwater, wastewater overflows and leachate from contaminated land, as discussed in Section 4.5.4 of Appendix O (Technical working paper: Surface water quality and hydrology).

The freshwater ecology impact assessment (refer to Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report)) notes that the surveyed (affected) reaches of Burnt Bridge Creek appear to have intermittent flow with significant flow typically associated with stormwater runoff during rainfall events. Between rainfall events there would still be some (low) flow along the waterways, with pools retained along the creek. Due to the existing nature of the creek, many of the species present would be tolerant of low flow conditions and rely on pools, which would be largely unaffected by any baseflow reductions. Outside of the pool areas, substantially reduced flows between rainfall events would be expected to alter assemblages of freshwater biota in the creek to generally include only those species that are most tolerant to low flows. In this context, the conservative (worst case) predicted baseflow reductions along Burnt Bridge Creek would not result in significant ecological impacts. There are no groundwater dependent ecosystems near Burnt Bridge Creek that would be impacted by the project, as discussed in Section 19.3.4 and Section 19.5.4 of the environmental impact statement.

Recommended environmental management measures

The recommended environmental management measures FE1, FE3 and FE6 provided in the freshwater ecology impact assessment (refer to Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report)) are measures recommended by suitably qualified specialists who prepared the assessment. Transport for NSW has generally included specialist recommendations regarding environmental management as committed environmental management measures included in Appendix Y (Compilation of environmental management measures). The environmental management measures, including any revisions or new measures following exhibition of the environmental impact statement, are included in Table D2-1 of the submissions report.

Environmental management measure SG1 and revised environmental management measures SG2, SG6 and SG16 (refer to Table D2-1 of this submissions report) incorporate the recommended environmental management measures FE1 and FE6. Environmental management measure SG1 and revised environmental management measures SG2 and SG16 requires the continuation of the existing groundwater monitoring program, updated groundwater modelling and consideration of reasonable and feasible design mitigation such as tunnel linings, to ensure groundwater inflows during the operation phase do not exceed one litre per second per kilometre across any given kilometre.

Revised environmental management measure SG6 requires a focused study to be carried out prior to construction in consultation with Department of Planning, Infrastructure and Environment (Environment, Energy and Science Group), to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek due to tunnelling and confirm potential impacts on freshwater ecology. Where ecological impacts are predicted to be worse than that

presented as part of the environmental impact statement/submissions report, feasible and reasonable mitigation measures to address the impacts will be identified in consultation with a suitably qualified and experienced specialist, incorporated into the detailed design, and implemented during construction. The mitigation measures considered will include tunnel linings.

New environmental management measure B40, revised environmental management measure WQ8 and environmental management measures WQ4 and WQ13 (refer to Table D2-1 of this submissions report) incorporate the recommended environmental management measure FE3. These environmental management measures include a number of design requirements for the localised adjustment of Burnt Bridge Creek to ensure impacts to the existing flow regime and fish passage are minimised.

Further, revised environmental management measure B6 (refer to Table D2-1 of this submissions report) aims to minimise vegetation removal to the extent where reasonably practicable.

Further discussion on the impacts of reduced baseflow for Burnt Bridge Creek is provided in Section B11.15.4 above.

Given the predicted negligible impact on streamflow of Burnt Bridge Creek and the proposed environmental management measures provided in Table D2-1 of this submissions report, Transport for NSW considers the proposed environmental management measures to be sufficient with regard to the protection of freshwater habitat and natural flow regimes of Burnt Bridge Creek.

Downstream impacts

Manly Lagoon has a catchment of about 18 square kilometres and is fed primarily by Burnt Bridge Creek, Brookvale Creek and Manly Creek (BMT WBM, 2013). The Manly Lagoon catchment is highly urbanised and its catchment also consists of a significant piped stormwater network as illustrated in Annexure A of Appendix R (Technical working paper: Flooding). While a 96 per cent (worst case) reduction in base flow to Burnt Bridge Creek has been estimated during operation, it is likely that high flows within the waterway immediately after rainfall events would continue and between rainfall events there would still be some (low) flow along the waterways (refer to Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement).

Given the above, it is unlikely the hydrology and ecology of Manly Lagoon estuary, its associated/fringing terrestrial vegetation communities (including any threatened ecological communities) and coastal wetlands and habitats, including Manly Golf Course, would be impacted as a result of the potential reduction in base flow to Burnt Bridge Creek. Downstream habitats and Manly Lagoon would still receive flows from Burnt Bridge Creek, in addition to Brookvale Creek and Manly Creek and the piped stormwater network.

B11.18.15 Further consideration of Key Threatening Processes

Issue raised

Page 39

Northern Beaches Council believes there has been inadequate assessment of two Key Threatening Processes listed under *Fisheries Management Act 1994*:

- Degradation of native riparian vegetation along NSW water courses. Assessment only considered direct removal of riparian vegetation and not potential impacts due to hydrological changes (groundwater drawdown and near complete loss of baseflow)
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams. Assessment only addressed effects of culvert extension works

and/or scour protection at Burnt Bridge Creek and has not considered impacts of groundwater drawdown which will significantly affect natural flow regime in reducing baseflow by 96 per cent.

Response

Consideration of Key Threatening Processes listed under the *Fisheries Management Act 1994* is provided in Section 4.5 of Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report).

As a result of the submissions received and discussions with the Department of Planning, Industry and Environment, revised groundwater modelling was carried out for the project to address concerns regarding predicted groundwater drawdown and baseflow reductions at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek (refer to Appendix E of this submissions report).

As part of the revised groundwater modelling, supplementary freshwater ecology surveys were carried out at Burnt Bridge Creek to facilitate a more detailed analysis of the effect of altered baseflows on freshwater ecology as a result of predicted groundwater drawdown during construction and operation of the project (refer to Annexure A of Appendix E of this submissions report). The surveys indicate that the riparian corridors of Burnt Bridge Creek appears to be in good condition, with native vegetation dominating apart from the middle and downstream areas. None of the riparian zones of Burnt Bridge Creek, including the project exclusion zone in its middle section, are dependent, either entirely or in part, on the presence of groundwater for their health and/or survival (refer to Appendix S (Technical working paper: Biodiversity development assessment report)).

The revised groundwater assessment highlights that the water flowing in creeks and watercourses, known as streamflow, is the combination of water from several sources including rainfall run-off, direct rainfall into the stream, discharge from stormwater pipes and groundwater contributions and that groundwater baseflow only represents a small proportion of total streamflow, as discussed in Section B11.15.4 above. The revised groundwater modelling further indicates that reductions in streamflow would be relatively small (a one per cent reduction at Burnt Bridge Creek) and changes to baseflow caused by groundwater drawdown would not substantially alter the flow regime in Burnt Bridge Creek.

Following completion of revised environmental management measure SG2, a focussed study will be carried out in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Group) to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems. Where ecological impacts are predicted to be worse than that presented as part of the environmental impact statement/submissions report, feasible and reasonable mitigation measures to address the impacts will be identified in consultation with a suitably qualified and experienced specialist, incorporated into the detailed design, and implemented during construction. The mitigation measures considered will include tunnel linings (refer to revised environmental management measure SG6 in Table D2-1 of this submission report).

Given the predicted negligible impact on streamflow of Burnt Bridge Creek, Flat Rock Creek and Quarry Creek and the proposed environmental management measures provided in Table D2-1 of this submissions report, Transport for NSW considers the proposed environmental management measures to be sufficient with regard to the protection of native riparian vegetation and natural flow regimes of these creeks in relation to the Key Threatening Processes listed under the *Fisheries Management Act 1994*.

B11.18.16 Impacts to Climbing Galaxias

Issue raised

Pages 39, 40

Northern Beaches Council are concerned about any decrease to water quality in Manly Creek as it is considered Type 1 highly sensitive Key Fish Habitat due to potential fish refuge. As noted in the environmental impact statement, the reach of Manly Creek upstream of Manly Dam supports a population of Climbing Galaxias (*Galaxias brevipinnis*) which have been able to complete their lifecycle entirely within the freshwater habitat above Manly Dam. While the species is not classified as threatened under State or Commonwealth legislation, it has declined in NSW. In 2001, it was included in an NSW Fisheries report as 'Threatened and Potentially Threatened Freshwater Fishes of Coastal New South Wales and the Murray-Darling Basin'. The population in Manly Creek represent the northernmost extent of the species and its loss would represent a range contraction. The species is susceptible to declines in water quality caused by increased sedimentation, contaminants and nutrients.

In addition, the assessment determined that taxa in these sections of the Wakehurst Parkway catchment are pollution tolerant and therefore, should not be significantly impacted by a further increase in nutrients or suspended solids. Council believes that the assessment should also consider cumulative impacts of declining water quality and assess against relevant tolerance limits/thresholds of Climbing Galaxias.

Response

Consideration of the impacts to Climbing Galaxias are provided In Section 19.5.3 of the environmental impact statement and Section 4.4 of Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report).

Climbing Galaxias hatch in fresh water but normally spend their larval stage in seawater and then juveniles migrate back into freshwater. The construction of Manly Dam has meant that the population above it has become land-locked, however Climbing Galaxias has managed to maintain a sustainable population above the dam without access to the sea. Based on a review of historic and more recent anecdotal information, there is evidence that it remains within the Manly Creek catchment in the tributaries of the dam and the dam itself, but not below the dam (Salkavich et al., 2002; www.smh.com.au/environment/conservation/manly-dam-s-ancient-climbing-fish-have-a-new-threat-to-scale-20200828-p55qck.html).

Water pollution is considered the main threat to Climbing Galaxias (Salkavich et al., 2002), particularly from cumulative impacts from various upstream projects such as urban development, but also potentially from construction and operation of the project. The project would not, however, require physical works within Manly Creek itself or its tributaries and while the project discharge locations (ie temporary sediment basins) for construction are not yet known, they are likely to be of a similar distance from Manly Creek to those for operation (refer to Figure 6-3 of Appendix O (Technical working paper: Surface water quality and hydrology)). As can be seen in Figure 6-3, operational discharge locations are between 300 and 650 metres from Manly Creek.

Potential construction impacts that could decrease water quality within Manly Creek are discussed in Section 19.5.3 of the environmental impact statement and detailed in Section 5.2.2 of Appendix O (Technical working paper: Surface water quality and hydrology). However, with the implementation of the environmental management measures detailed in Table D2-1 of this submissions report and temporary sediment basins, pollutant loading in discharge waters is considered to be low compared to the pollutant loading in existing waterways within affected catchments.

Treated discharges during construction would flow via ephemeral drainage lines/overland before reaching potential Climbing Galaxias habitat (ie tributaries of Manly Dam). In addition, discharge impact assessments, commensurate with the potential risk and consistent with the Australian Government National Water Quality Management Strategy guidelines and *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) will be carried out as detailed in environmental management measure WQ14 (refer to Table D2-1 of this submissions report). Any discharges from temporary construction sediment basins would be in accordance with the requirements of the project environment protection licence. This would also minimise water quality impacts during construction.

Operational phase water quality modelling (MUSIC model) results for the Wakehurst Parkway stormwater catchments show that the project would result in an overall beneficial water quality outcome during operation with a reduction in annual total suspended solid and total phosphorous loads, but an increase in total annual nitrogen loading when compared to the existing conditions. The MUSIC model results for the combined Wakehurst Parkway catchment are detailed in Table 6-6 of Appendix O (Technical working paper: Surface water quality and hydrology).

Based on the overall Wakehurst Parkway catchment results, it was concluded in Section 19.5.3 of the environmental impact statement that the impact on downstream locations would not represent a potential adverse water quality impact and the project would not decrease the water quality of Manly Creek. This can be further justified given discharge nutrient levels were estimated only for the immediate point downstream of the outlet of the basin and swale. Modelling has assumed that the exfiltration rate for the basins and swales is zero but in reality much dilution and exfiltration would be likely to occur before treated runoff reached the Manly Creek and tributaries, given there would be between 300 to 650 metres of overland flow.

Opportunities for water sensitive urban design will be investigated during detailed design as described in environmental management measure WQ5 (refer to Table D2-1 of this submissions report), which refers to consideration of best management practice guidelines such as *Water Sensitive Urban Design Guideline: Applying Water Sensitive Urban Design Principles to NSW Transport Projects* (Roads and Maritime Services, 2017a) when considering these opportunities. Water quality treatment controls for stormwater will be in accordance with environmental management measure WQ6 (refer to Table D2-1 of this submissions report).

Given the above, it is likely that impact of project discharge on the water quality of Manly Creek during construction and operation would be negligible, if any, and would likely be a very small component of overall (cumulative) impacts to water quality of Manly Creek occurring as a consequence of all other activities within or affecting the catchment. It is therefore not considered to be appropriate or necessary for Transport for NSW to carry out a more detailed assessment of cumulative impacts of declining water quality against relevant tolerance limits/thresholds of Climbing Galaxias (as recommended by Northern Beaches Council), given Transport for NSW has no control over all other activities within or influencing water quality in the Manly Creek catchment.

B11.18.17 Adequacy of aquatic biodiversity offsets

Issue raised

Page 39

Northern Beaches Council believes that the offset package for loss of aquatic habitat in Burnt Bridge Creek is inadequate. The assessment only considers offset for a 15 metre section of Burnt Bridge Creek directly affected by culvert extension and/or scour protection. According to *Policy and guidelines for fish habitat conservation and management* (NSW DPI, 2013) if freshwater habitat is to be removed or irreparably damaged, then a minimum 2:1 offset is required to help re-dress direct

and indirect impacts. In the absence of acceptable mitigation measures, Council would also seek an offset for the entire reach of Burnt Bridge Creek affected by 96 per cent reduction in baseflow in operation.

Response

In regard of aquatic fish habitat offsets, Transport for NSW has applied the requirements of the *Policy and guidelines for fish habitat conservation and management* (NSW DPI, 2013) that significant environmental impacts (direct and indirect) are to be offset by environmental compensation. In accordance with the policy, the project would offset on a minimum 2:1 basis for key fish habitat lost. A greater compensation ratio may be considered if offsets cannot be sourced in the vicinity of the impact or are not of the same habitat type as that impacted. Aquatic biodiversity offset requirements for the project are discussed in Section 19.6.1 of the environmental impact statement.

The potential impact associated with the localised adjustment of Burnt Bridge Creek (Type 2 key fish habitat) is the only impact that required consideration of offsetting in accordance with the *Policy and guidelines for fish habitat conservation and management* (NSW DPI, 2013). Final offset calculations for this impact would be carried out following further design development.

The potential impact to aquatic biodiversity, including fish habitat of Burnt Bridge Creek, as a result of reduced baseflows is discussed in Section 19.5.3 of the environmental impact statement and further considered in Section 4.2.2 and Section 4.4 of Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report) for construction and operation respectively. Further consideration of the impacts of a reduced baseflow on aquatic biodiversity is provided above in Section B11.18.144 above.

The assessment concluded the potential reduced baseflow, which has been modelled conservatively as outlined in Section B11.18.14 above, is in any event unlikely to result in a complete loss of aquatic habitat. Pools would be retained in Burnt Bridge Creek and there would still be high flows immediately after rainfall events. Between rainfall events there would still be some (low) flow along the waterways. Outside of the pool areas, substantially reduced flows between rainfall events would be expected to alter assemblages of freshwater biota in these creeks to generally include only those species that are most tolerant to low flows.

While the assessment concluded that there would be a change to fish habitat, it did not conclude there would be a loss of fish habitat due to reduced baseflows. As such, an offset is not required for potential impacts resulting from reduced baseflows at Burnt Bridge Creek under the *Policy and guidelines for fish habitat conservation and management* (NSW DPI, 2013).

Transport for NSW has carried out supplementary freshwater ecology surveys at Burnt Bridge Creek and a more detailed ecological assessment since the environmental impact statement to address concerns raised in submissions regarding predicted groundwater drawdown and baseflow reductions at Flat Rock Creek, Quarry Creek and Burnt Bridge Creek as discussed in Section B11.18.15 above and Appendix E of this submissions report. The ecological assessment of the potential effects on aquatic ecosystems due to predicted reductions in baseflow at Burnt Bridge Creek 100 years after the project starts operation concludes that none of the riparian zones of Burnt Bridge Creek are dependent, either entirely or in part, on the presence of groundwater for their health and/or survival and that they are most likely supported by rainfall and hence groundwater drawdown would not be expected to affect these vegetation communities (refer to Annexure A of Appendix E of this submissions report).

Further discussion on aquatic offsets is provided in Section B5 Department of Primary Industries (Fisheries) of this submissions report.

B11.18.18 Impacts to threatened marine species and populations

Issue raised

Pages 40, 41

Northern Beaches Council is concerned about marine ecology habitat, in particular regarding habitat in the vicinity of the planned tunnel crossing of Middle Harbour (between Northbridge and Seaforth and the Spit West Reserve construction support site (BL9)), which is home to a wide range of marine habitats and biota. Some of these are listed as threatened species under State and Commonwealth legislation and/or are sensitive to the potential hazards associated with the construction phase of the project, such as increased turbidity, sedimentation and contamination.

Local seagrass beds are highly sensitive key fish habitat and include the endangered seagrass *Posidonia australis* which is found in close proximity to the work site off Northbridge headland, Seaforth Bluff, Beauty Point and past the Spit in Sandy Bay. *Posidonia australis* is also habitat for the endangered White's Seahorse (*Hippocampus whitei*) which is particularly susceptible to localised impacts, due to life history characteristics and extremely limited mobility and home range. There is a known population of White's Seahorse on the tidal pool at Clontarf Beach. Subtidal rocky reefs are also present in the area and they support a range of sponges, macroalgae, invertebrates and fish, including the threatened Black Rockcod (*Epinephelus daemelii*).

Response

Northern Beaches Council's concern regarding impacts to sensitive marine habitats and threatened species including White's Seahorse and the Black Rockcod is noted.

A comprehensive assessment of impacts to marine biodiversity within and surrounding the construction footprint has been included in Appendix T (Technical working paper: Marine ecology). The project has been designed to avoid and minimise potential impacts on marine ecology and has included the development of the design to minimise the construction footprint as far as practicable to reduce the area of impact to marine vegetation and habitat. This is discussed in Section 19.4 of the environmental impact statement and Section 1.8 of Appendix T (Technical working paper: Marine ecology).

Threatened marine species or populations most likely to be affected by the project are those that reside, forage or transit through areas affected by construction activities. Such species may include the Black Rockcod and White's Seahorse because of their potential to reside in high and medium relief rocky reef, although only a few individuals of these species would occur in the small areas of these habitats where individuals would potentially be harmed. Some marine mammals, marine turtles and sharks could also occur in these areas. However, these habitats are generally considered suboptimal for these species.

The disturbance of threatened marine species would be temporary and limited to the construction phase, and it is considered that the potential for significant impacts to any threatened species would be minor and would not affect the viability of local populations of listed species. Notwithstanding this minor potential impact, a number of marine biodiversity environmental management measures have been included in Table D2-1 of the submissions report to manage potential impacts to the threatened marine species, including revised environmental management measures B5 and B9 and environmental management measures B37 and B38.

Patches of *Posidonia australis* endangered population are located close to construction activities associated with the Middle Harbour south cofferdam (BL7), Middle Harbour north cofferdam (BL8) and Spit West Reserve (BL9) construction support sites. No direct impact on these patches is anticipated and they are located outside of the zone of moderate impact and zone of influence for

potential turbidity and sedimentation impacts (refer to Section 5.2.12 of Appendix T (Technical working paper: Marine ecology)). Notwithstanding, a number of management measures have been developed to manage and minimise potential risks during construction, including environmental management measures WQ16, B32 and B33 and revised environmental management measure B31 (refer to Table D2-1 of the submissions report).

Specifically, the proposed dredging methodology for the project includes the provision of three types of silt curtain used at the Middle Harbour crossing to provide three layers of protection for marine biodiversity. These are described in environmental management measure WQ16 (refer to Table D2-1 of this submissions report) and include:

- Two deep draft silt curtains (one on each side of the crossing) designed with a draft of 10-12 metres placed around the dredging activities
- Shallow draft silt curtains ('Moon pools') about two to three metres deep immediately at the dredge excavation point, attached to the backhoe dredge
- Shallow silt curtains around ecologically sensitive areas (eg nearby seagrass patches and subtidal rocky reef habitat) within 25 metres of the Middle Harbour cofferdam construction support sites (BL7 and BL8) to minimise the potential impact of turbidity (suspended sediment) on sensitive marine vegetation and habitats.

As discussed below in Section B11.18.21, monitoring of dredge activities will also be carried out for the project in accordance with revised environmental management measure WQ12 (refer to Table D2-1 of this submissions report). This will include the use of real-time turbidity monitoring at both potential impact and background locations, as well as adoption of a tiered (trigger level) management approach for sensitive sites (eg subtidal rocky reef and seagrass habitats) to manage any potential impacts.

Environmental management measures B28 to B30 will be implemented to identify transit routes for vessels entering and departing from construction support sites with consideration for propeller wash and distances to sensitive marine habitats, provide exclusion zones to avoid disturbance to sensitive marine habitats and manage potential scour and wash impacts on the marine environment (refer to Table D2-1 of the submissions report).

The above measures would be supported by the implementation of a flora and fauna management plan and dredge management plan as part of the construction environmental management plan as described in Section D1 of this submissions report.

B11.18.19 Impacts to sensitive marine habitats including seagrass

Issue raised

Pages 14, 15

Northern Beaches Council recommends that temporary moorings used for the project in Middle Harbour (for work vessels or relocation of private moorings) be installed in soft sediments away from sensitive habitats such as seagrass. If there are no alternative locations, then 'seagrass-friendly' moorings should be used as an alternative to swing moorings.

Council also recommends that barges used during construction in Middle Harbour be moored away from seagrass beds to avoid impacts from shading, and that any walkways or pontoons placed over seagrass use materials (such as mesh) that would allow light to penetrate to the sea floor.

Response

As described above in Section B11.18.18, the project design and construction works have been developed to largely avoid direct impacts to seagrass and other sensitive marine habitat areas in Middle Harbour.

The temporary mooring facility for the immersed tube tunnel units is not located within any sensitive marine habitat for the project as shown in Figure 19-13 of the environmental impact statement. Given the depths at this location, it is anticipated that mooring lines and anchors would be installed in soft sediments as recommended by Northern Beaches Council. In addition, temporary mooring lines and anchors required as part of the placement of the immersed tube tunnel units at the Middle Harbour crossing location would similarly be installed in soft sediments well outside the areas of mapped sensitive marine habitats.

To further reduce the potential for direct impacts on sensitive marine habitats including seagrass from construction vessels, specific environmental management measures have been committed to by Transport for NSW. These measures include identifying transit routes for vessels entering and departing from construction support sites with consideration for propeller wash and distances to sensitive marine habitats (environmental management measure B28), and the adoption of exclusion zones to avoid disturbance to sensitive marine habitats including seagrass (environmental management measure B29). A suitable buffer distance will also be established between marine habitat and silt curtains to prevent shading of the marine vegetation from the silt curtain and avoid direct damage to seagrass and subtidal rocky reef from silt curtain movement (environmental management measure B33). The complete list of environmental management measures to protect marine habitats is provided in Table D2-1 of this submissions report.

A flora and fauna management plan would be implemented as part of the construction environmental management plan, as described in Section D1 of this submissions report. The flora and fauna management plan would include seagrass monitoring and management measures.

With regard to the relocation of private moorings, Transport for NSW (inclusive of NSW Maritime) will consult with the leaseholders of moorings that require temporary relocation to determine alternative arrangements in accordance with revised environmental management measure CTT2 (refer to Table D2-1 of this submissions report). Moorings impacted during construction will be temporarily relocated elsewhere in Middle Harbour in consultation with the leaseholder(s) and coordination with the Port Authority of NSW. Where appropriate, Transport for NSW would consider the implementation of ‘seagrass-friendly’ moorings as suggested by Council during this consultation.

B11.18.20 Potential effects of the Middle Harbour sill and low dissolved oxygen conditions

Issue raised

Page 42

Northern Beaches Council is concerned about potential effects of the Middle Harbour sill and associated low dissolved oxygen (DO) conditions. Council notes that the sill created by the immersed tube tunnels (up to 9.2 metres above seabed at its highest) would increase residence time (ie reduce tidal flushing) of near bed waters (-22 metres to -32 metres AHD) by about 50 per cent (from 1.6 to 2.4 days) for a distance of two kilometres upstream of the sill. Periods of naturally occurring low dissolved oxygen (following significant rainfall) would be more severe and longer duration than that prior to tunnel construction. Generally, rapid vertical mixing ensures that low dissolved oxygen conditions do not extend far above the seabed. When DO in bottom layers is depleted, there can be mortality to benthic fauna. Low DO can also lead to nutrient release from sediments and vertical mixing into the photic zone can stimulate algal growth at surface.

Council notes that there are two natural sills located in Middle Harbour at Grotto Point and The Spit. Council also notes that the assessment in the environmental impact statement found that although duration of depleted DO events may increase upstream of the tunnel sill, these areas are able to be re-colonised from planktonic larvae and by fauna from shallower unaffected sediments.

Council is concerned about potential effects of an additional sill in Middle Harbour. It is possible that the worsening of seabed DO conditions upstream of the tunnel, may reduce the capacity of Middle Harbour as a whole to recover from significant low DO events. It is conceivable (but ultimately unknown) that the increased residence time and severity of low DO events may reach a threshold that could significantly increase mortality of benthic fauna.

Response

The immersed tube tunnel crossing of Middle Harbour would be located around 1.5 kilometres upstream of the Spit Bridge. The depth of the channel at the proposed crossing location is particularly deep being up to 32 metres at its deepest point. Due to the profile of the harbour bed, the immersed tube tunnel units would sit both partially within in a trench closer to the shore and above the bed of the harbour towards the centre of the harbour crossing. In the centre of the harbour crossing, the immersed tube tunnel units would need to be installed on a piled foundation due to the very soft marine sediments of lower strength which occur in Middle Harbour, forming a 9.2 metre high sill above the bed of the harbour at the deepest part of the crossing. The natural sill at The Spit is at a depth of 10 metres below the water surface. The top of the immersed tube tunnel would be 22 metres below the water surface at the deepest part of the crossing.

The sill created by the tunnel would result in a permanent hydrodynamic alteration to Middle Harbour during operation of the project. The presence of the Middle Harbour immersed tube tunnel sill has the potential to impact on water quality in the marine environment by reducing the natural flushing of upstream waters, which in turn could promote conditions more favourable to the depletion of dissolved oxygen in the bottom boundary layer and may lead to longer periods of low dissolved oxygen concentrations in the near-bed waters upstream of the immersed tube tunnel. Reduced dissolved oxygen concentrations may result in the mortality to some benthic infauna and epifauna in soft sediment habitat in the deepest parts of the harbour. However, the environmental impact statement concluded that this is not considered to be a significant impact given these assemblages are already exposed to similar disturbances naturally and would be expected to be resilient to slight increases in the longevities of these disturbances through rapid recolonisation. Any depletion of dissolved oxygen in deeper waters would be rapidly mixed vertically resulting in the project having a negligible effect on dissolved oxygen in surface waters and nearshore environments.

The sill created by the immersed tube tunnels would also likely increase the rate of siltation in the deepest waters upstream of the crossing by three to four millimetres per decade. However, the siltation rate would remain within the range of sedimentation rates for Sydney Harbour and would have a negligible impact on overall sedimentation.

Following exhibition of the environmental impact statement, modelling and additional assessment has been carried out as part of the preferred infrastructure report (refer to Section 4 (Assessment of potential effects of the immersed tube tunnel sill) and Appendix A of the preferred infrastructure report). The modelling and additional assessment was carried out to confirm the findings in the environmental impact statement regarding potential changes to dissolved oxygen that could occur upstream and downstream of the immersed tube tunnels due to reduced tidal flushing and mixing and to update the findings of the marine ecology impact assessment where required.

The modelling has shown under most simulation scenarios, the immersed tube tunnels would only slightly decrease concentrations of dissolved oxygen near the bed of the harbour in deeper waters

after heavy rain from what would be expected under natural conditions and would not substantially increase the duration of occasionally naturally low dissolved oxygen concentrations. The small effects predicted would be confined to an area of deeper water in the deep basin immediately upstream of the immersed tube tunnels. The magnitude, duration, and spatial scale of the effect of the immersed tube tunnel sill to benthic fauna in these areas would not be measurable beyond natural impacts from the occasionally low dissolved oxygen events.

Given that sensitive Type 1 or Type 2 key fish habitat in the vicinity of the immersed tube tunnels, such as seagrass or subtidal rocky reef, are located in shallow water close to the shoreline of Middle Harbour, these habitats would be unaffected by any changes in dissolved oxygen levels in deeper waters downstream of the immersed tube tunnel sill.

These findings support the conclusions made in the environmental impact statement and Appendix T (Technical working paper: Marine ecology) in regard to addressing the Secretary's environmental assessment requirement 6, Part 10.

The modelling results were presented and discussed with Northern Beaches Council in a meeting on 9 August 2021, as shown in Table A2-8 of this submissions report. Further information on the modelling results is provided in Section 4 (Assessment of potential effects of the immersed tube tunnel sill) of the preferred infrastructure report.

B11.18.21 Monitoring of dredging activities

Issue raised

Pages 40, 41

Northern Beaches Council considers that the current monitoring program in Middle Harbour for the adaptive dredge management plan is inadequate. During the construction period, the monitoring scope should be expanded to include:

- Sensitive marine habitats and biota
- Contaminants in marine waters.

Observed impacts on marine ecology or presence of contaminants in water samples above identified thresholds, should trigger appropriate management responses to construction works.

Council notes that monitoring of dredge operations is limited to water quality parameters such as turbidity and suspended solids, which represent the main stressors to marine ecology (eg reduced light and increased sedimentation). The potential impact of these hazards to marine ecology was assessed by modelling dredge plume dispersion and then mapping areas of ecological impact and 'influence' based on tolerance limits to turbidity and sedimentation calculated for the aquatic biota.

Given the sensitivity and importance of marine habitats and biota in proximity to the work site – and the uncertainty and assumptions involved in plume modelling, calculation of tolerance thresholds, the efficacy of mitigation measures (eg sediment curtains) and environmental conditions during dredge operations – Council believes it would be sensible and precautionary to monitor the actual marine ecology on site rather than rely entirely on the accuracy and precision of the turbidity and total suspended solids triggers as a proxy for ecological stress.

Equally, it is important that ecological monitoring would also inform the adaptive dredge management plan. Relevant ecological thresholds should be used to trigger management action to modify dredging operation to mitigate environmental impacts.

Council also notes that a variety of contaminants occur in the upper one metre of soft sediment to be removed from the bed of the harbour during dredging. Construction activities have the potential to mobilise these contaminants.

Therefore, given the proximity of the dredge site to significant marine biota sensitive to pollution and popular locations for water-based recreation (Clontarf Beach and sailing around the Spit), Council believes it would be precautionary to verify the environmental impact statement predictions that the project would not contaminate surrounding waters and sampling for relevant contaminants is carried out as part of the water quality monitoring program.

Council believes that sampling locations should include sensitive marine habitats and popular recreational sites (eg Clontarf Tidal Pool). Contaminant thresholds should also inform the adaptive dredge management plan. Sampling should be planned to include periods (eg ebb tides or periods of high rainfall) when water from work zones could move down to popular recreational locations or sensitive marine habitats.

Response

The concerns raised by Northern Beaches Council regarding the proximity of dredging activities to sensitive marine habitats and water-based recreational areas are noted. Potential impacts to marine biodiversity associated with dredging activities is described in Section 19.5.5 of the environmental impact statement and detailed in Section 5.2 of Appendix T (Technical working paper: Marine ecology). Potential health impacts to recreational areas associated with dredging activities is described in Section 13.4.3 of the environmental impact statement. Additional site-specific consideration, including additional information in relation to potential recreational exposures to sediments in Middle Harbour, is also provided in Appendix C2 of this submissions report. Further detailed response is provided below.

<u>Dredging methodology and sensitive marine habitats</u>

Transport for NSW has developed an appropriate and effective dredging methodology for the project. The dredging methodology includes a range of measures developed to mitigate the generation and movement of suspended sediments due to dredging which would manage potential impact to nearby sensitive marine habitats. These measures include (refer to Table D2-1 of this submissions report for full environmental management measure wording):

- Design methodology to raise the level of the immersed tube tunnel and reduce dredging to one third of the amount required for a fully buried immersed tube tunnel similar to the existing Sydney Harbour Tunnel
- Restricted working hours, thereby minimising the rate of sediment disturbance (as outlined in Table 6-35 of the environmental impact statement)
- Use of a closed environmental clamshell bucket for removal of the surface layer of sediments with elevated contaminant concentrations. These buckets have been specifically designed for dredging contaminated sediments (in accordance with environmental management measure WQ16)
- The use of two 10-12 metre deep draft silt curtains around the entire dredging operation (one on each side of the crossing) (in accordance with environmental management measure WQ16)
- The use of an additional shallower silt curtain (‘Moon pool’), about two to three metres deep, attached to the dredge barge within which the dredge bucket specifically operates (as outlined in Section 6.4.4 of the environmental impact statement) (in accordance with environmental management measure WQ16)

- The use of shallow silt curtains around ecologically sensitive areas within 25 metres of the Middle Harbour cofferdam construction support sites (BL7 and BL8) that could be potentially impacted by dredging activities, to minimise the potential impact of turbidity on sensitive marine vegetation and habitats (in accordance with revised environmental management measure B31)
- Wastes (including dredge material that is not suitable for offshore disposal) will be appropriately loaded, transported and handled according to their waste classification and in a manner that prevents pollution of the surrounding environment (in accordance with revised environmental management measure WM4).

For further information on the proposed dredging methodology, refer to Appendix P (Technical working paper: Hydrodynamic and dredge plume modelling) and Appendix C1 of this submissions report.

Recreational exposures

In response to issues raised in various submissions, further assessment of potential recreational exposures to sediments in Middle Harbour has been carried out and is detailed in Appendix C2 of this submissions report.

Locations of interest around Middle Harbour, including Sailors Bay, Northbridge Park, Clive Park, Sandy Bay, The Spit, Clontarf Marina, Clontarf Baths, Clontarf Beach and Tunks Park, have been assessed to evaluate whether there are any risk issues of concern for recreational exposures to sediments disturbed by the project.

The assessment, carried out by Environmental Risk Sciences, concludes that all maximum (or worst-case) concentrations of chemicals in water as a result of the presence of suspended sediments or dissolved phase concentrations from dredging activities are well below (at least 1000 times below) recreational water guidelines at Clive Park, which is the closest recreational swimming area to the project construction works.

For further information refer to Appendix C2 of this submissions report.

Dredge Monitoring Program and construction environmental management plan

Following exhibition of the environmental impact statement, revised environmental management measure WQ12 (refer to Table D2-1 of this submissions report) has been updated as follows:

> Monitoring during dredging activities will be carried out to validate the effectiveness of mitigation measures implemented to manage potential impacts on the water quality and sensitive marine vegetation and habitats of Middle Harbour. The use of real-time turbidity monitoring at both potential impact and background locations, as well as adoption of a tiered (trigger level) management approach for sensitive sites to manage any potential impacts, will be included in a dredge monitoring program. The dredge monitoring program will be developed in consultation with an appropriately qualified and experienced specialist, DPI Fisheries and the NSW EPA prior to its implementation.

Silt curtains installed around ecologically sensitive areas will also be monitored for their effectiveness, particularly during periods of inclement weather and maintenance will be carried out when required, in accordance with environmental management measure B32 (refer to Table D2-1 of this submissions report).

Table D1-1 of this submissions report provides the likely sub-plans, along with the relevant guidelines or requirements of each plan, which would support the implementation of the overarching construction environmental management plan for the project. This includes the development of a flora and fauna management plan and a dredge management plan.

All sub-plans would be prepared based on the requirements of environmental management measures provided in Table D2-1 of this submissions report and the dredge monitoring program requirements described above would form part of the flora and fauna management plan and/or dredge management plan as required. As discussed in Section D1.1 of this submissions report, the sub-plan structure may be modified during detailed construction planning to respond more effectively to particular contractor or stakeholder requirements.

Given the above proposed construction methodology and management of dredging activities within Middle Harbour, as well as the revision to environmental management measure WQ12 (refer to Table D2-1 of this submissions report), Transport for NSW consider the proposed monitoring approach to dredging activities in Middle Harbour to be sufficient with regard to protection of sensitive marine habitats and water-based recreational areas.

B11.18.22 Pre-construction surveys for White's Seahorses (and other Syngnathids)

Issue raised

Page 42

Northern Beaches Council is concerned about environmental management measure B5 which refers to pre-construction diving surveys of potentially impacted marine habitat for threatened White's Seahorse and protected Syngnathiformes.

Council believes that relocation requires suitably qualified and experienced marine ecologists as different taxa can have different relocation requirements regarding distance and habitat. It is not enough to briefly 'train' commercial divers regardless of their experience doing construction work.

Response

Transport for NSW's commitment to carry out pre-construction surveys of potentially affected marine habitat areas to search for White's Seahorse (and other Syngnathids) and relocate them to nearby habitat is outlined in revised environmental management measure B5 (refer to Table D2-1 of this submissions report). As required by the environmental management measure, the surveys will be carried out by suitably qualified and experienced marine ecologists.

In addition, environmental management measure B5 has been revised to include the need to consult with the Department of Primary Industries (Fisheries) prior to commencement of surveys to obtain a permit under Section 37 of the *Fisheries Management Act 1994* to authorise potential relocations.

B11.18.23 Training on marine biodiversity aspects

Issue raised

Page 42

Northern Beaches Council suggests that all workers on site should be trained about the sensitive marine habitats and biota in the vicinity of the worksite as part of their induction, as well as preventing the spread of marine pest species.

Response

The requirement and scope of biodiversity awareness training for the project has been included in new environmental management measure B43 as follows (refer to Table D2-1 of this submissions report):

> Biodiversity awareness training will be provided for contractors prior to commencement of construction works to ensure an understanding of potential threatened species, populations and

ecological communities that may be impacted during the project, and the environmental management measures proposed to minimise and/or manage potential impacts including the contractor's responsibilities under the unexpected species find procedure included in *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a).

This training will be applied to terrestrial, aquatic and marine biodiversity aspects.

Table D2-1 of this submissions report provides a number of environmental management measures to manage impacts to sensitive marine habitats and marine fauna species and to assist in preventing the spread of marine pest species. As noted above, biodiversity awareness training will include an understanding of the environmental management measures.

B11.19 Land use and property

B11.19.1 Public open space

Issue raised

Pages 8, 11

Works and assets delivered along Wakehurst Parkway must be wholly contained within the Wakehurst Parkway road corridor and not take place on, or encumber in any way, Manly Warringah War Memorial State Park, without prior agreement from Northern Beaches Council as Reserve Trust Manager. The Wakehurst Parkway east construction support site (BL13) must also be wholly contained within the approved site and have no encumbrance on Manly Warringah War Memorial State Park.

Response

Consultation carried out with key stakeholders, including Northern Beaches Council, has informed the design development of the Beaches Link and Gore Hill Freeway Connection project and has led to the preferred design as described in the environmental impact statement.

The construction footprint of the preferred design along Wakehurst Parkway is shown in Figure 6-28 and Figure 6-29 of the environmental impact statement, with the construction footprint along Wakehurst Parkway entirely contained within the road corridor and not encroaching on the Manly Warringah War Memorial State Park.

The Wakehurst Parkway east construction support site (BL13) would occupy three portions of land east of Wakehurst Parkway and north of Kirkwood Street, as shown in Figure 6-41 of the environmental impact statement. Two portions of land are currently owned by Sydney Water and a smaller portion of land, required for the access road to and from the support site forms part of the Manly Warringah War Memorial State Park, which is Crown land and managed by Council. The access decline at this site would also be excavated below the ground surface of the Manly Warringah War Memorial State Park, as shown in Figure 6-41 of the environmental impact statement, however no surface disturbance is required for this activity.

In addition, the environmental impact statement acknowledged that impacts to the Manly Warringah War Memorial State Park would occur to land on the east side of the access road, including where there is a need to adjust the access to the transmission line maintenance track so it can be accessed from the new road alignment after works are complete. Should the project require intermittent access to any additional area of Manly Warringah War Memorial State Park this would be discussed and arranged with Council beforehand, and Transport for NSW would ensure the required approvals are in place prior to the commencement of works.

As the area of Manly Warringah War Memorial State Park that would be directly impacted by the proposed Wakehurst Parkway east construction support site (BL13) is small and located on the edge of the park, its temporary use for the project is unlikely to be an encumbrance on the park.

Exclusion zones will be implemented during site establishment in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protection and managing biodiversity on RTA projects* (RTA, 2011a). This will ensure work is contained within the construction footprint and would minimise the potential risk of encroaching on Manly Warringah War Memorial State Park beyond that assessed in the environmental impact statement. The establishment of exclusion zones is included in new environmental management measure B45 (refer to Table D2-1 of this submissions report):

> Exclusion zones will be set up at the limit of clearing in accordance with *Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a).

Following the completion of construction, the access decline would be backfilled and the Wakehurst Parkway east construction support site (BL13) would be rehabilitated, revegetated and handed over to Council to manage as part of Manly Warringah War Memorial State Park. This includes the portion of land subject to temporary use and currently owned by Sydney Water, which will also be rehabilitated as soon as practicable to an appropriate condition, in accordance with environmental management measure LP5 (refer to Table D2-1 in this submissions report). This would add about 4000 square metres of new public space to the Manly Warringah War Memorial State Park.

B11.19.2 Asset management and operational plans of management

Issue raised

Pages 10, 45

Northern Beaches Council requests that asset management be determined prior to the 50 per cent design approval to allow all modifications required during the detailed design process to be completed to the satisfaction of all asset managers. The asset management accounting requirements of Council, especially the way assets are catalogued and recorded for the GIS systems of the asset manager, need to be considered in the design phase to eliminate issues during handover.

Council requests that all assets created as part of the project, where maintenance responsibility would reside with Council at the expiry of the contracted maintenance period, be constructed to Council's standards and the detailed design have approval from Council.

Council requests where assets are created and remain the responsibility of Transport for NSW or the future concession holder, the road reserve is to be adjusted or an agreed Memorandum of Understanding is to be entered into between Council, Transport for NSW and the concession holder.

Council seeks confirmation that where the landings of the proposed new pedestrian bridges at Wakehurst Parkway are on a council reserve and the approach ramps associated with the bridge component are located on council land, Transport for NSW will be responsible for the asset.

Council notes a new plan of management for the remnant parts of the Balgowlah Golf Course construction support site (BL10) will be required and the *Manly Warringah War Memorial Park Plan of Management* (Warringah Council, 2014) will need to be amended to include the new parcel of land. Council requests that Transport for NSW fund the development and documentation of the updated plans.

Council also recommends the new plan of management for the Balgowlah Golf Course go on exhibition at the same time the concept plan is exhibited.

Response

Transport for NSW would continue to proactively consult with the Northern Beaches Council on the allocation of management of project assets throughout further design development and construction. An interface agreement would be established between Transport for NSW and Council and would provide further details on this consultation and the design review process. This would seek to ensure the orderly, efficient and effective transfer of project assets where appropriate. Where an asset would ultimately be managed by Council, it would be designed to Council's or Transport for NSW's specifications, whichever is greater.

If the management of a project asset would be transferred to the Council, the scope would be agreed prior to the transfer, including the provision of any data or information to be exchanged.

Transport for NSW will engage with Council during further design development with the aim of achieving good community and environmental outcomes at Manly Warringah War Memorial State Park and Balgowlah Golf Course.

As a result, a new environmental management measure, LP9, has been included to clarify the requirement to work with Council on the preparation and update of plans of management (refer to Table D2-1 of this submissions report):

> Prior to operations, Transport for NSW will assist Northern Beaches Council to prepare a Plan of Management for the new and improved open space and recreation facilities at Balgowlah. Transport for NSW will also assist Northern Beaches Council to update and amend the *Manly Warringah War Memorial Park Plan of Management* (Warringah Council, 2014) to reflect the changes to the park as a result of the project.

B11.19.3 Temporary drainage works on council land

Issue raised

Page 11

Northern Beaches Council requests any temporary drainage works which extend beyond the footprint of the project into land under Council's care, control or management, have the prior approval of Council.

Response

Stormwater drainage proposed as part of the project is discussed in Section 6.5.4 of the environmental impact statement. Depending on site conditions, temporary drainage works may be required to extend outside the construction footprint to ensure appropriate connection to existing drainage lines and that flow conditions are maintained or impacts minimised where possible.

Transport for NSW would consult with property and asset owners affected by any temporary drainage works that extend beyond the footprint of the project as required, and would ensure the required approvals are in place prior to the commencement of works.

Land subject to temporary use, including areas of public open space, will be rehabilitated as soon as practicable to an appropriate condition, in accordance with environmental management measure LP5 (refer to Table D2-1 in this submissions report). Rehabilitation will be carried out in consultation with the relevant landowner (where appropriate).

B11.19.4 Wakehurst Parkway east construction support site (BL13) maintenance

Issue raised

Page 9

Northern Beaches Council requests the Wakehurst Parkway east construction support site (BL13) be surveyed prior to any excavation so the original topography of the site can be restored as close to the original condition as possible. Council requests the site be replanted with endemic species prior to being handed back to Council for inclusion in Manly Warringah War Memorial State Park. Council requests all landscaping and revegetation work have a three-year maintenance period provided by Transport for NSW's contactor, with maintenance frequency to be determined, with the intention of it being a rehabilitation and regrowth site.

Response

Land subject to temporary use, including areas of public open space, will be rehabilitated as soon as practicable to an appropriate condition, in accordance with environmental management measure LP5 (refer to Table D2-1 in this submissions report). Rehabilitation will take into consideration the location, land use characteristics, area and adjacent land uses or, where applicable, be in accordance with the urban design and landscape plan prepared in accordance with environmental management measure V1 (refer to Table D2-1 in this submissions report). Rehabilitation will be carried out in consultation with the relevant landowner (where appropriate).

Landscaped areas of the project would be maintained by Transport for NSW, unless arrangements have been made to transfer the landscaped area to an alternative party, at which point it would be the responsibility of the alternative party to maintain the landscaped area.

Transport for NSW would maintain landscaped areas of the project in accordance with the appropriate Transport for NSW Quality Specifications.

B11.19.5 Wakehurst Parkway east construction support site (BL13) residual land use

Issue raised

Pages 44, 45

Northern Beaches Council notes the Wakehurst Parkway east construction support site (BL13) is zoned R2 Low Density Residential under the Warringah Local Environmental Plan 2011 and that a planning proposal has been submitted to the Department of Planning, Industry and Environment for three parcels of Crown land (with Council as the Reserve Trust Manager) that surround the site. The planning proposal is to rezone Lot 76 DP 504237, Lot 77 DP 504237 and Lot 2 DP 710023 from R2 Low Density Residential to RE1 Public recreation and remove the residential development standards under the local environmental plan. The purpose of the planning proposal is to correct an anomaly in the local environmental plan and to ensure future land use is consistent with the protection and management of the adjoining Manly Warringah War Memorial State Park.

Council also notes Sydney Water attempted to sell the proposed Wakehurst Parkway east construction support site (BL13) for development in 2015, however, this was put on hold due to community objections.

While the Wakehurst Parkway east construction support site (BL13) comprises a residential zone, Council notes this land plays an important function in protecting the natural environment of the adjoining Manly Warringah War Memorial State Park. Council requests that the use of the Wakehurst Parkway east construction support site (BL13) consider the adjoining natural environment as a key priority.

Response

Transport for NSW notes that Gateway Determination has been issued by the Department of Planning, Industry and Environment for the planning proposal to rezone Lot 76 DP 504237, Lot 77 DP 504237 and Lot 2 DP 710023 that adjoin the proposed Wakehurst Parkway east construction support site (BL13) (Application No. PEX21018/0007) to correct an anomaly in the local environmental plan. The planning proposal is available on the Northern Beaches Council website: eservices.northernbeaches.nsw.gov.au/ePlanning/live/Public/XC.Track/SearchApplication.aspx?id=1596799.

The potential land use impacts of the proposed Wakehurst Parkway east construction support site (BL13) are discussed in Table 20-5 of the environmental impact statement. The site would occupy two portions of land east of Wakehurst Parkway and north of Kirkwood Street currently owned by Sydney Water.

One portion of land, surrounding the main Bantry Bay Reservoir site north of the existing water tanks, would be leased by Transport for NSW from Sydney Water and returned once construction is complete. The other portion of the site would be located wholly on vacant non-operational Sydney Water owned land, immediately north of the existing water tanks. Transport for NSW would acquire this non-operational part of the Bantry Bay Reservoir site from Sydney Water. This land would be rehabilitated and revegetated as soon as practicable after construction and handed over to Council to manage for use by the community as part of the Manly Warringah War Memorial State Park. This would add about 4000 square metres of new public space to the Manly Warringah War Memorial State Park.

B11.19.6 Balgowlah Golf Course land acquisition

Issue raised

Page 45

Northern Beaches Council notes the property acquisitions for the project at Balgowlah (Figure 20-8 of the environmental impact statement) shows the owner of the land that is proposed to be acquired for the tunnel access road and tunnel operations facility as being the State of NSW. While the land is Crown land, Council is the trustee and the negotiations for land acquisition will be with Council.

Council recommends the proposed property acquisitions at Balgowlah be progressed with input from several business units within Council and the process commence in parallel with the detailed design, if the project proceeds after ministerial approval is granted.

Response

Transport for NSW will compulsorily acquire the affected Crown land at Balgowlah in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and relevant Transport for NSW property acquisition guidelines, as required by environmental management measure LP3 (refer to Table D2-1 of this submissions report). Where required, Transport for NSW will consult with Northern Beaches Council as the trustee as part of the acquisition process.

B11.19.7 Impacts to Balgowlah Oval

Issue raised

Page 8

Northern Beaches Council's understanding was the existing Balgowlah Oval would not be directly impacted for five years and would retain its current function until it required reconstruction to facilitate its expansion. The exhibited plan identifies it as a rectangular field and clearly implies that it

will not be available for use until 2025 at the earliest, which will pose significant issues for Council to relocate existing users for this period of time.

Response

The existing Balgowlah Oval would remain operational throughout construction until a new facility is commissioned; it would not form part of the Balgowlah Golf Course construction support site (BL10), as shown in Figure 6-38 of the environmental impact statement. As discussed in Section 6.6 of the environmental impact statement, construction of the new access road and the new and improved open space and recreation facilities would be staged, including maintaining the current access to the existing Balgowlah Oval during construction until a new facility is operational. Indicative staging for the construction and delivery of the new and improved open space and recreation facilities is shown in Figure B11-2.

Should the existing Balgowlah Oval be replaced with a rectangular field, pending the outcomes of the consultation process, this would be done once an alternative new field, is available, eg the proposed new Balgowlah Oval. In addition, residual land, primarily to the east and north of the new access road, would progressively become available throughout the construction period, which would facilitate re-purposing it to the new open space and recreation facilities. This would allow it to be handed over progressively for use by the community. The new open space and recreation facilities to the west of the proposed access road, between the access road and Burnt Bridge Creek Deviation, would be constructed after completion of the project and then handed over to Northern Beaches Council.

The layout of the new and improved open space and recreation facilities at Balgowlah, including Balgowlah Oval, as shown in Figure 5-28 of the environmental impact statement, is indicative and would be subject to the dedicated consultation process described in Section B11.4.4.

Figure B11-2 Indicative staging at Balgowlah Golf Course for construction and delivery of new and improved open space and recreation facilities

B11.20 Socio-economics

B11.20.1 Impacts to mountain biking trails

Issue raised

Page 9

Northern Beaches Council notes that the project would impact an unauthorised mountain bike trail network that runs parallel to Wakehurst Parkway. These trails form part of what is known to riders as the 'Extended Possums Loop'. They are mapped in detail on www.trailforks.com. Although not authorised, these trails provide important connections between the formal Manly Dam (Manly Warringah War Memorial State Park) mountain bike trail on the eastern side of Wakehurst Parkway and the formal mountain bike trails in Garigal National Park on the western side of Wakehurst Parkway. When combined, the trails in the two areas provide a ride experience of about 20 kilometres.

Council requests that access to the full 11 kilometre mountain bike trail loop at Manly Warringah War Memorial State Park be retained. Council notes that this is one of the few authorised mountain bike trails on the Northern Beaches and requests that a solution is found to ensure the continuity of a loop trail. Trail data indicates that up to 10,000 laps are ridden on the Manly Dam mountain bike trail per month. Council believes the loss of access to the full 11 kilometre loop during a lengthy tunnel construction phase would be devastating to the mountain bike community. Council requests that any relocation of mountain bike trails be discussed with Council if the design of the project cannot be adjusted to avoid impacting the trail network.

Council also advises that it is developing an Off-Road Cycling Action Plan as part of its draft Open Space and Recreation Strategy. The preliminary findings indicate that unauthorised trails are developed by riders when there are insufficient facilities to meet their needs. The loss of access to one of the only tracks authorised for mountain biking on the Northern Beaches, even temporarily, will exacerbate the problem of unauthorised trail building that Council is already dealing with.

Response

Transport for NSW notes the authorised and unauthorised aspects of the mountain bike trail network on land owned by Transport for NSW and owned or under the care, control and maintenance of Northern Beaches Council. Transport for NSW met with Council representatives on 2 March, 23 March and 19 May 2021 to discuss the mountain bike trails, new connectivity opportunities provided between Garigal National Park and Manly Warringah War Memorial State Park and the realignments of trails required during construction and operation of the project (refer to Section A2.4.1 of this submissions report for further information).

Transport for NSW also held the following meetings and virtual information sessions with relevant mountain biking associations and interest groups to discuss impacts on mountain bike trails, detours, mitigation measures and the potential restoration of mountain bike trails post construction:

- Bike North, Bicycle NSW and TrailCare on 29 January 2021
- Manly Warringah War Memorial State Park Advisory Committee on 1 February 2021
- Manly Warringah Mountain Bike Club, TrailCare and Garigal Gorillas Mountain Bike Club on 12 February 2021.

The project would require a temporary adjustment to the Manly Warringah War Memorial State Park mountain bike trail network at Wakehurst Parkway, as identified in Section 21.4.8 of the environmental impact statement. The mountain bike trail network (including authorised and unauthorised trails) extends along both the western and eastern sides of Wakehurst Parkway from Warringah Aquatic Centre in the north to Seaforth in the south. Where possible, Transport for NSW

would refine the design of the project and seek to avoid or otherwise minimise impacts to the mountain bike trail network where possible.

Since exhibition of the environmental impact statement, Transport for NSW has proposed a number of design refinements to reduce potential impacts on the mountain bike trail network at Wakehurst Parkway. The project refinements and potential impacts to the mountain bike trail network are outlined in Section A4.5 of this submissions report. Greater detail of the mountain bike trails in relation to the construction footprint and operational features of the project are shown in Figure A4-7 and Figure A4-8 in Part A of this submissions report.

Where impacts to mountain bike trails cannot be avoided, minor detour routes would be implemented including some staging of trail adjustments to align with construction staging of the Wakehurst Parkway upgrade works. Any detours and adjustments would be designed with consideration of user safety and convenience and advanced notification of track closures would be provided at key locations. In addition, construction of the three permanent shared user path underpasses proposed along Wakehurst Parkway would be prioritised where feasible to facilitate enhanced connectivity.

Transport for NSW would continue to consult with Council and relevant mountain biking associations during the detailed design of the project regarding potential impacts to the mountain bike trail network (including authorised and unauthorised trails) at Wakehurst Parkway.

B11.20.2 Construction impacts on schools

Issue raised

Pages 10, 11

Northern Beaches Council recommends that consideration is given to the impact of construction traffic on local schools, preschools and childcare centres, especially during the HSC period. Schools that would be impacted include Northern Beaches Secondary College Balgowlah Boys Campus, Manly West Public School, Balgowlah Heights Public School, Seaforth Public School, Balgowlah North Public School, St Cecilia's Catholic Primary School, St Kieran's Catholic Primary School, Manly Vale public schools and Mackellar Girls High School. Construction traffic impacts should be given specific consideration during project program scheduling.

Response

Education and childcare facilities near the Balgowlah Golf Course construction support site (BL10) may experience increased construction traffic due to the use of Sydney Road by construction vehicles travelling to and from the temporary construction support site. Increased heavy vehicle movements along Sydney Road may impact on perceptions of safety for children and students and result in occasional dust impacts. Increased construction traffic may also result in temporary amenity and noise impacts for students and teachers or affect their ability to participate and concentrate. A reduction in the enjoyment or convenience of access to education and childcare facilities may potentially impact on student attendance levels, as outlined in Section 21.4.4 of the environmental impact statement. Schools and childcare facilities near Sydney Road likely to be impacted by increased construction traffic include Northern Beaches Secondary College Balgowlah Boys Campus and St Cecilia's Catholic Primary School.

Temporary construction support sites and haulage roads have been selected to minimise the use of local roads where possible. A range of mitigation measures outlined in Table D2-1 of this submissions report will be implemented to reduce the impacts of construction traffic on nearby schools. They include:

- Measures to minimise traffic impacts, including:
  - Ongoing consultation will be carried out with Northern Beaches Council, emergency services and bus operators to minimise traffic and transport impacts in Balgowlah and surrounds (environmental management measure CTT6)
  - Construction road traffic will be managed to minimise impacts of movements during peak periods where feasible and reasonable (environmental management measure CTT8)
  - Vehicle movements to and from the temporary construction sites will be managed to ensure pedestrian, cyclist and road user safety (environmental management measure CTT9)
  - Directional signage, barriers and/or linemarking will be used as required to direct and guide motorists, cyclists and pedestrians past construction sites and on the surrounding network and Variable Message Signs will be used to advise all road users of potential delays, traffic diversions, speed restrictions or alternative routes (environmental management measure CTT10)
  - Direct impacts to existing pedestrian and cycling facilities will be minimised to the extent reasonably practicable and any detours and adjustments will be designed with consideration of user safety and convenience (revised environmental management measure CTT15)
  - The community will be notified in advance of any proposed transport network changes or adjustments to bus stops (environmental management measure CTT7 and revised environmental management measure CTT12).
- Measures to minimise noise impacts, including from construction traffic, including:
  - A construction noise and vibration management plan will be developed and implemented for the duration of construction of the project (revised environmental management measure CNV1)
  - Detailed location and activity specific construction noise and vibration impact statements will be prepared and implemented (environmental management measure CNV2)
  - Shoulder periods will be utilised where appropriate and where a road occupancy licence is approved by Greater Sydney Operations for the works (if required) (revised environmental management measure CNV4)
  - Construction noise and vibration impacts will be monitored periodically throughout construction (environmental management measure CNV5)
  - Construction traffic will not utilise local roads beyond those required for direct access to construction sites where possible (environmental management measure CNV6)
  - Construction noise from concurrent and consecutive major projects in the vicinity of work locations associated with the project will be managed to minimise cumulative impacts (environmental management measure CNV13).

Transport for NSW is aware of the importance and increased sensitivity associated with school exam periods, including for Year 12 students and have direct experience in successfully managing works around these periods as part of other projects. Ongoing engagement will be carried out with managers of sensitive social infrastructure, including schools and childcare facilities about the timing and duration of construction works and management of potential impacts, in accordance with environmental management measure SE2 (refer to Table D2-1 of this submissions report). Manly West Public School, Balgowlah Heights Public School, Seaforth Public School, Balgowlah North Public School, St Kieran's Catholic Primary School, Manly Vale public schools and Mackellar Girls High School would not likely be materially impacted by increased construction traffic, considering the availability of alternative routes and/or distance from construction access routes. The potential impacts of an increase in construction traffic near education and childcare facilities are discussed in Section 21.4.4 and Section 21.4.5 of the environmental impact statement. Schools and childcare facilities near the project that could potentially be impacted by construction traffic are shown in Figure 21-3 to Figure 21-10 of the environmental impact statement.

B11.20.3 Amenity impacts to businesses at Seaforth

Issue raised

Page 45

Northern Beaches Council notes that short-term construction impacts, perceived or real, are of concern for some local centres such as Seaforth, where Council has found that 26 per cent are concerned about the negative impact on amenity (noise, congestion) during construction and requests these be addressed especially for outdoor dining. Given construction is potentially five years, for businesses this is probably not considered 'short-term'.

Response

The potential impacts of the project on businesses are addressed in Chapter 21 (Socio-economics) of the environmental impact statement and Appendix U (Technical working paper: Socio-economic assessment). A business survey was carried out as part of the business impact assessment (refer to Annexure A of Appendix U (Technical working paper: Socio-economic assessment)) to gain a better understanding of the main issues, perceptions and concerns of businesses regarding the project's construction and operation. Of the businesses surveyed across the study area for the business impact assessment (shown in Figure 2-1 and Figure 2-2 of Annexure A of Appendix U: Technical working paper: Socio-economic assessment), 89 per cent perceived the effect of construction on the amenity of their business would be neutral. Two per cent stated the effect would be positive, while eight per cent stated that the effect would be negative. The business centre that recorded the most negative responses to demand during construction was Seaforth/Spit Bridge, where 26 per cent of businesses perceived that demand for their goods and services would be affected negatively. Businesses in the Seaforth/Spit Bridge business centre also identified as being more sensitive to changes in the acoustic environment, air quality, visual amenity and identity and character of the business area, especially food and beverage services that rely on outdoor dining.

Potential impacts that may arise at the Seaforth Centre business centre during construction of the project are identified in Section 21.4.7 of the environmental impact statement. The commercial and industrial premises along Sydney Road are identified as being most likely to be impacted by reduced amenity from ground-borne noise associated with rock hammer tunnelling works. The proposed use of rock hammers is limited to clearing the bench of the tunnel and might also be required for other subsurface excavations. These potential impacts would be temporary and short-term in nature and would only be experienced when rock hammers are in close proximity to the business. The project would consult with potentially affected receivers during construction and would limit rock hammering, where feasible and reasonable, to the least sensitive time periods. Changes in the traffic environment for motor vehicles with increased wait times during peak periods at the intersection of Sydney Road/Manly Road/Burnt Bridge Creek Deviation could affect the amenity of the Seaforth Centre, with potentially increased traffic noise, and impacts to transport efficiency to and from the centre. These potential traffic impacts during construction would be temporary and intermittent in nature and would be experienced when construction vehicle volumes from the Balgowlah Golf Course construction support site (BL10) are at their peak. These construction road traffic volumes will be managed to minimise the impacts of movements during peak periods where feasible and reasonable, in accordance with environmental management measure CTT8 (refer to Table D2-1 of this submissions report). Noise intensive activities and traffic congestion would be managed as to not occur continuously throughout the entire construction period, and are therefore unlikely to have a lasting effect on business viability over the long term (refer to Section 6.6 and Section 8.4.4 of the environmental impact statement).

It is noted that the Seaforth Centre is the closest retail centre to the Balgowlah Golf Course construction support site (BL10) and would potentially benefit from an increase in passing trade, business visibility and demand for services during construction.

The business impact assessment concluded that businesses at Seaforth Centre have a strong local catchment, and while construction would alter the traffic environment and potentially marginally increase demand for services, any positive or negative changes would be minor. Overall, construction is not anticipated to impact ongoing centre or business performance.

Transport for NSW will carry out specific consultation with businesses potentially impacted during construction in accordance with environmental management measure BU2 (refer to Table D2-1 of this submissions report). Consultation will aim to identify specific potential construction impacts for individual businesses. Based on consultation with businesses, specific feasible and reasonable measures to maintain business access, visibility, parking and address other potential impacts as they arise through the construction phase will be identified and implemented in accordance with environmental management measure BU3 (refer to Table D2-1 of this submissions report). Mitigation of other impacts eg construction traffic, noise and dust would also be carried out through implementation of other relevant mitigation measures.

B11.20.4 Impacts to businesses at Manly Vale

Issue raised

Page 45

Northern Beaches Council notes that traffic congestion/delays at Condamine Street, Manly Vale, which is already a busy intersection with large format retail and supermarkets, may be an issue for businesses in that precinct. This includes urban services/light manufacturing that is not acknowledged in the business impact assessment.

Response

Business centres were characterised in the business impact assessment based on the land use zoning of the business centre area. The Manly Vale Business Centre area is zoned as ‘B6 Enterprise Corridor’ in the Manly Local Environmental Plan 2013 and has construction supply businesses, automotive rental, repair and mechanical services, and ‘a range of different business types’, as described in Section 3.1.1.3 of the business impact assessment (provided in Annexure A of Appendix U (Socio-economic assessment)). Although it is acknowledged that there may be urban services or light industry located in this business centre, any businesses of this nature would be incidental and are not considered to accurately characterise the area.

Potential impacts on businesses in the Manly Vale Business Centre are described in Section 5.1.1.2 and Table 5-2 of the business impact assessment, including impacts on retailers, supermarkets and urban services/light manufacturing.

The study area for the socio-economic assessment in Chapter 21 (Socio-economics) of the environmental impact statement and Appendix U (Technical working paper: Socio-economic assessment) focused on areas within 400 metres of a temporary construction support site as these are more likely to experience direct impacts from construction, however broader (indirect) effects on businesses outside the study area were also considered.

A minor reduction in intersection performance at Sydney Road/Manly Road/Burnt Bridge Creek Deviation may potentially have flow on effects to Condamine Street. This may increase travel time during peak periods and is more likely to impact commercial offices and retail providers with ‘standard’ business operating hours rather than shift workers.

The project would not involve any changes to parking and loading zones in Manly Vale Business Centre. Minor alterations to traffic conditions may marginally impact service and delivery efficiency to the centre. This would particularly affect the specialised retailers that receive and distribute products or stock such as the local supermarkets, liquor stores, hardware, homewares, cafes and restaurants.

Temporary delays and speed restrictions for through traffic due to construction activities and construction vehicle access may temporarily affect the efficiency of access for employees, customers and for servicing and deliveries for businesses within the centre. Construction in the area may also increase demand for some specialised retail, food, beverage, and convenience businesses. The assessment concluded that while construction would alter access arrangements and potentially marginally increase demand for services, businesses would be able to adapt to any positive or negative changes. Overall, construction is not anticipated to affect ongoing centre or business performance at Manly Vale Business Centre and the significance of the potential impacts is low.

Transport for NSW will carry out specific consultation with businesses potentially impacted during construction in accordance with environmental management measure BU2 (refer to Table D2-1 of this submissions report). Consultation will aim to identify specific potential construction impacts for individual businesses. Based on consultation with businesses, specific feasible and reasonable measures to maintain business access, visibility, parking and address other potential impacts as they arise through the construction phase will be identified and implemented in accordance with environmental management measure BU3 (refer to Table D2-1 of this submissions report).

B11.20.5 Positive long-term operational impacts

Issue raised

Page 45

Northern Beaches Council agrees that there are overall positive long-term operational socio-economic impacts of the project with greater access to a wider workforce, especially Frenchs Forest and Brookvale, which may benefit from access to hospital staff and logistic workers outside the Northern Beaches LGA (secondary trade-catchment).

Response

Transport for NSW acknowledges and agrees with the comment from Northern Beaches Council. The project would result in improved travel times and access to work, business and leisure activities between the Northern Beaches and other areas of Sydney. This would include both trips that use the new tunnels and trips on surface roads that are less congested than they would otherwise be without the project. The project would also facilitate (in conjunction with the Western Harbour Tunnel and Warringah Freeway Upgrade project) greater access to jobs, service providers, schools and health care within 30 minutes of people's homes between the Northern Beaches and Greater Sydney.

B11.20.6 Inclusion of Brookvale Centre in the business impact assessment

Issue raised

Page 45

Northern Beaches Council notes that Appendix U (Technical working paper: Socio-economic assessment) should refer to Brookvale Centre rather than Warringah Mall as it has a much wider employment/economic role.

Response

Business centres considered in the business impact assessment are described in Table 21-4 and shown on Figure 21-11 of the environmental impact statement.

The study area selected for the business impact assessment comprises the Australian Bureau of Statistics Statistical Areas Level 2 (SA2) geographies that either overlap or are located near the project. The study area includes those businesses and local business centres that may experience changes to existing conditions due to the location of the project, construction activities and changes in movement patterns for business owners, workers and customers. Business centres within close proximity (within 400 metres) of construction works, as shown in Figure 3-1 of Annexure A of Appendix U (Technical working paper: Socio-economic assessment), are considered more likely to experience direct impacts from construction.

Businesses in Warringah Mall were surveyed because they are within a commercial core immediately adjacent to the Eastern Precinct study area, as defined by the SA2 boundaries. However, as Warringah Mall is located outside the Eastern Precinct study area and is not within 400 metres of a temporary construction site, businesses in Warringah Mall are not considered to be directly influenced by the project. Brookvale Centre is located well outside the Eastern Precinct study area. Therefore, Warringah Mall and Brookvale Centre were not specifically profiled as part of the business impact assessment.

B11.20.7 Journey to work data

Issue raised

Page 45

Northern Beaches Council notes that there could be more information on current journeys to work to Warringah Mall and Brookvale Centre from outside the Northern Beaches local government area.

Response

Journey to work data used in the socio-economic assessment of the project is from the 2016 Census of Population and Housing conducted by the Australian Bureau of Statistics and is presented in Section 4.2.9 of Appendix U (Technical working paper: Socio-economic assessment). The socio-economic assessment is primarily concerned with the travel modes taken to work, to assess existing and predicted changes in access and connectivity as a result of the project.

The business impact assessment (refer to Annexure A of Appendix U (Technical working paper: Socio-economic assessment)), which informed the socio-economic assessment, included a survey of businesses within the study area to collect customer and employee journey information, including mode of travel to the business, to determine their sensitivity and their ability to adapt and respond to project related changes to the socio-economic environment (refer to Section 4.2 of Annexure A of Appendix U (Technical working paper: Socio-economic assessment)). The survey indicated that the majority of customers and employees within the study area travel to businesses by car, with significantly smaller proportions (26 per cent or less) using public transport or walking or cycling to businesses. As noted in the above response, Warringah Mall and the Brookvale Centre are not within the Eastern Precinct study area and therefore specific journey to work data for these centres was not analysed.

Journey to work information was also used in the traffic and transport assessment to analyse travel patterns for residents and workers and is based on Journey to work data derived from the 2016 Census of Population and Housing conducted by the Australian Bureau of Statistics, as stated above. Warringah Mall and the Brookvale Centre are outside of the Frenchs Forest and surrounds

and the Balgowlah and surrounds study areas for the traffic and transport assessment (refer to Appendix F (Technical working paper: Traffic and transport)).

The review of the environmental impact statement, including the socio-economic assessment (Appendix U) and business impact assessment (Annexure A of Appendix U), by Transport for NSW subject matter experts, key regulatory agencies and the Department of Planning, Industry and Environment concluded that it adequately addressed the Secretary's environmental assessment requirements. Therefore, Transport for NSW considers that the appropriate journey to work data has been used in the socio-economic assessment, business impact assessment and traffic and transport assessment.

B11.20.8 Employment type and capacity in Frenchs Forest

Issue raised

Pages 45, 46

Northern Beaches Council notes that as per its draft employment study, Frenchs Forest has an increasing logistic role as well as potential for greater business park employment, which currently has high vacancy.

Response

Business centres considered in the business impact assessment (refer to Annexure A of Appendix U (Technical working paper: Socio-economic assessment)) are described in Table 21-4 of the environmental impact statement. The Frenchs Forest Business Hub is described as comprising a diverse range of uses including corporate offices, gym/fitness centres, sports facilities, storage facilities/warehouses, medical laboratories, distribution centres and bulky goods retailers such as homeware and furniture stores.

Potential operational impacts on business centres are described in Section 21.5 of the environmental impact statement. The Frenchs Forest business hub is anticipated to experience additional passing trade due to an increase in traffic demand and accessibility with the establishment of the Beaches Link tunnel. The additional connections to North Sydney and other centres facilitated by the project (in conjunction with the Western Harbour Tunnel and Warringah Freeway project) would increase the trade catchment for service industries. For businesses that are dependent on servicing, delivery and distribution, the new road infrastructure would provide noticeable benefits.

Transport for NSW notes Northern Beaches Council's comment that Frenchs Forest has an increasing logistics role as well as potential for greater office park employment. The potential benefits to businesses at Frenchs Forest Business Hub would apply to logistics businesses and would facilitate growth in business park employment.

B11.20.9 Traffic impacts to businesses in Frenchs Forest

Issue raised

Page 46

Northern Beaches Council is concerned that the business impact assessment (refer to Annexure A of Appendix U (Technical working paper: Socio-economic assessment)) identifies potential delays (northbound) in deliveries and commuter traffic in Frenchs Forest during construction and operation, which may have implications to job growth.

Response

During construction, there are likely to be temporary impacts on businesses due to changes in traffic and transport movements and an increase in construction vehicles. Increased construction traffic along Warringah Road and Wakehurst Parkway, as well as the temporary relocation of bus stops along Wakehurst Parkway, could potentially result in travel time delays for service and delivery vehicles and customers and employees. It is also noted that some businesses may benefit from an increase in demand for services. Overall, the significance of these impacts is expected to be low, and construction is not anticipated to effect ongoing centre or business performance.

During operation, the project would have long term strategic benefits, with few discernible localised impacts. The Frenchs Forest area is anticipated to experience an increase in traffic demand and an improvement in employee and customer accessibility with the establishment of the Beaches Link tunnel, which in turn may result in an increase in passing trade and business exposure as more vehicles and customers travel past the centre.

Although the Frenchs Forest Business Hub does not directly adjoin the tunnel entry, it is positioned on a main feeder road with the capacity to benefit from increased transport network accessibility. While minor localised increased traffic travel times and minor reduced travel speeds are predicted on Wakehurst Parkway, the substantial increase in connectivity would counter these impacts and enhance accessibility for a broader catchment.

The additional connection across Middle Harbour to the Warringah Freeway, Gore Hill Freeway and further via the Western Harbour Tunnel has the capacity to increase the trade catchment of some businesses, with the area now more accessible to a broader customer catchment. For businesses that are dependent on servicing, delivery and distribution, the new road infrastructure would provide noticeable benefits.

The project would have a positive outcome for businesses in the Frenchs Forest Business Hub over the long term.

For further details on potential impacts on businesses in the Frenchs Forest Business Hub, refer to Section 21.4.7 (construction impacts) and Section 21.5.6 (operational impacts) of the environmental impact statement.

B11.20.10 Management of impacts to businesses

Issue raised

Page 46

Northern Beaches Council notes that the business impact assessment (refer to Annexure A of Appendix U (Technical working paper: Socio-economic assessment)) recommends consultation with businesses to manage localised impacts including a business support hotline. Council requests this be implemented early in the detailed design and construction phase of the project to assist local businesses.

Response

Transport for NSW will carry out specific consultation with businesses potentially impacted during construction in accordance with environmental management measure BU2 (refer to Table D2-1 of this submissions report). Consultation will aim to identify specific potential construction impacts for individual businesses. Based on consultation with businesses, specific feasible and reasonable measures to maintain business access, visibility, parking and address other potential impacts as they arise through the construction phase will be identified and implemented in accordance with environmental management measure BU3 (refer to Table D2-1 of this submissions report). A phone

hotline that enables businesses to find out about the project or register any issues will be maintained.

More generally, a complaints management system would be developed and implemented before the start of construction activities for the project as detailed in Section 3 of Appendix E (Community consultation framework). It would include establishing and maintaining a toll-free 24 hour telephone number, a postal address to which written complaints and enquires may be sent, an email address to which electronic complaints and enquiries may be transmitted, and a mediation system for complaints unable to be resolved. The complaints management system would be maintained during construction and for 12 months after the project is completed.

B11.21 Urban design and visual amenity

B11.21.1 Maintenance of landscaping and revegetation

Issue raised

Pages 9, 11

Northern Beaches Council requests that all landscaping and re-vegetation work to be handed to Council have a three-year maintenance period provided by Transport for NSW's contractor/s, with the maintenance frequency to be determined in partnership with Council's Environment and Climate Change and Parks Assets business units.

Response

Transport for NSW would continue to proactively consult with the Northern Beaches Council on the allocation of management of project assets, including landscaping, throughout the further design development and construction phases of the project (refer to Section B11.19.2). An interface agreement would be established between Transport for NSW and Council and would provide further details on this consultation and the design review process. During the development of the landscape design for the project the maintenance of plants would be considered, with a preference for plant species which require less maintenance.

Landscaped areas of the project would be maintained by Transport for NSW, unless arrangements have been made to transfer the landscaped area to an alternative party, at which point it would be the responsibility of the alternative party to manage and maintain the landscaped area.

Transport for NSW would maintain landscaped areas of the project in accordance with the appropriate Transport for NSW Quality Specifications.

B11.21.2 Landscaping and revegetation at Wakehurst Parkway east construction support site

Issue raised

Page 9

Northern Beaches Council requests that all landscaping and revegetation work at the Wakehurst Parkway east construction support site (BL13) have the intention of the site being a rehabilitation and regrowth site.

Response

As discussed in Section B11.19.5, the proposed Wakehurst Parkway east construction support site (BL13) would include one portion of land that is vacant non-operational Sydney Water owned land. Transport for NSW would acquire this land for temporary use as part of the construction support

site. This land would be rehabilitated and revegetated as soon as practicable after construction and handed over to Northern Beaches Council to manage for use by the community as part of the Manly Warringah War Memorial State Park. Additionally, a small portion of land within Manly Warringah War Memorial State Park is temporarily required for the access road to and from the Wakehurst Parkway east construction support site (BL13) and would be leased. This land would be rehabilitated and returned to Council at the end of construction. Transport for NSW will engage with Council during further design development with the aim of achieving good community and environmental outcomes at Manly Warringah War Memorial State Park.

B11.21.3 Consistency of urban design and landscaping with local guidelines and policies

Issue raised

Pages 46, 47

Northern Beaches Council are of the view that the overall urban design plans and outcomes are well founded, justified and supported.

Council recommends that future detailed planning and development of the project, including preparation of the urban design and landscape plan, should consider the following local guidelines and policies:

- *Northern Beaches Public Space Vision & Design Guidelines* (Northern Beaches Council, 2021b)
- *Towards 2040 – Local Strategic Planning Statement* (Northern Beaches Council, 2020b)
- *Move: Northern Beaches Transport Strategy 2038* (Northern Beaches Council, 2018a)
- *Shape 2028 Northern Beaches Draft Community Strategic Plan 2017 – 2028* (Northern Beaches Council, 2018b)
- *Protect. Create. Live. Northern Beaches Environment and Climate Change Strategy 2040* (Northern Beaches Council, 2020a).

Council requests that all assets handed back to it comply with Council's urban design guidelines.

Response

Transport for NSW acknowledges the in principle support provided by Northern Beaches Council for the proposed overall urban design plans and outcomes.

The project urban design and landscape plan will be further developed during design development and implemented in line with the strategic urban design framework for the project and appropriate operational mitigation measures, in accordance with environmental management measure V1 (refer to Table D2-1 in this submissions report). Once developed, this plan will be made available to the public for feedback.

The urban design and landscape plan would be guided by *Beyond the Pavement* (Transport for NSW, 2020a) which sets the urban design direction for road projects within NSW. The plan would take into consideration the local guidelines and policies listed above. Urban design and landscape features and assets delivered by the project would comply with Transport for NSW standards and guidelines. Further information on the allocation of management of project assets is included in Section B11.19.2.

B11.21.4 Integration of infrastructure and landscaping with surrounds

Issue raised

Page 46

Northern Beaches Council recommends future design development should deliver a project that is physically and visually integrated within its surrounding environment, enhances community connectivity and engages the road user with the unique and defining characteristics of the local context of the Northern Beaches. Design of key infrastructure elements should have an integrated approach, informed by reference to the landscape typology. The objectives for the infrastructure elements should include:

- Reinforcing the landscape typologies
- Creating access and circulation
- Providing a gateway element to the Northern Beaches
- Providing safe, legible access across the corridor
- Providing road users with a safe, engaging and enjoyable driving experience.

Response

The project urban design and landscape plan will be developed during further design development and implemented in line with the strategic urban design framework for the project, in accordance with environmental management measure V1 (refer to Table D2-1 in this submissions report). The strategic urban design framework is described in Section 3 of Appendix V (Technical working paper: Urban design, landscape character and visual impact).

The framework includes six urban design objectives that form the basis of ongoing strategic urban design development for the project. The objectives provide a design structure that resolves to tie all components of infrastructure together with one identity and integrate them thoughtfully into the existing urban fabric. The objectives which align with Northern Beaches Council's recommendation include:

- Objective 1 Identity and user experience: Develop a theme that references Sydney's unique geography and place to provide a user experience that enhances the journey, encourages awareness of the living environment, enables orientation and enhances safety
- Objective 2 Integrated design: Provide an integrated urban design approach that thoughtfully seams the Beaches Link and Gore Hill Freeway Connection to its surrounding urban and landscape interfaces
- Objective 3 Connectivity and legibility: Provide connectivity between areas beyond the boundaries of the motorway corridor and promote increased legibility of places, buildings, streets and landmarks.

The urban design and landscape plan will identify proposed vegetation species composition and planting layout and densities and would be developed in accordance with best management practice guidelines such as *Beyond the Pavement* (Transport for NSW, 2020a) and supplementary Transport for NSW urban design guidelines such as *Landscape design guideline: Design guideline to improve the quality, safety and cost effectiveness of green infrastructure in road corridors* (Roads and Maritime Services, 2018a). Once developed, this plan will be made available to the public for feedback.

B11.21.5 Northern Beaches Hospital road upgrade project design concept

Issue raised

Page 46

Northern Beaches Council recommends the new transport infrastructure should continue developing the successful design concept of the Northern Beaches Hospital road upgrade project of which the

underpinning design theme is derived from reference to the local landscape concept of 'the northern beaches' and 'from the sea' – 'sweep, curves and forms of the shared path bridges, the portal at the Wakehurst Parkway interchange and the pattern on the slot walls reflect the biorhythms of the ocean – swell period along the slot structure crescendo with cresting waves in the form of the shared path bridges and portals' (excerpt from the design concept).

Response

Transport for NSW notes Northern Beaches Council's positive comments on the Northern Beaches Hospital road upgrade project's urban design approach.

Following consultation with the NSW Department of Education – School Infrastructure and Council, Transport for NSW proposes to realign the ramps of the replacement pedestrian bridge across Wakehurst Parkway, to facilitate direct connectivity between Fitzpatrick Avenue East and Aquatic Drive with secondary access also provided via the bridge to the Warringah Aquatic Centre. The curvilinear form of the refined bridge design would complement the curvilinear shared user bridge recently constructed by Transport for NSW connecting Hilmer Street with the Northern Beaches Hospital Precinct. Refer to Section A4.3.3 of this submissions report for further discussion of this refinement.

Transport for NSW's urban design approach for the Beaches Link and Gore Hill Freeway Connection project would be developed through the application of the strategic urban design framework described in Section 3 of Appendix V (Technical working paper: Urban design, landscape character and visual impact). It would also be developed in accordance with best management practice guidelines such as *Beyond the Pavement* (Transport for NSW, 2020a) and supplementary Transport for NSW urban design guidelines, so the project applies an equally well-considered urban design approach. The strategic urban design development for the project will be based on six urban design objectives, including Objective 2 Integrated design, which seeks to provide an integrated urban design approach that thoughtfully seams the Beaches Link and Gore Hill Freeway Connection to its surrounding urban and landscape interfaces.

The urban design and landscape plan will be made available to the public for feedback in accordance with environmental management measure V1 (refer to Table D2-1 of this submissions report).

B11.21.6 Inclusion of public art

Issue raised

Pages 46, 47

Northern Beaches Council recommends the project should incorporate public art in major public spaces, to identify a neighbourhood gateway. On a pedestrian scale it should assist in wayfinding and provide visual interest for those passing by. It should also present beauty and symbolic meaning as both independent installations and into functional objects such as seats, grates and railings, to create a sense of place and identity.

Response

Transport for NSW's urban design approach for the Beaches Link and Gore Hill Freeway Connection project would be developed through application of the strategic urban design framework which is described in detail in Section 3 of Appendix V (Technical working paper: Urban design, landscape character and visual impact).

The strategic design framework includes a requirement to consider public art opportunities along the project alignment and use wayfinding elements such as feature landscaping design and distinct

architectural design at key intersections and entry/exit points to create a self-explaining road environment.

The urban design and landscape plan will detail built and landscape features to be implemented during construction, including any public or wayfinding features. The urban design and landscape plan will be made available to the public for feedback in accordance with environmental management measure V1 (refer to Table D2-1 of this submissions report).

B11.21.7 Landscape and visual impacts at Balgowlah Oval

Issue raised

Page 47

Northern Beaches Council requests the concept plan and visual and landscape assessment of the impacts at Balgowlah Oval be further refined to be supported, however, it is also noted that Council will work with Transport for NSW to refine these designs to mitigate the landscape and visual impact.

Response

The project would include new and improved public open space at Balgowlah that is freely accessible to all members of the public and has broad recreational uses.

An indicative design of the proposed new and improved public open space and recreation facilities at Balgowlah is shown in Figure 5-21 and Figure 5-28 of the environmental impact statement. This design is subject to consultation but has been developed to identify what could be delivered within the available space, with consideration of the *Northern Beaches Sportsground Strategy* (Northern Beaches Council, 2017b) and in acknowledgement of Northern Beaches Council's ongoing work to develop their open space and recreation strategy.

Through an iterative process carried out in consultation with Council during development of the project design, the extent of residual open space available for active recreation has been maximised whilst still delivering the operational requirements of the project.

The final layout of the new and improved open space and recreation facilities at Balgowlah will be subject to a dedicated consultation process jointly led by Transport for NSW and Northern Beaches Council, in accordance with revised environmental management measure LP4 (refer to Table D2-1 in this submissions report). As part of the consultation process, a community reference group will be established, with representative stakeholder groups and the community, to support Transport for NSW and Council with the development of this important public space. This will give the community and key stakeholders an opportunity to provide input into the final layout of the new facilities.

B11.21.8 Safety barrier for Wakehurst Parkway shared user path

Issue raised

Page 47

Northern Beaches Council recommends the shared user path proposed along Wakehurst Parkway would require protection from vehicle incursion, with the preferred option of an Elscholz kerb with a Brifen cable barrier as a vertical separator, rather than guardrails or jersey kerb to minimise the visual impact.

Response

Artist impressions of the proposed shared path along Wakehurst Parkway are provided in Section 4.9.18 of Appendix V (Technical working paper: Urban design, landscape character and visual impact) and show viewpoints looking south and north along Wakehurst Parkway. Currently, cyclists travelling along Wakehurst Parkway must do so on the road occupied by vehicle traffic. The proposed Wakehurst Parkway shared user path would be a dedicated off-road path for cyclists and pedestrians, allowing cyclists to be physically distanced from road traffic and able to travel more slowly than drivers.

To provide further separation between motorists and active transport users, the design of the shared user path would include the provision of a safety barrier on the kerbline. Further details about the safety barrier are provided in Section A5.1.8 of this submissions report. The barrier would be a W-beam steel rail, with sections of concrete barrier where there are fill retaining walls on the outside of the shared path. Breaks would be provided in the barrier to access bus stops and vehicle fire trails. The cross sections AA and BB on page 172 of Appendix V (Technical working paper: Urban design, landscape character and visual impact) have been updated to show the provision of this safety barrier, with the updated cross sections provided in Figures A5-1 and A5-2 of this submissions report.

The Elsholz kerb is best suited to speed zones of 70 kilometres per hour or less whereas the current speed limit on Wakehurst Parkway is 80 kilometres per hour. In addition, the Elsholz kerb is not typically used in combination with a wire rope barrier.

The W-beam steel rail is proposed for this area as it has a dynamic deflection of one metre whereas wire rope barriers have deflections of around three metres. A landscaped strip of around 1.5 metres wide would be provided between the kerb and shared user path to accommodate the dynamic deflection of the barrier.

During further design development, the design would continue to be developed in accordance with relevant standards, including Austroads and Transport for NSW standards, to ensure the safety, amenity and comfort of pedestrians, cyclists and drivers.

B11.21.9 Use of coloured concrete for Wakehurst Parkway shared user path

Issue raised

Page 47

Northern Beaches Council recommends consideration should be given to using a coloured concrete for the proposed Wakehurst Parkway shared user path, to minimise the visual impact through this bushland area.

Response

Transport for NSW's urban design approach for the project would be developed through application of the strategic urban design framework outlined in Section D1.3 of this submissions report and described in detail in Appendix V (Technical working paper: Urban design, landscape character and visual impact).

The strategic urban design framework includes the principle to deliver a road corridor and associated infrastructure/public domain that presents a consistent palette of high quality materials representative of the project image and local context. The material palette for the project would be developed in line with the project identity and integrated design objectives to assist linear and lateral integration, enabling project elements to fit, connect and provide a meaningful user experience relevant to their surroundings.

The strategic urban design framework provides several urban design requirements for materials and finishes. These include requirements to utilise a materials palette which includes a consistent suite of treatments that relate to local settings, adjacent developments and wider project design elements, and to minimise visual clutter by avoiding the use of unnecessary elements, variety of materials and colour in the public domain. Transport for NSW will develop the materials palette with reference to all relevant local council public domain requirements and materials guidelines. The resulting design will be presented in the project urban design and landscape plan, which will be developed in accordance with environmental management measure V1 (refer to Table D2-1 in this submissions report) and made available to the public for feedback.

B11.22 Hazards and risks

B11.22.1 Reporting on disturbance and mobilisation of contaminated material

Issue raised

Page 47

Northern Beaches Council requests that an incident/impact report register be developed for on-site workers and/or local community to report on disturbance and mobilisation of contaminated material during construction and operation.

Response

Construction stage

A construction environmental management plan would be prepared for the project and will include environmental incident response and reporting requirements, including for contamination of land and water. An outline framework for the construction environmental management plan is provided in Section D1 of this submissions report.

Environmental incident response and reporting requirements for the project would need to address the requirements of relevant conditions of approval issued by the Department of Planning, Industry and Environment, the conditions of any environmental protection licence issued to the contractor/s by the NSW Environment Protection Authority to carry out the construction of the project, as well as Transport for NSW's own environmental incident response and reporting requirements.

Transport for NSW would develop and implement a complaints management system before the start of construction activities for the project, as detailed in Section 3 of Appendix E (Technical paper: Community consultation framework). This system will provide several mediums to receive and address community enquiries and complaints including any concerns regarding the mobilisation of contaminated materials. The complaints management system would be maintained during construction and for 12 months after the project is completed.

Operational stage

The project and its environmental performance during operation would be managed under the existing Transport for NSW environmental management system for asset maintenance (or similar) prepared in accordance with the *AS/NZS ISO 14000 Environmental Management System* series and developed to be consistent with the broad environmental objectives and policies set out in the Transport for NSW environmental management system. Environmental incident response and reporting requirements for the operational phase of the project would address Transport for NSW's own environmental incident response and reporting requirements as well as relevant conditions of approval issued by the Department of Planning, Industry and Environment. Transport for NSW

would also develop and implement a complaints management system before the start of operational activities for the project.

B11.22.2 Storage of dangerous goods and hazardous materials

Issue raised

Page 47

Northern Beaches Council recommends that dangerous goods and hazardous substances stored on site during construction and operation of the project be recorded in a register (including accurate estimation of quantities) that is supplied to the appropriate regulatory authorities on a regular basis and/or upon request.

Response

Dangerous goods and hazardous materials will be stored during construction and operation in accordance environmental management measure HR1 (refer to Table D2-1 in this submissions report) which requires dangerous goods and hazardous materials to be stored in accordance with suppliers' instructions and relevant legislation, Australian Standards, and applicable guidelines. Dangerous goods and hazardous materials may be stored on site in bulk storage tanks, chemical storage cabinets/containers or impervious bunds.

Under relevant legislation including the *Work Health and Safety Regulation 2017*, businesses using dangerous goods and hazardous chemicals must prepare a register and keep it up to date so that workers can easily find information about chemicals stored, handled and used at the workplace. Accordingly, dangerous goods and hazardous materials that are stored on site during both construction and operation of the project would be included in a register that would contain the relevant Material Data Safety Sheets (MSDS)/Site Safety Data Sheets (SDS).

Reference to the dangerous goods and hazardous chemicals register would be included in the relevant section(s) of the construction and operation environmental management plan, and site work health and safety plan(s).

B11.22.3 Emergency response infrastructure, systems and equipment

Issue raised

Page 47

Northern Beaches Council requests that the detailed design of the project consider an emergency response design factor and incorporates measures to prevent water and land pollution.

Response

<u>Emergency response facilities and systems</u>

Operational facilities and ancillary infrastructure including facilities and infrastructure related to emergency response are identified in Section 5.2.7 of the environmental impact statement. They include a motorway control centre, incident recovery centre, fire and life safety systems, tunnel drainage and wastewater treatment plant as well as closed circuit television (CCTV) and other traffic control systems.

A motorway control centre is proposed at the Gore Hill Freeway, within the Artarmon industrial area. It would be continually staffed and used to monitor and, if necessary, respond to, conditions in the tunnels and on surface road connections.

Tunnel support facilities would be located at the Gore Hill Freeway, within the Artarmon industrial area and next to the intersection of Wakehurst Parkway and Warringah Road at Frenchs Forest, as shown in Figure 5-2 and Figure 5-27 of the environmental impact statement respectively. The tunnel support facilities would include a maintenance facility, an incident recovery centre and material storage and management areas.

The tunnels would be fitted with fire and life safety systems consistent with Australian Standard *AS 4825:2011 Tunnel Fire Safety* (Standards Australia, 2011), applicable Austroads and Transport for NSW guidelines and the outcomes of consultation with emergency services.

Tunnel and surface water drainage

Tunnel drainage and water treatment infrastructure proposed as part of the project is identified in Section 5.2.7 and Section 17.4.3 of the environmental impact statement. A drainage and sump system would be installed within the tunnels to collect groundwater ingress into the tunnels, deluge water in the event of an incident or during routine testing of emergency systems, washdown water and spills and leaks.

Wastewater intercepted by the tunnel drainage systems would be collected at a sump and pumped to the project's operational wastewater treatment plant at the Gore Hill Freeway in Artarmon.

Surface water drainage and management infrastructure proposed as part of the project is identified in Table 5-10 of the environmental impact statement. Key surface water drainage and management that would be provided to prevent water and land pollution include new drainage at the tunnel portals to minimise the potential for ingress of water, replacement of existing drainage infrastructure directly affected by surface works where required, new water quality basins to provide flood storage capacity and localised adjustments to stormwater structures to accommodate the project.

B11.22.4 Location of spill response equipment

Issue raised

Page 47

Northern Beaches Council requests that detailed environmental emergency and spill response capabilities or equipment be located to quickly address any incidents throughout the project.

Response

Emergency response facilities and systems are identified in Section 5.2.7 of the environmental impact statement and summarised above. Details of environmental emergency and spill response capabilities and equipment and their storage location would be developed during further design development in consultation with relevant stakeholders including emergency services.

B11.23 Resource use and waste management

B11.23.1 Targets for resource management and waste minimisation

Issue raised

Page 48

Northern Beaches Council recommends that targets for resource management and waste minimisation are established as part of detailed design and the procurement phase.

Response

As noted in Section 24.1 of the environmental impact statement, the project design has taken into account the framework and targets for waste management and recycling as defined in the *Waste Avoidance and Resource Recovery Act 2001*.

Transport for NSW, as a NSW Government agency, supports these targets by:

- Implementing complementary policies and programs, including sustainable procurement policies
- Incorporating resource recovery and waste reduction objectives into its operations
- Complying with relevant regulations.

The aims of these policies are incorporated into the *Environmental Sustainability Strategy 2019–2023* (Roads and Maritime Services, 2019), which outlines specific focus areas for integrating sustainability into Transport for NSW road projects and services. Under the *Environmental Sustainability Strategy 2019–2023,* resource use and waste reduction initiatives include:

- Consideration of earthworks in project design and construction, including the recovery of materials for reuse
- Recycling materials
- Reducing resource use through appropriate project design and operation.

Identification of opportunities for the avoidance, minimisation and reuse of waste, including targets for the beneficial reuse of solid waste, will be addressed as part of the project's sustainability framework in accordance with environmental management measure SU1 (refer to Table D2-1 of this submissions report).

B11.23.2 Resource use

Issue raised

Pages 47, 48

The following recommendations and comments were raised by Northern Beaches Council regarding resource use for the project:

- When purchasing products and materials, the use of recovered materials should be considered to support the move to a more circular economy in Australia
- There is a significant opportunity for use of high-quality recycled glass in proven applications in the resources outlined in Table 24-2 of the environmental impact statement as follows:
  - 124,400 tonnes asphalt
  - 322,100 cubic metres ready mixed concrete
  - 25,400 cubic metres aggregates – sand/gravel
- It is noted that the provision of on-site concrete batching allows improved quality management, with a potential to reduce the wastage and transport related non-conformance
- A suitable certified recycled product alternative should be used when possible
- Concrete, asphalt, brick and tile recycling through on-site processing should be considered where temporary project requirements allow for this reuse or if possible, included in permanent works, eg crushed concrete drainage aggregate.

Response

The design of the project has included careful consideration of the selection of materials and resources to ensure they are fit for purpose and minimise resource consumption. Transport for NSW will require the project to be delivered in accordance with its own quality assurance specifications. This includes the need to meet engineering design specifications and requirements. Notwithstanding this, construction materials will be sourced in accordance with the project's Sustainability Framework and with a preference for Australian materials and prefabricated products with low embodied energy, to the extent reasonably practicable, in accordance with revised environmental management measure WM1 (refer to Table D2-1 of this submission report).

Table 24-2 of the environmental impact statement outlines the indicative quantities of construction materials required for the project and these material requirements are typical for a motorway project of this scale.

The project design has taken into account the principles of the resource management hierarchy as defined in the *Waste Avoidance and Resource Recovery Act 2001* and as described in Section 24.1 of the environmental impact statement. These principles of avoid/reduce/reuse/recycle/dispose will be applied during construction as per environmental management measure WM2 (refer to Table D2-1 of this submissions report) and aim to promote efficient use of resources, and avoidance and minimisation of waste wherever possible. For example, temporary work structures such as road plates and tunnel formwork would be reused and asphalt from decommissioned paving would be reused in new paving where possible.

Transport for NSW is also committed to a minimum of 10 per cent recycled content (when locally available) by volume in road base and sub base as per target RW5 in the *Environmental Sustainability Strategy 2019-2023* (Roads and Maritime, 2019).

Transport for NSW would also consider other alternate reuse methods for materials based on trials and lessons learnt from other projects, if appropriate. For example, the WestConnex Rozelle Interchange project has several sustainability innovation case studies that may be considered for the project as relevant. These sustainability innovation case studies are available at Rozelle Interchange.

Transport for NSW notes the Northern Beaches Council comment on concrete batch plants and agree that where appropriate, on-site concrete batch plants can improve quality management, reduce the wastage and minimise transportation issues. Provision for on-site batch plants has been made at the Balgowlah Golf Course construction support site (BL10) and Wakehurst Parkway north construction support site (BL14).

B11.23.3 Waste generation and management

Issue raised

Page 48

Northern Beaches Council recommends to source separate waste materials where possible to allow for those products to be recycled and diverted from landfill. This includes the 30 cubic metres of plastic sheeting that will be generated as waste.

All waste material is to be contained within the project sites to limit windblown spread or mobilisation into creeks and waterways.

Response

As mentioned above, the project design has taken into account the principles of the resource management hierarchy as defined in the *Waste Avoidance and Resource Recovery Act 2001* and

as described in Section 24.1 of the environmental impact statement. These principles of avoid/reduce/reuse/recycle/dispose will be applied during construction as per environmental management measure WM2 (refer to Table D2-1 of this submissions report) and aim to promote efficient use of resources and avoidance and minimisation of waste wherever possible.

Section 24.5 of the environmental impact statement outlines the approach for recycling and disposal of construction waste generated by the project, including the types of facilities within Sydney that are licensed to accept waste. The environmental impact statement notes that specific facilities and collection contractors for the disposal of putrescible and non-putrescible general solid waste, special and hazardous waste would be selected during the later stages of the project and documented in the construction waste management plan.

The project's waste will be stored and handled according to their waste classification in a manner that prevents pollution of the surrounding environment, as required by revised environmental management measure WM4 (refer to Table D2-1 of this submission report). Wastes will be managed and disposed of in accordance with relevant applicable legislation, policies and guidelines, including the *Waste Avoidance and Resource Recovery Act 2001* and the *NSW Waste Avoidance and Resource Recovery Strategy 2014–21* (NSW EPA, 2014a) in accordance with environmental management measure WM11.

Standard construction air quality mitigation and management measures will be detailed in construction management documentation and implemented during construction, as required by revised environmental management measure AQ1 (refer to Table D2-1 of this submission report). Section 24.3.3 of the environmental impact statement states that potential impacts from runoff and sedimentation would be further minimised through the implementation of the environmental management measures described in Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement.

B11.23.4 Spoil generation and management

Issue raised

Page 48

It is recommended that Transport for NSW and the Department of Planning, Industry and Environment work with Northern Beaches Council to assess whether the significant volume of sandstone spoil generated during construction would be suitable for beach nourishment. The cost of additional processing for this purpose could be offset against the transport and disposal cost, when the volume of material and number of truck movements are factored in.

Response

Where spoil cannot be reused for the project, opportunities to reuse this material on other projects (preferably within the Sydney region to reduce transport distances) would be identified (as discussed in Section 24.3.3 of the environmental impact statement). The final destination(s) for excess spoil from construction of the project would be planned prior to construction commencing and would continue to evolve throughout the construction phase.

Transport for NSW suggests that Northern Beaches Council considers the suitability of using sandstone spoil for the purpose of beach nourishment in their council area to determine if it is fit for purpose, and also considers their capacity to legally accept this material. Subject to Council providing a duly completed and signed notice under section 143(3A) of the *Protection of the Environment Operations Act 1997* (NSW), the proposal can then be considered by the contractor/s and Transport for NSW.

B11.24 Sustainability

B11.24.1 Review of the sustainability management plan

Issue raised

Page 48

Northern Beaches Council requests that it be provided the opportunity to review the sustainability management plan prior to it being finalised.

Response

Transport for NSW will prepare a sustainability management plan for the project in accordance with revised environmental management measure SU2 (refer to Table D2-1 of this submissions report). The plan will detail measures to meet the sustainability objectives and targets as well as achieving 'Design' and 'As Built' ratings of Excellent under the Infrastructure Sustainability Council rating scheme.

Transport for NSW would engage with Northern Beaches Council throughout preparation of the sustainability management plan and sustainability initiatives for the project as relevant.

B11.24.2 Indicative sustainability target themes

Issue raised

Page 48

Northern Beaches Council suggests the following additional sustainability target themes be included in Table 25-4 of the environmental impact statement to:

- Minimise energy use and greenhouse emissions, including a target theme on ventilation
- Optimise resource efficiency and waste management, including a target theme for resource recovery for demolition materials.

Response

Indicative sustainability objectives and target themes are provided in Table 25-4 of the environmental impact statement. Transport for NSW notes Northern Beaches Council's suggestions for target themes on ventilation and resource recovery for demolition materials, which are additional to the target themes listed in Table 25-4 of the environmental impact statement.

As discussed in Chapter 25 (Sustainability) of the environmental impact statement, the project sustainability objectives and targets are indicative and will be finalised during further design development. Finalisation of the project sustainability objectives and targets will be informed by the requirements of the project planning approval, in accordance with environmental management measure SU1 (refer to Table D2-1 of this submissions report). Transport for NSW will also consider Council's suggested additional target themes during finalisation of the project sustainability targets.

B11.24.3 Use of Portland cement

Issue raised

Page 48

Northern Beaches Council notes that the Portland cement content within concrete mixes is the most greenhouse gas intense component of the material. Council recommends that steps be taken to reduce Portland cement content to achieve a lower embodied carbon outcome. This can be

achieved through either reduced amount of concrete on the project, or through supplementary cementitious materials such as fly ash or slag, as well as many others. A target, such as a 30 per cent reduction in Portland cement content measured by mass across the project compared to a base case, should be considered.

Response

Transport for NSW will require the project to be delivered in accordance with its own quality assurance specifications. This includes the need for materials to be fit for purpose and meet engineering design specifications and requirements including satisfactory durability. Construction materials will be sourced in accordance with the project's sustainability framework, as outlined in revised environmental management measure WM1 (refer to Table D2-1 of this submissions report) which requires that prefabricated products with low embodied energy will be preferred, to the extent reasonably practicable.

Transport for NSW notes Northern Beaches Council's concern about the use of Portland cement. Initiatives such as targets for reducing Portland cement use will be considered during finalisation of the project sustainability objectives and targets and preparation of the sustainability management plan in accordance with environmental management measures SU1 and SU2 respectively (refer to Table D2-1 of this submissions report).

B11.24.4 Asphalt selection

Issue raised

Page 48

Northern Beaches Council notes that asphalt pavement material is typically 95 per cent mineral aggregates (such as sand or gravel) mixed with five per cent petroleum-based bitumen, with bitumen functioning as the glue binding the aggregates in a cohesive mix. Traditionally, asphalt is produced at temperatures around 160 to 180 degrees Celsius to optimise the coating of aggregate with bitumen and its laying manageability. Many innovations that attempt to lower the environmental impact of asphalt production centre on reducing the production temperature which reduces the energy (and consequently fuel) that is traditionally required to heat both the binder and the aggregates.

Where practicable, Council recommends that the project use:

- Alternative processes to traditional 'hot mix asphalt', such as warm or cool mix asphalts which have reduced energy requirements and reduced greenhouse gas emissions
- Recycled/reclaimed aggregates, such as recycled asphalt pavement, glass and/or concrete.

Response

Transport for NSW will require the project to be delivered in accordance with its own quality assurance specifications. This includes the need for materials to be fit for purpose and meet engineering design specifications and requirements including durability.

Transport for NSW is a leader in promoting the use of recycled materials into asphalt pavements. *Paving the way* (Transport for NSW, 2019b) provided the pavement industry with guidance on how Transport for NSW is using recycled materials in asphalt pavements, the different asphalt mix types in use and the design tools it has produced to assist pavement designers in the design of asphalt pavements.

Asphalt will be sourced in accordance with the project's sustainability framework, to the extent reasonably practicable, as outlined in revised environmental management measure WM1 (refer to

Table D2-1 of this submissions report). The resource management hierarchy principles established under the *Waste Avoidance and Recovery Act 2001* of avoid/reduce/reuse/recycle/dispose will be applied to the selection of asphalt in accordance with environmental management measure WM2 (refer to Table D2-1 of this submissions report).

B11.24.5 Lighting selection

Issue raised

Page 48

Northern Beaches Council requests that street lighting upgrades across the project use 4000k colour temperature LED lights for main roads and 3000k for residential roads. Council notes that LED street lighting with inbuilt smart control technology will reduce energy costs, reduce light spill into the environment, reduce impacts on fauna in the area and future proof the installed infrastructure.

Response

Lighting of surface roads would be provided consistent with the guidelines published by Austroads and Transport for NSW, as well as the relevant and applicable Australian Standards, as noted in Section 5.2.7 of the environmental impact statement.

Lighting design would be in accordance with Transport for NSW specifications for all assets to be owned by Transport for NSW. These specifications include the requirement that all new project road lighting, both on the surface and within the tunnel, would have an LED luminaire.

Where an asset would be owned by Northern Beaches Council it would be designed to Council's specifications. Transport for NSW would consult with Council on lighting assets to be owned by Council during detailed design.

B11.25 Climate change and greenhouse gas

B11.25.1 Adequacy and accuracy

Issue raised

Page 49

The following issues were raised by Northern Beaches Council regarding climate change and greenhouse gas:

- Council recommends additional hazards be included in the climate change risk assessment in Table 26-3 of the environmental impact statement, including heat and storm impacts (ie increased wind speeds, increased impervious surfaces and decreased green space), flooding risks in the vicinity of the tunnel and bush fire risk associated with operational infrastructure along Wakehurst Parkway, including the impact of smoke on emissions from ventilation outlets
- In Section 26.1.5 of the environmental impact statement, replace the word 'mitigate' with 'manage' (or something similar) as the term 'mitigate' is associated with reducing carbon emissions
- Section 26.2 of the environmental impact statement outlines the greenhouse emissions for the project. While it notes that these emissions are a small proportion of the NSW State emissions in 2027 and 2037, Council recommends that net zero emissions be considered for the project in line with the State Government's *Net Zero Plan Stage 1: 2020-2030* (NSW DPIE, 2020c). Council requests further detail regarding how the project's greenhouse gas emissions will be reduced.

Response

Climate change risks

A climate change risk assessment was completed as part of the environmental impact statement to assess the risk and vulnerability of the project to climate change. The assessment identified risks including increases in temperature and wind speed, and risks related to rainfall, surface flooding, sea level rise and bushfires. The assessment of climate change risks identified no extreme or high initial risk ratings, and some medium risk ratings which have been presented in Table 26-3 of the environmental impact statement. Low risks identified during the assessment were not considered to require any additional risk treatment, with these risks considered tolerable, and as such were not included in Table 26-3 of the environmental impact statement.

Predicted increases in temperature and wind speed were assessed as posing negligible to low risks to the project and would be managed with business as usual practices, therefore no additional risk treatment was required.

Impervious surfaces created by the project has the potential to increase the volume and rate of runoff and cause erosion within instream channels and change flood behaviour. The effects of impervious surfaces created by the project were discussed in Section 17.4.4 and Section 18.6.2 of the environmental impact statement. To address these effects a series of measures have been incorporated into the design of the project near the tunnel portals for all events up to the probable maximum flood level, as discussed in Section 18.6.1 of the environmental impact statement. Impacts of the project on flood behaviour during operation will be confirmed during further project development, and will include the consideration of future climate change, as outlined in revised environmental management measure F2 (refer to Table D2-1 of this submissions report). Other environmental management measures related to flooding impacts are outlined in Table 18-3 of the environmental impact statement. In addition, the loss of green space and tree removal on carbon absorption and the heat island effect is addressed in Section C25.3 of this submissions report.

The climate change risk assessment anticipated medium risks in respect to rainfall and surface flooding, bushfires (particularly in the area adjoining Wakehurst Parkway), and sea level rise. These medium risks drop to a final risk rating of low when incorporating further proposed additional treatment or investigations presented in Table 26-3 of the environmental impact statement and the revised environmental management measure CC1, which has been revised in response to Northern Beaches Council's recommendation (refer to Table D2-1 of this submissions report and Section B11.25.2). Medium risks related to bushfires would be managed with measures incorporated into the current design and business as usual practices presented in Table 26-3 of the environmental impact statement, including asset protection zones around buildings and variable message signs.

Bushfire risk, as assessed in the climate change risk assessment, related to damage of road infrastructure and the potential for injuries and/or fatalities to pedestrians and cyclists along Wakehurst Parkway. Consistent with other recent motorway tunnel projects in NSW, and as described in Technical Paper *TP05: Road Tunnel Stack Emissions* (Longley, 2014), the ventilation outlets for the project have been designed to improve dispersion and lower ground level concentrations of vehicle emissions compared to existing ground level concentrations of vehicle emissions by:

- Moving the point of release further away from sensitive receivers at ground level, giving more time and distance for emissions to dilute
- Moving the point of release higher in the atmosphere where dispersion is improved by more turbulence and stronger winds.

Given the above, bushfire smoke is not expected to affect the dispersion of emissions from the ventilation outlets. Since the predicted contribution of tunnel ventilation outlets to overall pollutant concentrations is negligible for all receivers in all of the expected traffic scenarios (refer to Section 12.6.2 of the environmental impact statement), the tunnel ventilation outlet contributions are also expected to be negligible during bushfires.

Climate change resilience and adaptation are embedded into the design, construction and operation phases of all Transport for NSW projects, as outlined in the *Environmental Sustainability Strategy 2019 - 2023* (Roads and Maritime Services, 2019). This includes ensuring that Transport for NSW specifications for delivery, maintenance and operation of infrastructure consider suitable climate and weather-related constraints which include current best practice climate change predictions.

‘Mitigate’

Transport for NSW agrees that the word ‘manage’ is more appropriate than the term used in Section 26.1.5 of the environmental impact statement. This is acknowledged as an oversight and has been clarified in Table A5-13 of Part A of this submissions report.

Greenhouse gas emissions

Greenhouse gas emissions are projected to increase as traffic numbers across the road network increase, as outlined in Section 26.2.4 of the environmental impact statement. However, the expected reduction in congestion and increase in vehicle efficiencies due to fewer stop and start movements as a result of the project, in addition to expected improvements in fuel efficiency and increased use of electric vehicles, in line with the *Net Zero Plan Stage 1 2020-2030* (NSW DPIE, 2020c), are projected to assist in reducing emissions.

Additionally, Priority 4 of the *Net Zero Plan Stage 1 2020-2030* (NSW DPIE, 2020c) would be met through the implementation of the Beaches Link and Gore Hill Freeway Connection sustainability vision and policy, outlined in Chapter 25 (Sustainability) of the environmental impact statement. This includes integration of sustainability-specific processes into procurement and labour practices, aligning with the policy commitment to bring sustainable goods, services and practices into the market. A sustainability management plan for the project will be developed following engagement of the contractor/s and further design development and construction planning, in accordance with revised environmental management measure SU2 (refer to Table D2-1 of this submission report). It will include objectives and targets to minimise energy use and greenhouse gas emissions during construction and operation, as well as optimising resource efficiency and waste management during construction. The project would also adhere to relevant NSW Government sustainability policies to minimise emissions during construction and operation.

As outlined in Section 26.2.5 of the environmental impact statement, greenhouse gas emissions will be managed and minimised as part of the sustainability management plan, which will be implemented to assist in achieving ‘Design’ and ‘As Built’ ratings of Excellent under the Infrastructure Sustainability Council rating scheme, in accordance with revised environmental management measure SU2 (refer to Table D2-1 of this submission report). This commitment is generally aligned with the NSW Government stated intention to reduce net greenhouse gas emissions.

B11.25.2 Updates to environmental management measures

Issue raised

Pages 48, 49

Northern Beaches Council recommends the risk relating to flooding in Table 26-4 of the environmental impact statement be updated to 'The impacts demonstrated from flood modelling projections incorporate climate change'.

Council also recommends updates to environmental management measure CC1 in Table D2-1 of this submission report so that it cross references Annexure B of Appendix R (Technical working paper: Flooding) and uses the 1 in 200 year and 1 in 500 year flood events as proxies to assess the sensitivity to an increase in rainfall intensity of flood producing rainfall events to climate change (10 per cent and 30 per cent increase in 1% AEP rainfall intensities ie 0.5% AEP and 0.2% AEP storms), noting this is specifically recommended in the Secretary's environmental assessment requirements.

Response

The climate change risk assessment was completed in accordance with the Secretary's environmental assessment requirements, as summarised in Table 26-1 of the environmental impact statement.

The recommendation from Northern Beaches Council to amend Table 26-4 of the environmental impact statement is noted. Transport for NSW will amend the risk summary in Table 26-4 to 'Changes to flooding impacts from climate change'. A clarification has been included in Table A5-13 of Part A of this submissions report regarding the amendment. This clarification does not impact the outcome of the assessment provided in the environmental impact statement.

The recommendation from Council to amend mitigation measure CC1 is also noted and a revised environmental management measure CC1 has been prepared which references revised environmental management measure F2 (refer to Table D2-1 of this submissions report):

The following actions will be carried out during further design development to ensure climate change is adequately addressed:

a) Flood modelling (required by environmental management measure F2) will continue to use sea level rise projections and future climate change rainfall projections

b) The extent of scour protection will be refined

c) Sensitivity testing for future climate change will be carried out in the detailed design of drainage channels and culverts. Increased capacity will be provided where feasible and reasonable.

B11.26 Cumulative impacts

B11.26.1 Construction fatigue

Issue raised

Page 20

Northern Beaches Council is concerned there is substantial construction fatigue in the Frenchs Forest area as a result of recent road upgrades, which should be considered when planning the staging of the project.

Response

Construction fatigue is discussed in Section 7.5.3, Section 13.4.3 and Section 27.3.7 of the environmental impact statement. The project design and construction methodology has been developed with consideration of construction fatigue with mitigation identified to address many of the issues associated with construction fatigue where possible.

The potential for cumulative impacts to occur in Frenchs Forest, based on likely interactions with other projects and strategic plans, was assessed in the cumulative impact assessment, as discussed in Section 27.3.6 of the environmental impact statement. Of particular relevance to the Frenchs Forest area is the Northern Beaches Hospital road upgrade project that was recently completed in August 2020 after a five year construction period. Major work on Beaches Link and Gore Hill Freeway Connection is planned to begin by 2023, which would provide the surrounding community in Frenchs Forest respite between both projects. As such, the cumulative impact assessment found that, based on the status, timeframe, location and scale of impact of assessed projects and strategic plans relevant to the area, the construction of the project in Frenchs Forest would be unlikely to produce cumulative impacts in this area.

However, each of the study disciplines presented in the environmental impact statement have identified environmental management measures to reduce potential impacts to acceptable levels, as outlined in Table D2-1 of this submissions report. Key to managing any perceived construction fatigue concerns in the Frenchs Forest area would be the environmental management measures proposed to address construction related traffic and transport impacts and construction noise and vibration impacts. Responses provided in Section B11.7 and Section B11.9 provide discussion on how these impacts would be managed for the project. In addition, the community consultation framework presented in Chapter 7 (Stakeholder and community engagement) of the environmental impact statement and Appendix E (Community consultation framework) has also been developed with consideration of construction fatigue and includes procedures to proactively manage this issue where possible as part of the community communication strategy. Further discussion on how construction fatigue would be managed during the implementation community communication strategy is provided in the response in Section B11.6.2.

B11.26.2 Concurrent delivery of the Northern Beaches Hospital Precinct Plan

Issue raised

Page 50

Northern Beaches Council states that based on approved projects in the Northern Beaches, construction of the project is unlikely to produce cumulative impacts for the Northern Beaches. Notwithstanding this, the environmental impact statement notes the potential for cumulative impacts associated with future development in the Frenchs Forest Hospital precinct, and this is also noted by Council.

Council recommends that once there is certainty on the delivery of the Frenchs Forest Planned Precinct and phases two and three of the *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a), the stakeholder and community engagement framework should be reviewed to ensure any impacts are appropriately managed.

Response

The potential for cumulative impacts at Seaforth, Killarney Heights and Frenchs Forest from the concurrent delivery of the project and the *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017a) was considered in Section 27.3.6 of the environmental impact statement. The assessment identified that cumulative construction impacts at Frenchs Forest may be generated by future projects associated with the *Northern Beaches Hospital Precinct Structure Plan*, however construction programs and specific scopes for individual projects have not yet been released.

Transport for NSW will manage the potential for cumulative impacts during the construction of the project in accordance with revised environmental management measure CI1 (refer to Table D2-1 of

this submissions report). Considered and tailored multi-party engagement and cooperation will be established prior to construction to ensure all contributors to impacts are working together to minimise adverse impacts or enhance benefits of multiple projects occurring concurrently or consecutively. Haulage routes and road occupancy will be coordinated with other major transport projects via Greater Sydney Operations.

B11.26.3 Concurrent delivery of the Mona Vale Road West project and future development in Ingleside, Brookvale and Dee Why

Issue raised

Page 50

Northern Beaches Council recommends that consideration be given to the future project impacts along the Mona Vale Road corridor during the construction of the Mona Vale Road West project, as well as future development potential in Ingleside and/or Brookvale and Dee Why. Consideration should be given to the construction impacts of both portals, and transport using the Wakehurst Parkway corridor to facilitate both sites, and the potential for works to be programmed to consider this matter.

Response

Mona Vale Road West project

The Mona Vale Road West project involves upgrading 3.4 kilometres of Mona Vale Road to two lanes in each direction through Ingleside between McCarrs Creek Road and Powder Works Road to improve road safety (refer to Appendix F (Technical working paper: Traffic and transport)). Detailed design of the Mona Vale Road West project is continuing and construction will commence when funding becomes available.

Potential for cumulative impacts during operation

Traffic modelling carried out for the environmental impact statement included the available information at the time and includes recently completed and future infrastructure project lists, including the Mona Vale Road West project.

On completion of the project, there is expected to be some benefit in terms of reduced traffic and congestion on Mona Vale Road, with peak period traffic demand expected to decrease by up to eight per cent as a result of the project (refer to Section 9.4.1 of the environmental impact statement).

Potential for cumulative impacts during construction

The Mona Vale Road West project is more than two kilometres from the project's construction footprint and, therefore, was not included in the cumulative impact assessment (refer to location criteria in Table 27-2 of the environmental impact statement). Notwithstanding, the potential cumulative impacts are not able to be considered in detail given the uncertainty of the status and timing of construction of the Mona Vale Road West project.

Transport for NSW will manage the potential for cumulative construction impacts in accordance with environmental management measure CI1 (refer to Table D2-1 of this submissions report).

Future development potential in the Northern Beaches

Traffic modelling carried out for the environmental impact statement takes into account forecast changes in future land use through the Sydney Motorway Planning Model (SMPM), as described in Section 3.3 of Appendix F (Technical working paper: Traffic and transport). The SMPM provides a

platform to understand changes in future traffic volumes and patterns under different land use, transport infrastructure and pricing scenarios.

Consequently, future development potential in Ingleside, Brookvale, Dee Why, and across the Northern Beaches and Greater Sydney, has been considered in the planning, design and environmental impact assessment of the project.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B12 – Willoughby City Council

November 2021

B12 Willoughby City Council

Contents

B12.1 Strategic context and project need

B12.1.1 Adequacy and accuracy

Issue raised

Pages 1, 5, 17, 19, 20, 105 and 106

Willoughby City Council considers the strategic justification for the project has not been clearly articulated, including when compared to public transport alternatives. A Final Business Case has never been released to the public. Council recommends that Transport for NSW release the Final Business Case prepared for the program/project to demonstrate why the program/project was considered the best option for addressing the transport issues facing the northern Sydney region. If this is not provided, Council requests a more thorough and comprehensive assessment of public transport alternatives to the project. Council considers that a more efficient and sustainable way to support mobility and continued growth of travel over the long term would be to invest in public transport, in particular heavy and light rail but also the rapid bus network.

Council question the travel time savings and reduced congestion benefits of the project, raising the concern that traffic benefits over the longer term may be eroded due to 'induced demand'.

Response

Project need and alternatives considered

Middle Harbour is a natural feature fundamental to the liveability and amenity of the Northern Beaches area which has historically presented a substantial challenge to the region's transport network, constraining north-south and east-west journeys to and from the Northern Beaches. Addressing this transport challenge has been considered since the late 1930s, with multiple options investigated to provide additional cross-harbour capacity as summarised in Figure 4-2 of the environmental impact statement.

Freight services, public transport and other road users travelling to and from the Northern Beaches region currently experience some of the slowest and most unreliable travel times across Greater Sydney. The North District and Northern Beaches region transport challenges face a number of key issues including:

- Limited arterial road capacity servicing the Northern Beaches Region
- Low population density across the region resulting in a wide variety of origins and destinations for transport journeys that are not well suited to high-frequency mass transit modes
- Road based transport modes, which provide the greatest flexibility to service the diverse trip needs, are constrained by a congested road network.

Considering future land use, population density and transport requirements, *Future Transport Strategy 2056* (NSW Government, 2018) identified road-based transport, including improvements to bus services, as important modes to support the development of the 30-minute city. The need for additional core motorway capacity at the crossings of Middle Harbour and Sydney Harbour was identified as key to the development of an appropriate multi-modal Sydney transport network. Further, *Future Transport Strategy 2056* specifically identified the Western Harbour Tunnel and Beaches Link program of works as transport projects required to support the plan.

Several key strategic alternatives were considered to provide extra transport capacity, to relieve pressure on existing crossings and to improve the efficiency and reliability for journeys across Middle Harbour, as outlined in Section 4.3 of the environmental impact statement. These included:

- Do nothing: this option was rejected as an undesirable strategic alternative because it would not address the identified project need
- Travel demand management: demand management measures need considerable changes in social attitudes, behaviour and government policy and can take years to achieve and would be unlikely to cater for the population and economic growth projected for Sydney over the next 40 years
- Improvements to the existing harbour crossing capacities and road network: this option was discounted as the scale of surface road improvements needed would result in unreasonable amounts of land acquisition and environmental and social impacts. In addition businesses and communities along the entire route would be heavily impacted and users of the existing surface corridors would also be considerably impacted during construction of these upgrades
- A new motorway crossing of Middle Harbour (the project): this option would address the project need of providing additional transport capacity across Middle Harbour between the Northern Beaches and strategic centres across Greater Sydney (including for public transport customers), deliver travel time savings and travel time reliability, and increase the resilience of the North District transport network. For these reasons this option was considered further.

The key strategic alternative of providing improvements to alternative transport modes was also considered, with the following options further investigated:

- The Sydney bus network: this option was discounted as improved bus services on existing surface corridors alone would not be sufficient to provide the level of additional transport capacity that is needed for the Northern Beaches region
- The rail network: although improvements to the rail network would contribute to reducing congestion on the existing road network, this option was discounted because it would not be sufficient to resolve the existing road network capacity constraints between the lower North Shore and the Northern Beaches. The provision of rail infrastructure is also reliant on the location of and accessibility to high density residential or commercial property close to the proposed location of stations, whereas in the Northern Beaches the population density is low resulting in a wide variety of origins and destinations for transport journeys. Further, new rail infrastructure would have engineering challenges based on the geography of the Northern Beaches (deep tunnels and station boxes) and be expensive to deliver in addition to requiring a long lead time to develop
- The ferry network: this option was discounted as while it would contribute to reducing congestion on the existing road network, it would not resolve the existing cross-harbour road congestion and capacity constraints
- Active transport: as outlined in Sydney's Cycling Future and Sydney's Walking Future, journeys made by cycling and walking are generally for short trips only, which would not meet the project need of improving cross-harbour capacity or resilience. Improvements to cyclist and pedestrian infrastructure alone would not cater for the diverse travel demands within the North District that are best met by road infrastructure.

When considering the strategic alternatives and complementary projects, it was concluded that the construction and operation of a new tunnelled motorway crossing of Middle Harbour was the preferred alternative to achieve the project objectives.

Project benefits

The Beaches Link and Gore Hill Freeway Connection project provides considerable benefits for the North Shore area, including the Willoughby local government area, as detailed in Chapter 3 (Strategic context and project need) of the environmental impact statement.

The project would provide a new underground motorway bypass of the Warringah Road (A38)/Eastern Valley Way corridor, providing travel time savings and reliability benefits for users of the project and for users of existing key corridors which would benefit from reduced traffic demand including on the congested Warringah Road/Eastern Valley Way corridor.

Modelled forecast traffic demands across Middle Harbour indicate a reduction in demand on major arterial routes around northern Sydney, including a forecast decrease in daily traffic demand on Eastern Valley Way of up to 40 per cent by 2037. Reduced congestion on existing surface arterial routes is expected to improve network resilience due to the provision of new road capacity and connectivity, and reduce the attractiveness of rat-running on these roads, including Eastern Valley Way, reducing traffic through surrounding urban and residential areas.

By providing additional motorway capacity and bypassing communities underground, the project would reduce through traffic volumes in many areas, resulting in reduced noise and improved amenity in these areas. This includes reduced through traffic on Eastern Valley Way and down through Willoughby, Naremburn, Cammeray and Northbridge. This would also assist in improving the efficiency of local movements between these localities and for those travelling from these areas into and out of the Northern Beaches.

Public transport customers would also benefit substantially from the project. The Beaches Link and Gore Hill Freeway Connection project would provide a step-change in travel times and reliability for bus services, and resilience for the critical road network servicing the Northern Beaches region.

Existing services would benefit from reduced traffic demand on key arterial bus corridors including the Warringah Road/Eastern Valley Way corridor, by improving travel times and travel time reliability on these roads as a result of reduced traffic demand and congestion. The reduced vehicle congestion on Warringah Road between Frenchs Forest and Roseville would support the possible implementation of a proposed rapid bus service, similar in nature to that of the existing B-Line between Dee Why and Chatswood. In addition, by reducing network congestion, improving network resilience, and increasing reliability in peak periods, the project would make bus travel to and from the Northern Beaches a more attractive transport option, supporting and encouraging a mode shift to public transport as indicated in Section 3.6.3 of the environmental impact statement.

The project would result in improvements to the efficiency of the city's critical bus network, by reducing pressure on key surface roads and delivering opportunities for new connections. The project would enable direct bus access to North Sydney and an efficient transfer to the Sydney Metro at the new Victoria Cross Station at North Sydney and Sydney Trains services at North Sydney Station. It would also create the opportunity for new public transport routes to be developed in response to diverse travel demands and future social and economic development. The project provides the opportunity to supplement existing services with express buses using the Beaches Link Tunnel to North Sydney, St Leonards and Sydney CBD, as well as to the north-west to employment areas like Macquarie Park via the Gore Hill Freeway and Lane Cove Tunnel.

Business case

The Beaches Link and Gore Hill Freeway Connection project forms part of a complementary, integrated, multi-modal strategy being implemented by the NSW Government to deliver an integrated transport network, as discussed in Section 3.4 of the environmental impact statement.

The Western Harbour Tunnel and Beaches Link program of works has followed the Infrastructure NSW processes. Through this process the program of works has demonstrated its economic merit and successfully passed, for this development stage of the project, the Infrastructure NSW Assurance Review Process. In addition to independent review of the design, constructability, environmental impacts, and traffic and transport benefits, this assurance review process included a review of the economic merit of the program of works. As part of this governance and rigorous review process, the Beaches Link and Gore Hill Freeway Connection project has undergone extensive scrutiny throughout its development.

The business case analysis for the Western Harbour Tunnel and Beaches Link program of works was augmented by extensive stakeholder and community consultation, additional site investigations and design development during 2017 and 2018. This resulted in design and construction improvements to reduce stakeholder impacts and improve project outcomes where feasible.

An overview of the development process and options considered as part of this process is provided in Chapter 4 (Project development and alternatives) of the environmental impact statement. An overview of the strategic context and project need is provided in Chapter 3 (Strategic context and project need) of the environmental impact statement.

Separate business cases were prepared for the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project. The business case carried out for the project contains confidential and market-sensitive information such as forecast construction costs, which if made public, could jeopardise the integrity of the procurement process for the project and risk achieving value for money for the people of NSW.

Consistent with NSW Government policy, a summary of the business case for the project will be released by Infrastructure NSW at an appropriate time once an investment decision has been made. It is noted that Infrastructure NSW has released a summary of the Final Business Case for the Western Harbour Tunnel and Warringah Freeway Upgrade project, which is available online:

www.infrastructure.nsw.gov.au/media/2528/western-harbour-tunnel_bc-summary-may-2020.pdf

Traffic forecasting and modelling adequacy and accuracy

Transport modelling described in the environmental impact statement is informed by the NSW Government's standard integrated land use and multi-modal transport forecasting approach. This is an industry standard four stage transport forecasting approach which specifically accounts for trip generation, trip distribution, mode choice and route assignment factors, and other key factors including the potential for induced demand. An overview of this approach is provided in Section 9.2.2 of the environmental impact statement and Section 3 of Appendix F (Technical working paper: Traffic and transport).

The Sydney Motorway Planning Model (SMPM) which informed the traffic and transport assessment includes induced demand effects within the forecasting methodology. This means that induced demand has been considered in the assessment of project impacts in every section of the environmental impact statement.

The SMPM includes the changes in traffic associated with the following:

- Regional increase in number of trips due to population growth and increased economic activity
- Trips attracted from competing routes or modes as a result of improved travel times on the new or upgraded road

- Induced demand (new trips) as a result of improved travel times between homes and destinations, such as workplaces, shopping centres and education facilities, which cause changes to region-wide trip patterns.

The operational travel benefits outlined are therefore inclusive of forecast induced traffic demand.

As an example, Table 7-21 and Table 7-22 of Appendix F (Technical working paper: Traffic and transport) provide details of peak period demands in the Gore Hill Freeway and surrounds microsimulation modelling area. These tables indicate that for the design year of 2037 the project is forecast to increase (induce) peak period demand in this area by between five and 13 per cent. The traffic performance assessment metrics presented in the environmental impact statement (network speeds, corridor travel times, intersection level of service etc) and Section 6 of the preferred infrastructure report reflect the effects of demand increases created by the project in localised areas.

B12.1.2 Policy alignment

Issue raised

Pages 2, 5, 6, 7, 8, 105 and 106

Willoughby City Council suggests the project is not consistent with the *Greater Sydney Region Plan – A Metropolis of Three Cities, Future Transport Strategy 2056*, the *Greater Sydney Services and Infrastructure Plan 2056* and *Willoughby Integrated Transport Strategy 2036.* Council suggests that the project would likely perpetuate car dependency and do little to contribute to the NSW Government target of net-zero emissions by 2050.

Council questions whether the project aligns with the *Greater Sydney Services and Infrastructure Plan* and how it contributes to achieving the '30-Minute City' ideal via public transport. Council notes that Appendix F (Technical working paper: Traffic and transport) stated that the project 'would create opportunities for new, or the extension of existing, public transport services. These new service opportunities would benefit from the same increases in catchment size as private vehicles', however the maximum benefits for bus travel times would only be achieved if dedicated bus lanes were created.

Council questions whether the project can be described as sustainable, per *Outcome 6 – Sustainable* of *Future Transport Strategy 2056,* and whether it supports emissions reductions or the target of net-zero emissions by 2050. Council requests that Transport for NSW demonstrates how the project aligns with *Future Transport Strategy 2056*, including *Outcome 6 – Sustainable* given the continued and induced demand for private vehicle travel as a result of the project.

Council recommends that assessment of the project against the key concepts of Willoughby City Council local strategic plans should be provided, including *Our Future Willoughby 2028 – Community Strategic Plan* – the five Outcomes, *Willoughby City Local Strategic Planning Statement* – Priorities 7, 8 and 9, and *Willoughby Integrated Transport Strategy 2036* – the five Strategic Directions.

Response

A summary of how the project aligns with the objectives of State and national strategies for transport, freight and city planning is provided in Table 3-2 of the environmental impact statement.

<u>30-minute city</u>

The *Greater Sydney Region Plan – A Metropolis of Three Cities (Greater Sydney Region Plan)* (Greater Sydney Commission, 2018a) is built on a vision of three cities where most residents live

within a 30-minute journey of their jobs, education and health facilities, and services, as outlined in Table 3-2 of the environmental impact statement.

Access between the North District and employment hubs along the Eastern Economic Corridor is primarily provided by private vehicle and bus services using the Military Road/Spit Road and Warringah Road /Eastern Valley Way corridors, which are highly congested and unreliable during peak periods. As a result, a small proportion of jobs within Greater Sydney are accessible to North District residents within 30 minutes by private vehicle or public transport during the morning peak. The project contributes to the fulfilment of this 30-minute vision by supporting key movements by public transport, private vehicles and freight by road. The Beaches Link and Gore Hill Freeway Connection project, as part of an integrated multi-modal transport network being implemented by the NSW Government, would increase the number of people and places that are able to be reached within 30 minutes. The changes in the percentage of jobs accessible within 30 minutes in the 2037 AM peak for trips from Chatswood, Brookvale, Dee Why and Manly, for the 'Do minimum' and 'Do something' scenarios (ie with and without implementation of the project respectively), are outlined in Figures 3-11, 3-12 and 3-13 of the environmental impact statement. These figures indicate that the project would result in the employment centres of North Sydney and Chatswood being much more accessible for workers residing in the Northern Beaches region, including Manly and Dee Why.

One of the key roles of the *Greater Sydney Region Plan* is to provide appropriate infrastructure in the right places to support the continued growth of Greater Sydney. The plan also identifies the importance of investing in and delivering efficient and effective transport systems including road infrastructure that would improve business to business connections and support the 30-minute city vision. Objective 18 of the *Greater Sydney Region Plan* references the Western Harbour Tunnel and Beaches Link program of works as infrastructure that would further improve accessibility from the Northern Beaches to the Harbour CBD and reduce through traffic in the Harbour CBD ensuring the economic strength and global competitiveness of the Harbour CBD.

The project has been designed to complement and enhance the existing and future public transport network servicing the Northern Beaches region, by relieving pressure on surface arterial roads, allowing surface bus routes to operate more efficiently. Existing services would benefit from reduced traffic demand on key arterial bus corridors including the Warringah Road/Eastern Valley Way corridor, by improving travel times and travel time reliability on these roads as a result of reduced traffic demand and congestion. The project would result in improvements to the efficiency of the city's critical bus network, by reducing pressure on key surface roads and delivering opportunities for new connections, including:

- Reduced vehicle congestion on Warringah Road between Frenchs Forest and Roseville would support the possible implementation of a proposed rapid bus service, similar in nature to that of the existing B-Line between Dee Why and Chatswood.
- Direct bus access to North Sydney and an efficient transfer to the Sydney Metro at the new Victoria Cross Station at North Sydney
- Creation of the opportunity for new public transport routes to be developed in response to diverse travel demands and future social and economic development
- Creation of the opportunity to supplement existing services with express buses using the Beaches Link Tunnel to North Sydney, St Leonards and Sydney CBD, as well as to the north-west to employment areas like Macquarie Park via the Gore Hill Freeway and Lane Cove Tunnel. There would also be the opportunity for express bus services using the project to interchange with Sydney Trains and Sydney Metro at North Sydney.

As further explained below, the project is also part of a multi-modal network being delivered by the NSW Government including investments in metro railways, light rail and bus projects across Greater Sydney.

Future Transport Strategy 2056

The *Future Transport Strategy 2056* (NSW Government, 2018) promotes the development of an integrated multi-modal network, identifying that investment in motorways is needed in addition to investment to public transport such as Sydney Metro, light rail, and bus projects being rolled out throughout Sydney to accommodate the diverse needs of transport customers. The *Greater Sydney Services and Infrastructure Plan* forms part of *Future Transport 2056* and builds on the outcomes identified in the strategy, establishing specific outcomes that customers can expect and identifying the policy, service and infrastructure initiatives to achieve these. The Western Harbour Tunnel and Beaches Link program of works is identified in the *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan* as a 'Committed' project forming part of the vision for the future strategic road network for Greater Sydney that would support key movements by road, including public transport, private vehicles and freight.

The six principles outlined in *Future Transport Strategy 2056* are:

- 'Customer-focused'
- 'Successful Places'
- 'A Strong Economy'
- 'Safety and Performance'
- 'Accessible Services'
- 'Sustainability'.

The project is 'Customer-focused' as it would improve travel times and reliability and will facilitate 'A Strong Economy' by enabling and accommodating future growth. The project will also deliver the opportunity to relocate a significant volume of through traffic on surface arterial roads underground. In addition a direct benefit of moving traffic underground is reduced congestion on the arterial road network which would result in improvements in amenity related to physical safety, air quality and noise levels and thus contribute to 'Successful Places'. An example of this is the project would facilitate improvements to urban amenity by reducing through traffic and pressure on arterial roads including on Eastern Valley Way and down through Willoughby, Naremburn, Cammeray and Northbridge.

Objective six of *Future Transport Strategy 2056*, 'Sustainability', seeks for the 'transport system [to be] economically, environmentally and socially sustainable, operationally resilient, affordable for customers and supports emissions reductions'. Delivery of the project would support the sustainability objective in *Future Transport Strategy 2056* '…to be economically, environmentally and socially sustainable', by providing travel time savings for private vehicles, freight and buses, better access to jobs and businesses, reduced congestion on motorways and arterial roads and relief for the existing cross harbour transport capacity. This is demonstrated in Chapter 26 (Climate change and greenhouse gas) of the environmental impact statement which discusses how even though greenhouse gas emissions are projected to increase as traffic volumes across the road network grow, including the minor increase in induced demand expected to result from the project, the expected reduction in congestion as a result of the project is projected to result in improvements to the overall efficiency of emissions. The project would increase the number of road links across the network but would result in fewer vehicle stop and start movements, less congestion and a

greater average vehicle speed, which would further increase the efficiency of vehicles and help in reducing emissions and so contribute to the NSW Government target of net zero emissions.

In addition, to achieve the sustainability vision for the project and to contribute to the desired outcomes of relevant NSW Government and Transport for NSW policies and guidelines, the project would establish robust sustainability objectives and targets outlined in Table 25-4 and discussed in Section 25.2.3 of the environmental impact statement. The project is also committed to developing a Sustainability Management Plan and achieving 'Design' and 'As Built' ratings of 'Excellent' under the Infrastructure Sustainability Council rating scheme, as required by revised environmental management measure SU2 (refer to Table D2-1 of this submissions report).

Willoughby City Council local strategic plans

The project contributes to achieving the aims of the Willoughby City Council local strategic plans, by facilitating reduced congestion and improved travel times, increasing connectivity via improved active and public transport opportunities, and supporting local environment and amenity improvements in precinct areas and surrounding regions, as noted in Section 21.5 of the environmental impact statement. A review of how the project aligns with *Our Future Willoughby 2028 – Community Strategic Plan*, *Willoughby City Local Strategic Planning Statement* and *Willoughby Integrated Transport Strategy 2036* is provided in Table B12-1.

Table B12-1 Assessment of Willoughby City Council plans and their alignment with the project outcomes

Policy	Description
Our Future Willoughby 2028 – Community Strategic Plan	*Our Future Willoughby 2028 – Community Strategic Plan* (Willoughby City Council, 2018a) outlines the community's vision and priorities for the future of Willoughby City Council, including that it would be a diverse, liveable and prosperous city. The plan includes five outcomes to achieve this vision: that the city is green, connected and inclusive, liveable, prosperous and vibrant, and effective and accountable. In developing the plan Council ensured its outcomes aligned with the *NSW State Infrastructure Strategy 2018-2038*, *Our Greater Sydney 2056, North District Plan – Connecting Communities* and *Future Transport Strategy 2056*, which all identify the Beaches Link and Gore Hill Freeway Connection project as a priority and committed project which will help achieve the vision for the future strategic transport network for Greater Sydney. The project would support Council in achieving the outcomes in the plan through: • An expected reduction in traffic and congestion as a result of the project • An expected reduction in greenhouse gas emissions by reducing traffic and congestion in local areas, thereby reducing vehicle stop and start movements and increasing average vehicle speed • Reduced congestion on existing strategic bus corridors which would help improve travel times and reliability for public transport customers, encouraging a modal shift to public transport • Adherence to 'crime prevention through environmental design' principles within the design to help to support passive surveillance and create safe and comfortable places • Create faster, more reliable travel times via the Beaches Link tunnel for public transport and other road users between the Northern Beaches region and other strategic centres across Greater Sydney, including North Sydney, the Harbour CBD, Artarmon and St Leonards • Create more efficient, more reliable travel times for freight services between the Artarmon industrial area and the greater Northern Beaches region improving access to customers. This will also result in road safety improvements for all road users due to heavy vehicles being diverted into the tunnel

Policy	Description
	• Improve productivity and access to goods and services by facilitating faster and more reliable travel times for road users and service providers to reach their destinations • Prior to and during construction of the project Transport for NSW would continue to engage with Council and the community through an open, proactive and transparent community engagement and consultation process, as outlined in Appendix E (Community consultation framework).
Willoughby City Local Strategic Planning Statement	The *Willoughby City Local Strategic Planning Statement* (Willoughby City Council, 2020a) sets a 20-year vision with priorities and actions for land-use planning in the Willoughby City local government area, considering the economic and social needs of the community and how they will change in the future. The planning statement includes 20 priorities to achieve Council's vision, including: • Priority 7 – Developing Willoughby City local government area transport system and Chatswood's role as a true transport hub for Willoughby City and the North Shore • Priority 8 – Connecting Willoughby's network of centres with each other and to Greater Sydney by mass transit • Priority 9 – Developing Chatswood CBD as a key commercial centre and integral part of the Eastern Economic Corridor. The project would support Council in achieving the above priorities by enabling greater access to jobs and services for northern Sydney businesses and residents, with the project expected to result in the employment centres of North Sydney and Chatswood being much more accessible for workers residing in the Northern Beaches region, including Manly and Dee Why. Relieving pressure on existing surface arterial road corridors and improving the capacity of the road network would encourage opportunities for new express bus services. This is evidenced by the new rapid bus service between Dee Why and Chatswood currently being planned, which would benefit from reduced congestion on the Warringah Road/Eastern Valley Way corridor. In addition, on and off ramps to the tunnel at Reserve Road would offer the opportunity for express bus services in the Beaches Link tunnel between the Northern Beaches and strategic centres such as St Leonards. The planning statement is also consistent with the *Greater Sydney Region Plan* and the *North District Plan – Connecting Communities* which both identify the project an initiative to improve connections and access for the Northern Beaches and North Shore regions.
Willoughby Integrated Transport Strategy 2036	The *Willoughby Integrated Transport Strategy 2036* (Willoughby City Council, 2020b) provides an overarching framework for transport and planning initiatives across the Willoughby local government area. The strategy includes five strategic directions for a sustainable transport system with excellent connectivity which contributes to the development of vibrant, liveable and safe places and supports the local economy, responding to community needs. The project would support Council in achieving these strategic directions by: • An expected reduction in traffic and congestion in Willoughby LGA as a result of the project • An expected reduction in greenhouse gas emissions by reducing traffic and congestion in local areas, thereby reducing vehicle stop and start movements and increasing average vehicle speed • Reduced congestion on existing strategic bus corridors including Eastern Valley Way which would help improve travel times and reliability for public transport customers, encouraging a modal shift to public transport • Relieving pressure on existing surface arterial road corridors and improving the capacity of the road network which would encourage opportunities for new express bus services. This is evidenced by the new rapid bus service between Dee Why and Chatswood currently being planned, which would benefit from reduced congestion on the Warringah Road/Eastern Valley Way corridor • On and off ramps to the tunnel at Reserve Road would offer the opportunity for express bus services in the Beaches Link tunnel between the Northern Beaches and strategic centres such as St Leonards

Policy	Description
	• Adherence to 'crime prevention through environmental design' principles within the design to help to support passive surveillance and create safe and comfortable places.

B12.1.3 Staging of the program

Issue raised

Page 21

Willoughby City Council acknowledges that maximum benefits for Council would be realised if the overall program (Western Harbour Tunnel and Beaches Link program of works) is delivered concurrently. Furthermore, Council notes that the potential staging and separate delivery of the Gore Hill Freeway Connection from the Beaches Link component (refer to Section 5.1 of the environmental impact statement) would not provide the best performance outcomes for Council. Council request that both elements, ideally, be delivered at the same time and suggests that this 'same time' delivery of the Beaches Link and Gore Hill Freeway Connection be a condition of approval.

Response

The Western Harbour Tunnel and Beaches Link program of works is a major transport infrastructure program that would make it easier, faster and safer to get around Sydney. It has been developed as an integrated program of works consisting of the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project.

The Western Harbour Tunnel and Warringah Freeway Upgrade project has received planning approval and as such would commence construction before the Beaches Link and Gore Hill Freeway Connection project. The indicative construction program for the project currently shows elements of the Gore Hill Freeway Connection component and Beaches Link component would be constructed concurrently, as shown in Table 6-3 of the environmental impact statement. The final construction program for the project would depend on future project procurement and packaging decisions.

Should timeframes for the Beaches Link and Gore Hill Freeway Connection project be advanced, some elements of the project may be delivered as part of the Western Harbour Tunnel and Warringah Freeway Upgrade works to maximise construction efficiency and minimise impacts to particular areas, including minimising disruption to traffic and the community in and around Cammeray. Works could include but may not be limited to cut and cover and trough works at Cammeray, construction of motorway facilities and ventilation tunnels at Warringah Freeway and traffic staging enabling works for the Gore Hill Freeway Connection.

Chapter 5 (Project Description) of the environmental impact statement describes the scope of the Beaches Link and Gore Hill Freeway Connection project and notes the project may be staged, depending on future decisions regarding the delivery of the project. As a result of further planning and procurement packaging, Transport for NSW has elected to stage the project, which was foreshadowed in Chapter 5 (Project description) of the environmental impact statement. This includes the Gore Hill Freeway Connection being delivered separately to the Beaches Link component of the project. Section A4.9 of this submissions report provides details of the project staging plans.

Specific conditions of approval relating to active transport are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.2 Project development and alternatives

B12.2.1 Design change request – alternative surface connections at Artarmon

Issue raised

Pages 22, 55 and 56

Willoughby City Council is of the view that while providing an on ramp and off ramp in the vicinity of the Artarmon industrial area is considered acceptable, the best outcome is for the ramps to connect directly with the Pacific Highway in the vicinity of Dickson Avenue. This design would provide benefits to the industrial area (and residential areas as well), as there would be a direct connection of the project to a State road, similar to the Lane Cove Tunnel and Gore Hill Freeway. Surplus land could be used to provide green space/park for the industrial area.

Response

An overview of the development process and options considered as part of this process is provided in Chapter 4 (Project development and alternatives) of the environmental impact statement.

The project design chosen provides access to and from Artarmon industrial and wider residential areas, access to St Leonards/Crows Nest and access to the Pacific Highway and Gore Hill Freeway/Lane Cove Tunnel. This east/west connectivity to key employment and residential areas, including to the north-west (for example Macquarie Park), is an important function of the project design.

The alternative surface connections at Artarmon suggested by Willoughby City Council presents the following potential impacts and challenges:

- Increased property impacts, due to the requirement to widen the Pacific Highway to accommodate new portals/ramps in addition to existing lanes
- Significant cost increases, due to the additional tunnelling required (greater than one kilometre) and associated property costs
- Potential constructability challenges due to constrained works areas
- Likely decreased traffic performance (compared to the proposed design), due to the requirement to construct a new set of motorway ramps in an already congested corridor
- Increased environmental impacts such as noise and visual amenity etc.

It is also noted that traffic modelling for the project indicates that only a relatively small amount of traffic forecast to use the Beaches Link tunnels (approximately 10 per cent) is anticipated to travel to/from the Beaches Link via the Reserve Road interchange. Considering the above challenges, and the limited number of potential users at the Reserve Road interchange, this option is not considered to be a desirable alternative to the current project design.

B12.2.2 Active transport design changes

Issue raised

Pages 2, 16 and 58

Willoughby City Council identifies that the project may create opportunities to improve the standard of active transport infrastructure and services.

While the environmental impact statement highlights that the project provides an integrated transport network, Council notes that the project does not provide active transport improvements

connecting the Northern Beaches with Willoughby local government area. Council requests that a separated two-way bicycle lane on Warringah Road/Babbage Road/Boundary Road be investigated. Opportunities to upgrade connections for cyclists between the Forest District and Ku-ring-gai and Willoughby local government areas should be investigated, as this is a missing east-west link.

Willoughby City Council seeks a condition of approval requiring that an active transport review be carried out that includes a Forestville to Chatswood Bicycle Route Plan, to investigate and recommend improvements to safety, access, attractiveness and operation for cyclists along the Warringah Road/Babbage Road corridor between Forestville and Chatswood. This should be created in consultation with Northern Beaches, Ku-ring-gai and Willoughby councils and local cyclist groups/organisations.

Response

The project is one part of a complementary integrated multi-modal strategy being implemented by the NSW Government. As part of this overarching integrated transport network, the project includes the development of new or upgraded active transport links in several locations, generally associated with surface works for the project. These links would improve connectivity between communities, open space areas, public transport modes and the existing active transport network. Improvements to active transport infrastructure proposed by the project are identified in Section 5.1.1 of the environmental impact statement.

Project benefits include reduced congestion and a diversion of surface through traffic from other motorways and existing arterial roads into the Beaches Link tunnel, as discussed in Section 3.6.6 of the environmental impact statement. This in turn would result in improvements to safety and amenity in these neighbourhoods.

The potential operational impacts to active transport have been assessed in accordance with the Secretary's environmental assessment requirements in Section 9.5 of the environmental impact statement. The assessment concludes that overall the project would result in improved active transport connectivity.

While the provision of active transport links on Warringah Road/Babbage Road and between the Forest District and Ku-ring-gai and Willoughby local government areas is considered out of the scope of this project, they would not be precluded by the project. However, Transport for NSW notes that an active transport proposal of the scale and nature proposed by Willoughby City Council would require its own assessment, as appropriate, to consider aspects such as property acquisition, noise impacts, traffic impacts, parking impacts and vegetation impacts etc.

As a consequence of the forecast reduction in traffic on existing surface roads, the project would enable other divisions of Transport for NSW and other agencies (including Council) to explore opportunities for urban renewal, public transport, active transport and changes to transport management on key corridors. This includes working with local Council and other government stakeholders to develop a place based transport plan for the lower North Shore, which would identify potential transport opportunities to respond to the changing needs of the community, including movement types, and initiatives for mode shift and network operation across all transport modes. The development of the plan would consider the transport needs for the area based on transport and land use changes within the area, including their purpose, connections between centres and modal priority, eg light vehicle, freight, buses and cyclists, and changes to the transport network as a result of major infrastructure projects currently proposed and being delivered in the area. Transport for NSW is commencing engagement with Willoughby City Council, Mosman Council, North Sydney Council and Lane Cove Council in the last quarter of 2021.

For active transport connections outside the scope of the project, councils can apply for funding for cycleways under the NSW Government's Walking and Cycling Program. In line with the NSW Government's Future Transport Strategy 2056, this program focuses on improving the convenience of walking and cycling for short trips to key destinations and within centres, and making walking and cycling safe and reliable by prioritising infrastructure that supports pedestrian and cycling movement. Further information is available at www.transport.nsw.gov.au/projects/programs/walking-and-cycling-program.

Transport for NSW notes Council's most recent successful application for funding via the walking and cycling infrastructure program in 2019/20 which included upgrade of the pedestrian refuge on Herbert Street, St Leonards, near the Ella Street intersection. Applications for the NSW Government's 2022/2023 Walking and Cycling Program will commence shortly and Transport for NSW encourages Council to continue to apply for funding for specific initiatives via the program.

Specific conditions of approval relating to active transport are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project. Refer to Section B12.7.8 of this submissions report for discussion on Council's suggestion regarding the provision of an active transport review.

B12.3 Project description

Issue raised

Page 56

Willoughby Council notes that Table 5-12 of the environmental impact statement indicates that the surface road works in the Artarmon industrial area are minor. Council does not agree with this statement.

Response

Table 5-12 of the environmental impact statement states that minor changes to local roads around the Gore Hill Freeway Connection would include:

- Removal of the connection between Dickson Avenue east and Reserve Road at Artarmon, with conversion of Dickson Avenue to the east of Reserve Road to a cul-de-sac
- Removal of the connection between Punch Street and Lambs Road at Artarmon, with conversion of Punch Street to a cul-de-sac
- Modifications to the Dickson Avenue west/Reserve Road intersection to accommodate the new Beaches Link off ramp
- Modifications to the traffic signals of Reserve Road at Artarmon
- Upgrade and inclusion of traffic signals at the Dickson Avenue/Pacific Highway intersection and linemarking along Dickson Avenue west of Reserve Road
- Integration work along Dickson Avenue between Reserve Road and the Pacific Highway.

The word 'minor' was used to describe the scale of these surface road works, relative to the scale of the project as a whole. However, it is noted that receivers near surface works in the Artarmon industrial area would experience impacts during construction, and the scale of the works to these local receivers would not be considered to be minor. As such, a clarification is provided in Table A5-13 of this submissions report to remove the word "minor" from this description.

B12.4 Construction work

B12.4.1 Construction environmental management plan

Issue raised

Pages 60 and 95

Willoughby City Council requests a condition of approval requiring Transport for NSW to prepare and implement a construction environmental management plan.

Response

A construction environmental management plan would be prepared for the project, as outlined in Section 28.5.1 of the environmental impact statement. Section D1 of this submissions report builds upon the environmental management plan framework identified in Section 28.5 of the environmental impact statement, identifying the framework for the management of key issues. Table D1-1 provides the likely sub-plans, along with the relevant guidelines or requirements of each plan, which would support the implementation of the overarching construction environmental management plan. All relevant environmental management measures included in Table D2-1 of this submissions report will be adopted and incorporated into the management plans.

B12.4.2 Closure of public roads

Issue raised

Pages 29, 31 and 51

Willoughby City Council seeks clarification whether the following road closures are permanent and the timing of any permanent road closures:

- Parts of Lambs Road and Punch Street
- Dickson Avenue and Hesky Lane.

If permanent road closures are proposed, a road closure proposal is to be submitted to Council with relevant compensation.

Response

Lambs Road between Punch Street and Cleg Street would be closed during construction to make way for the Punch Street construction support site (BL3), as noted in Section 8.4.2 of the environmental impact statement. Existing access to this section of Lambs Road is via Cleg Street and Punch Street, and therefore access impacts due to this closure would be minor.

Periodic short-term closures of Reserve Road, Hampden Road, Dickson Avenue and Punch Street would also be required during construction. Given the extensive local road network at Artarmon, vehicles would have multiple alternative routes available during these interim closures. Potential detour roads include Herbert Street, Carlotta Street, Campbell Street, Frederick Street and Cleg Street.

During operation of the project, Lambs Road would be disconnected from the road network between Punch Street and Cleg Street to facilitate the tunnel support facilities, as described in Section 9.4.3 of the environmental impact statement. Lambs Road would connect directly onto Cleg Street at its northern end while a cul-de-sac would be permanently installed on Punch Street at its eastern end. Vehicles would be redirected from Lambs Road to Herbert Street and Punch Street.

Construction of the westbound off ramp connecting to Reserve Road would require the permanent conversion of Dickson Avenue to a cul-de-sac, directly east of the intersection with Reserve Road in Artarmon. Hesky Lane would not be closed; rather it would connect to the new Dickson Avenue cul-de-sac. Access to the existing properties on Dickson Avenue would be provided from Hesky Lane.

Timing of road closures would be determined during further design development and construction planning.

In relation to road closure agreements, the project has been declared State significant infrastructure pursuant to Clause 14 of the State Environmental Planning Policy (State and Regional Development) 2011. Further, Transport for NSW has made a request to the NSW Minister for Planning and Public Spaces for the project to be declared critical State significant infrastructure under Section 5.13 of the *Environmental Planning and Assessment Act 1979*. As State significant infrastructure, the project is granted a number of exemptions to authorisations under section 5.23 of the *Environmental Planning and Assessment Act 1979*. This includes an exemption from the need to obtain approval for the closure of a road and/or a change of use for the establishment of temporary construction support sites.

Transport for NSW intends to develop an Interface Agreement with Willoughby City Council which would provide more detail on the scope, rights and obligations for both the construction and operational phases of the project. This would include agreement regarding temporary and permanent closures of roads at Artarmon to facilitate construction and operation of the Beaches Link and Gore Hill Freeway Connection project.

B12.4.3 Western Harbour Tunnel motorway control centre

Issue raised

Page 32

Willoughby City Council seeks clarification whether the Western Harbour Tunnel motorway control centre at Dickson Avenue is occupying the road reserve and/or other public or private land.

Response

The Western Harbour Tunnel motorway control centre is identified in Figure 20-6 the environmental impact statement. This property is private (commercial) land.

B12.4.4 Potential impacts to council infrastructure – general

Issue raised

Pages 26, 27 and 28

Willoughby City Council is concerned that construction work would impact council assets. It has been recommended that conditions of approval include that:

- Council is consulted regarding impacts to Council and third-party assets
- A comprehensive works agreement between Council and Transport for NSW is agreed upon to document responsibilities
- Work as executed plans/as-constructed plans are to be provided to Council for records for completed works to Council assets
- Dilapidation surveys are to be carried out prior to work starting, during works at agreed intervals, and at the completion of works on Council assets (including but not limited to road pavement, footpaths, nature strips, kerb and gutter, bridges, retaining walls, car parks, roadside assets and

stormwater structures), within 50 metres of construction support sites and on the nominated construction traffic routes. Dilapidation surveys are to be provided to Council

- Any damage to Council assets is to be repaired at the cost of Transport for NSW. Transport for NSW must carry out routine maintenance in these surveyed areas so that all infrastructure assets, facilities and amenities are maintained at all times in a condition that provides for public safety and maintains functionality and performance
- Stormwater detention systems or other alternative systems should be installed to mitigate impact to the existing drainage network.

Response

Consultation with Council regarding impacts to assets

As required by the Secretary's environmental assessment requirements, a draft community consultation framework has been prepared (as detailed in Appendix E (Community consultation framework)), identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback and procedures for resolving stakeholder and community complaints during construction and operation. Should the project be approved, a community communication strategy would be prepared in accordance with Appendix E (Community consultation framework) which would guide the project team's interactions with the community and stakeholders, including Willoughby City Council. Refer to Section B12.5.3 for further details.

Transport for NSW also intends to develop an Interface Agreement with Willoughby City Council which would provide more detail on the scope, rights and obligations for both the construction and operational phases of the project. This would seek to ensure the orderly, efficient and effective transfer of project assets where appropriate and would include agreements regarding provision of work as executed plans to Council for buildings and roadways.

It is also noted that utilities that would need to be relocated or adjusted are identified in Appendix D (Utilities management strategy), including details on the environmental impact objectives for the works that seek to minimise the potential disruption of these activities to surrounding community and environment. Utility investigations and consultations with utility providers have been carried out and would continue during the ongoing project development, further design development and construction phases of the project, as noted in in Section 2 of Appendix D (Utilities management strategy). Section 5 of Appendix D (Utilities management strategy) includes details on how community and stakeholder coordination would be carried out for proposed utilities work.

Dilapidation surveys

A road condition report will be prepared before any local road is used by a heavy vehicle associated with the project, in line with revised environmental management measure CTT1 (refer to Table D2-1 of this submissions report). Where damage to the road network (beyond normal wear and tear) is caused by these movements the road will be restored to at least the condition it was pre-works or compensation will be offered to the road owner. A copy of the road condition report will be provided to the relevant council within three weeks of completion of the survey and no later than one month prior to the road being used by heavy vehicles associated with the project. Dilapidation/condition surveys for other local council assets are not considered to be required.

Maintenance and repair of Council assets

Where land owned by Council is identified in Table 20-3 of the environmental impact statement and used temporarily during construction, it would be subject to a lease agreement. Details regarding maintenance and repair of any Council assets located within or beneath the boundaries of leased land would be addressed in the lease documentation if required. There would be no public access to

temporary construction support sites or the construction footprint so any maintenance of Council infrastructure assets, facilities or amenities would only be to the extent necessary for continued function during construction (unless other arrangements are made) or its return to service when responsibility for the item is returned to Council.

Further details on the restoration of land subject to a lease for the project is provided in Section B12.18.1 below.

As outlined above, Transport for NSW also intends to develop an Interface Agreement with Willoughby City Council which would provide more detail on the scope, rights and obligations for both the construction and operational phases of the project. This would include any interactions with Council assets.

As discussed above, where damage to the road network (beyond normal wear and tear) is caused by heavy vehicle movements the road will be restored to at least the condition it was pre-works or compensation will be offered to the road owner, as required by revised environmental management measure CTT1 (refer to Table D2-1 of this submissions report). As noted above, the upgrade and/or rehabilitation of public assets including the return to Council for ongoing maintenance post-construction would be subject to consultation with Willoughby City Council.

Stormwater detention

Establishment of temporary construction support sites has the potential to result in erosion and mobilisation of exposed soils by stormwater runoff and wind leading to sedimentation of waterways, as identified in Table 17-14 of the environmental impact statement. Temporary construction phase sediment basins would be used in catchments where the erosion hazard exceeds 150 cubic metres/year (200 tonnes/year) of soil loss. The final location and size of all temporary construction phase sediment basins would be determined during further design development and construction planning, as outlined in Section 6.5.1 of the environmental impact statement.

Detention basins have a different function from a construction phase sediment basins. Detention basins which provide peak flow mitigation are not proposed to be used on the project as they are not required or appropriate for temporary construction works.

The temporary construction phase sediment basins would be designed and sized in accordance with the requirements of the Soils and Construction guidelines, *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction - Volume 2D Main Road Construction* (NSW Department of Environment and Climate Change (DECC), 2008). For the construction phase sediment basins, the 5-day, 80th or 85th percentile rainfall depths would be used to size the sediment basins as per the requirements of *Managing Urban Stormwater: Soils and Construction - Volume 2D Main Road Construction* (DECC, 2008). The 85th rainfall percentile has been applied for basins upstream of sensitive receiving environments (ie Quarry Creek, Flat Rock Creek, Trefoil Creek, Manly Creek and Manly Dam). The 80th rainfall percentile would be used elsewhere. Design events (ARI and AEP) would not be used as the design criteria for sizing temporary construction the sediment basins. The only ARI that would be used in the sizing of the sediment basins relates to rainfall erosivity (the energy in the rainfall drops that dislodges soil particles) which is derived from the rainfall intensity of the two-year average recurrence interval (ARI), 6 hour duration, noting that this ARI is not used to derive surface runoff.

B12.4.5 Flat Rock Drive construction support site (BL2) – potential impacts to Council infrastructure

Issue raised

Pages 28, 77 and 82

Willoughby City Council is concerned that key activities at the Flat Rock Drive construction support site (BL2) would impact council assets.

Willoughby City Council seeks conditions of approval addressing the following:

- That site support works are to be constructed, maintained and disposed of at the cost of Transport for NSW
- Council to receive a detailed analysis and plan for any impact mitigation proposed for this site, and identification of the specific construction support site area including structures required, construction parking and access/egress arrangements and maneuvering (turning) areas and measures proposed to mitigate construction impacts
- Any access roads used as part of the construction support site including roads from Small Street may require upgrade to meet traffic loads. Council requests that the public car park and access roads are to be upgraded and maintained by Transport for NSW
- That details are to be provided on the 'installation of a culvert in an existing aboveground watercourse within the northern extent of Flat Rock Reserve along the north eastern boundary of the site', with Council consulted during the various design phases.

Response

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project. Notwithstanding, further information is provided below in response to the issues raised by Council.

Construction and rehabilitation of Flat Rock Drive construction support site (BL2)

Transport for NSW confirm that all works associated with the establishment of temporary construction support sites, including site accesses, would be included as part of the project, and at the cost of Transport for NSW. Operation of temporary construction support sites, including any required maintenance of the sites, would also be part of the project, with works at the cost of Transport for NSW.

Where land is temporarily required for the construction of the project, including land to be leased from Council for the Flat Rock Drive construction support site (BL2), it would be rehabilitated in consultation with the landowner and returned as soon as practicable at the completion of construction, in accordance with Section 20.4.1 of the environmental impact statement and environmental management measure LP5 (refer to Table D2-1 of this submissions report). Transport for NSW will work closely with Willoughby City Council on its preferred final form of the Flat Rock Drive construction support site (BL2) in consultation with the local community, in accordance with new environmental management measure LP8 (refer to Table D2-1 of this submissions report, and see further discussion in Section B12.20.3). The site will be rehabilitated in line with the land use zoning. Vegetation and landscaping will be determined in consultation with Willoughby City Council and the community and will be implemented as soon as practicable at the completion of construction.

Access/egress arrangements

The boundary of the Flat Rock Drive construction support site (BL2) would be discussed with Council during further design development and construction planning and shown in lease agreement documentation. Lease agreements are discussed in Section B12.18.1 of this submissions report.

Access to Flat Rock Drive construction support site (BL2) would be from Flat Rock Drive only, as shown by the red and blue arrows on Figure 6-31 of the environmental impact statement. Temporary construction support sites, including vehicle access to and from these sites, would continue to be developed during further design development and construction planning, and be designed to operate safely and efficiently in accordance with relevant Austroads guidelines, Transport for NSW standards and Australian Standards. Review and approval of detailed traffic management plans would be carried out by relevant stakeholders and subject matter experts.

The existing public car park at Flat Rock Reserve is located within the Flat Rock Drive construction support site (BL2), and as such cannot be used by the public during construction. The project would provide a replacement public car park slightly to the north of the existing car park, as shown in Figure 6-31 of the environmental impact statement. The access road to the replacement car park would therefore be shortened, and would still be from Small Street. The replacement public car park and adjusted/shortened access road would be handed back to Council to maintain as soon as it is commissioned. Throughout further design development and construction phases of the project, Transport for NSW would continue to proactively consult with Willoughby City Council on the allocation of ownership and maintenance of project assets. This consultation would seek to ensure the orderly, efficient and effective transfer of project assets. Where an asset would ultimately be owned by Council it would be designed to Council's or Transport for NSW's specifications, whichever is greater.

During site establishment, some light vehicles may use Small Street for access to the site, but during construction access would be via Flat Rock Drive only.

Installation of a culvert at Flat Rock Drive construction support site (BL2)

Due to establishment of the Flat Rock Drive construction support site (BL2), there would be a need to carry out construction of a multicell box culvert and minor redirection of the existing aboveground constructed open channel within Flat Rock Reserve towards the northern extent of the reserve, as outlined in Section 6.5.4 of the environmental impact statement. Drainage works would be staged to ensure existing open drain flows and velocities are not substantially changed and to avoid downstream erosion and bed and bank stability impacts.

The final design of the culvert at Flat Rock Reserve would be confirmed during further design development. Willoughby City Council would continue to be engaged with throughout the next phases of the project. Development of the community consultation strategy is discussed in Section B12.5.3 of this submissions report.

B12.4.6 Punch Street construction support site (BL3) – potential impacts to Council infrastructure

Issue raised

Pages 29 and 30

Willoughby City Council is concerned that key activities at the Punch Street construction support site (BL3) would impact Willoughby City Council assets.

Willoughby City Council notes that the Punch Street construction support site (BL3) impacts drainage systems at a number of locations, and notes that in light of these impacts, new pipeline systems and easements would be required. Council seeks a condition of approval requiring that Council is consulted regarding new pipeline systems and easements. Council also notes that the drainage works are to be designed in accordance with Council's development control plan and relevant design standards, and requests that pipelines are not constructed over to enable future maintenance.

Willoughby City Council notes that the Punch Street construction support site (BL3) would sever the existing connection of the shared user path at the corner of Lambs Road and Punch Street. Council requests that post-construction, this connection is to be reconnected to the cycleway network at the cost of Transport for NSW.

Response

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project. Notwithstanding, further information is provided below in response to the issues raised by Council.

Pipeline systems and easements

Proposed treatments for existing utilities within the construction footprint, including utilities that would need to be relocated or adjusted, are identified in Appendix D (Utilities management strategy). It details how stakeholder coordination would be carried out and the environmental impact objectives for the work. These objectives seek to minimise the potential disruption of these activities to surrounding community and environment. Investigations and consultation with utility providers, as relevant, have been carried out and would continue during ongoing project development, further design development and construction phases of the project, as noted in Section 2 of Appendix D (Utilities management strategy). As a key stakeholder, the project team would provide Willoughby City Council with updates throughout the project. The final design of drainage systems in Council/ local roads would be confirmed during further design development in consultation with Council. Any potential changes to, or requirements for, easement arrangements for utilities would be considered at this time.

Punch Street shared user path

The southern footpath on Punch Street next to the Punch Street construction support site (BL3) would need to be temporarily adjusted during construction of the Gore Hill Freeway Connection component of the project. Users would be diverted to Clegg Street resulting in an increase in travel distance of about 70 metres, which is considered a minor impact.

Temporary adjustment of the shared user path along Gore Hill Freeway between Reserve Road and Station Street would also occur. Based on the current level of design, this would divert users via Station Street, Francis Road, Lambs Road, Cleg Street and Reserve Road, resulting in an additional travel distance of about 550 metres. This would have a moderate impact on pedestrians and a minor impact on cyclists, and would be managed by providing advanced notification to the community and appropriate linemarking and signage to clearly show the proposed detour route to pedestrians and cyclists.

Transport for NSW is continuing to develop the design and construction planning in the Gore Hill Freeway area, including detailed staging of the work. The intention is to plan this work so as to reduce the current distance and duration of impact of the detour, including consideration of cyclist safety. Transport for NSW is continuing to engage with key stakeholders within Transport for NSW

and external interested parties such as bike groups with respect to this proposed detour. Refer to Section B12.6.7 for further discussion on the Gore Hill Freeway shared user path detour.

The existing shared user path along the southern side of the Gore Hill Freeway would be replaced in areas directly disturbed by the project and connect with the existing active transport network as described in Table 5-3 and shown in Figure 5-2 of the environmental impact statement.

B12.4.7 Dickson Avenue construction support site (BL3) - potential impacts to Council infrastructure

Issue raised

Page 31

Willoughby City Council is concerned that key activities at the Dickson Avenue construction support site (BL3) would impact Willoughby City Council assets.

Willoughby City Council notes that Council stormwater systems pass through the Dickson Avenue construction support site (BL3), and seeks a condition of approval requiring that these assets are protected during works and should not be affected or built over during works. Council requests pre and post work CCTV footage of stormwater systems to be carried out and provided to Council.

Response

Utilities investigations and consultations with utility providers have been carried out and would continue during further design development and construction phases of the project which would inform the interaction of existing utilities with temporary and permanent project infrastructure and inform further design refinement as required.

Transport for NSW are planning to record major stormwater assets which could potentially be impacted by project works on an as required/risk basis. Council assets which may be impacted by the project would be recorded, confirmed with Willoughby City Council through ongoing consultation and further design development, and copies of reports provided to Council. Refer to Table 3-1 of Appendix D (Utilities management strategy) for details on identified major public utilities at the Gore Hill Freeway Connection component of the project, including their impact assessment and proposed treatments.

Specific conditions of approval relating are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.4.8 Barton Road construction support site (BL5) – potential impacts to Council infrastructure

Issue raised

Pages 32 and 33

Willoughby City Council is concerned that key activities at the Barton Road construction support site (BL5) would impact Willoughby City Council assets.

Willoughby City Council considers that Butchers Lane is not capable of supporting traffic proposed to access the site and is currently a loose gravel road with very minimal use. Transport for NSW would need to upgrade the road pavement of Butchers Lane, and provide kerb and gutter and appropriate stormwater drainage to support access via Butchers Lane. There is also no footpath currently provided in Butchers Lane; that must be constructed by Transport for NSW. Installation of a formed concrete vehicular crossing would be required to the site from Barton Road and Butchers

Lane would be at the cost of Transport for NSW with approvals sought via Council. Council seeks conditions of approval requiring addressing these items.

Response

An indicative layout of the Barton Road construction support site (BL5) is shown in Figure 6-34 of the environmental impact statement. Temporary construction support sites, including vehicle access to and from sites (including Barton Road construction support site (BL5)), would continue to be developed during further design development and construction planning, and be designed to operate safely and efficiently in accordance with relevant Austroads guidelines, Transport for NSW standards and Australian Standards. As a minimum, the existing road would be sealed to be made all weather, including being less likely to create dust impacts.

Review and approval of detailed traffic management plans would be carried out by relevant stakeholders and subject matter experts. Potential impacts from construction traffic including proposed access arrangements from construction support sites would be managed through proposed environmental management measures (eg environmental management measure CTT9, refer to Table D2-1 of this submissions report) ensuring appropriate traffic management and safety measures are in place.

As discussed in Section B12.4.4 of this submissions report, damage to the road network (beyond normal wear and tear) caused by heavy vehicle movements will be restored to at least the condition it was pre-works or compensation will be offered to the road owner, as required by revised environmental management measure CTT1 (refer to Table D2-1 of this submissions report). The upgrade and/or rehabilitation of public assets post-construction would be subject to consultation with Willoughby City Council.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.4.9 Crossing of Middle Harbour – potential impacts to Council infrastructure

Issue raised

Pages 36 and 37

Willoughby City Council is concerned that key activities as part of the crossing of Middle Harbour would impact Willoughby City Council assets. Council recommends that conditions of approval would address the following issues:

- Pre-construction phase: Transport for NSW is to develop a Maritime - Construction Environmental Management Plan in consultation with the Maritime Working Group and with feedback from other maritime stakeholders (eg Maritime Rescue and NSW Water Police), maritime users of Middle Harbour, and stakeholders of the Clive Park Heritage Area. The Plan is to provide technical staging, programming and detail all preliminary investigations, any pre-construction and construction phase maritime impingements to navigational waters

  The Maritime - Construction Environmental Management Plan is to be submitted to the Sydney Harbour Master for approval and or endorsement prior to any changes in navigational waters. Where maritime notices and publications are required, Transport for NSW must allow a minimum of two months' notice prior to any changes to navigational patterns, unless in an emergency and at the approval of the Sydney Harbour Master. Any changes to navigational waters must be notified in accordance with the Sydney Harbour Masters requirements and in accordance with the Maritime Communication Strategy

- Construction phase: The proposed construction methods are to reduce navigational risks and hazards while optimising the use of the Middle Harbour for maritime users. Transport for NSW is to restrict construction activities related to crossing-construction, including removal of cofferdams and installation of immersed tube tunnel units, to being carried out between May and be complete before the end of August each year when Middle Harbour waterway use is generally at its lowest (these works are currently scheduled for the Middle Harbour 'peak summer' sailing and waterway activity periods during 2025 and 2026).

Response

The project has been designed to limit the disturbance to harbour recreational users, community groups and clubs.

Section D1 of this submissions report builds upon the environmental management plan framework identified in Section 28.5 of the environmental impact statement, identifying the framework for the management of key issues. The likely sub-plans which would support the implementation of the construction environmental management plan along with the relevant guidelines or requirements of each plan are provided in Table D1-1 of this submissions report.

Marine works and marine traffic management plan would be produced as sub-plans under the construction environmental management plan. Key issues to be addressed by these sub-plans include:

- Marine works and marine traffic management objectives
- Marine works and marine traffic management documentation including:
  - Works approval requirements
  - Exclusion zones
  - Temporary mooring locations
- Marine works and marine traffic mitigation including requirements for vessel movements and navigational restrictions.

The Department of Planning, Industry and Environment would decide on consultation requirements for the development of marine works and marine traffic management plans during their assessment of the project and include these as a condition of approval if required.

The marine works and marine traffic management plan would incorporate relevant construction traffic and transport environmental management measures (including consultation requirements) that are listed in Table D2-1 of this submissions report. This would include:

- Construction vessels will be required to operate in a manner that minimises wash within Middle Harbour (revised environmental management measure CTT3)
- Construction marine traffic activities will be scheduled to avoid times and locations of high recreational marine traffic, including near the Spit Bridge, where possible (revised environmental management measure CTT4)
- Harbour closures scheduling will be carried out in consultation with Port Authority of NSW, other divisions of Transport for NSW and other relevant stakeholders (environmental management measure CTT5)
- Ongoing consultation, as relevant to the location, will be carried out with Greater Sydney Operations, the Port Authority of NSW, local councils, emergency services and bus operators to minimise traffic and transport impacts (environmental management measure CTT6)

- The community will be notified in advance of proposed transport network changes, and maritime restrictions through appropriate media and other appropriate forms of community liaison (environmental management measure CTT7)
- Consultation will be carried out with surrounding water based users of Middle Harbour including Mosman Rowing Club 1st Northbridge Sea Scouts Group, 1st Sailors Bay Sea Scouts and Northbridge Sailing Club to develop reasonable and feasible management measures to minimise construction impacts (revised environmental management measure CTT16)
- All construction vessels including stationary barges and transport vessels will be fitted with and use automatic identification systems (new environmental management measure CTT17)
- All structures occupying part of the waterway or any exclusion marker placed in the water will be adequately lit. This includes temporary wharves, jetties, cofferdams, dredgers, and the temporary mooring facility. Lighting shall minimise light pollution and include low glare fixtures (new environmental management measure CTT18)
- A navigation channel delineated with marker buoys will be formed on the approach to d'Albora Marina at The Spit adjacent to the Spit West Reserve construction support site (BL9) (new environmental management measure CTT19)
- A speed limit of four knots for all marine traffic will be implemented between the Spit Bridge and 100 metres upstream of the Middle Harbour crossing to minimise the impact of vessel wash and reduce vessel speed to ensure the safety of mariners (new environmental management measure CTT20)
- The Spit West Reserve construction support site (BL9) will not impact the land based approach or water based approach to the Mosman Rowing Club. The channel on approach to Mosman Rowing Club will be 30 metres (100 feet) wide and will be delineated with marker buoys (new environmental management measure CTT21).

The construction programs included in Chapter 6 (Construction work) of the environmental impact statement provide indicative timing only. The final construction program, and commencement of works at each temporary construction support site, may vary. Due to the scale and complexity of multiple marine based works activities including cofferdams construction and installation of the immersed tube tunnel units, it would not be feasible to limit construction to the months from May to August. To do so, would significantly prolong the construction period, resulting in prolonged disruption to water users and significant additional construction costs.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.4.10 Northside Storage Tunnel

Issue raised

Page 104

Council recommends that consideration and assessment to the potential damage to below ground infrastructure such as Sydney Water's Northside Storage Tunnel in the project area be completed prior to planning determination. Failure to consider this utility asset may cause project delays, unexpected costs and present a risk to community and workers, as the storage tunnel has the capacity to hold 500,000 million litres of wastewater and stormwater.

Response

The Northside Storage Tunnel follows a different alignment to the project although the two pieces of infrastructure would cross at three separate locations. The location where the two tunnels are at their closest is at Sailors Bay Road, near Strathallen Avenue at Northbridge, where the project

crosses the Scotts Creek branch of the Northside Storage Tunnel. At this location, the Northside Storage Tunnel is about 30 metres below the Beaches Link tunnels and therefore no interactions or impacts are expected. At the other two crossing locations, the distance between the two tunnels is even larger, so similarly no impacts are expected.

Notwithstanding, utility and infrastructure owners will continue to be consulted during the detailed design and planning phase of the project. Utility and infrastructure owners will be consulted prior to commencement of excavation or tunnelling works which may potentially affect the asset to identify settlement criteria and appropriate mitigation measures to ensure, where possible, that the asset will not experience exceedances of the relevant criteria, as required by new environmental management measure SG21 (refer to Table D2-1 of this submissions report).

B12.5 Stakeholder and community engagement

B12.5.1 Environmental impact statement

Issue raised

Pages 38, 39 and 40

Willoughby City Council acknowledged community engagement has generally been appropriate to this point. However, specific consultation with Council only occurred at a very late stage in the development of the environmental impact statement. Early scoping of the project did not include impacted suburbs, particularly in relation to route selection which has created a technical gap in terms of risk assessment.

A briefing was held by the project team with the Mayor, CEO and relevant Council staff (4 November 2020 – Western Harbour Tunnel and Warringah Freeway Upgrade, 18 November 2020 – Beaches Link and Gore Hill Freeway Connection). This was followed by a briefing to all Councillors and relevant Council staff (10 December 2020 – Gore Hill Freeway Connection). Council thanks the project team for holding these sessions, enabling Council to raise many of the issues included in this submission.

The environmental impact statement was released on 9 December 2020. While the project team at Transport for NSW had previously indicated to Council that the environmental impact statement would be released at some point in December, Council only became aware of the release via members of the community and through the media. Direct advice, which would have been expected to have been provided, did not eventuate until the day after the release.

Given the substantial amount of information in the environmental impact statement, the potential impacts of the project, the Christmas/summer holiday period and the break in Council meetings until February 2021, Council has previously expressed its disappointment with the timing of the release of the environmental impact statement and the period available to make submissions (until 1 March 2021).

This was an inadequate period of time for a heavily affected community to review the environmental impact statement documents and for Council to make a submission. It had already been a very difficult year for the local community, primarily due to the COVID-19 pandemic, and Council considered this additional burden during the festive holiday period was unacceptable. A Council submission was only able to be considered at the Council meeting of 8 March 2021 at the earliest.

Council acknowledges the restrictions in consultation due to the ongoing COVID-19 pandemic. Several virtual information sessions were held, generally on a site-specific basis, and these were somewhat useful and informative to both Council staff and the community who attended. It is

appreciated how additional sessions were held, tailored to key concerns raised previously, and by geographic area, which both Council and residents found easier to understand and comment on.

While Willoughby City Council appreciates the recent briefings and information sessions held by the project team, Council is disappointed with the lack of direct notification of the commencement of the exhibition period, the timing of the release of the environmental impact statement and the inadequate length of the exhibition period.

Response

Transport for NSW acknowledges Willoughby City Council's view that community engagement has generally been appropriate, but that council considers that specific consultation with Council occurred at a late stage in the development of the environmental impact statement. Consultation with Willoughby City Council has been carried out since 2017 and included the following topics and activities:

- Project updates on geotechnical work planning, potential project impacts, temporary construction support sites, noise, air quality, future land use after the project is complete and the development of the environmental impact statement
- Discussion of feedback from the local community
- A planning focus meeting on lodgment of a State significant infrastructure submission.

During the exhibition period, key Willoughby City Council personnel were engaged with through phone calls, correspondence and meetings. Transport for NSW called a representative from Willoughby City Council on 9 December 2020 to advise that the Beaches Link and Gore Hill Freeway Connection environmental impact statement had been placed on public exhibition. In addition, several Council staff members are on the project's email distribution list and were sent an email confirming commencement of exhibition. Further to this, as acknowledged by Council, a Councillors' briefing was held on 10 December 2020 and at this time Transport for NSW also advised that the environmental impact statement was on exhibition.

A stakeholder information pack was also provided to Council on 21 January 2021, which included a USB stick containing a digital copy of the environmental impact statement, project fact sheets and copies of the community guide to the environmental impact statement. This was provided to notify stakeholders of the exhibition period, invite them to the virtual information sessions and provide guidance on how to get further information.

Transport for NSW acknowledges Willoughby City Council's appreciation for carrying out project briefing sessions and virtual information sessions.

Under the *Environmental Planning and Assessment Act 1979*, the statutory duration of the public exhibition period for an environmental impact statement is a minimum of 28 calendar days. The Secretary of the Department of Planning, Industry and Environment is responsible for determining the timing and duration of public exhibition periods for an environmental impact statement. For this project, the environmental impact statement was placed on public exhibition on 9 December 2020, with an exhibition closing date of 1 March 2021. This equated to a total exhibition period of 61 days, noting that the period between 20 December 2020 and 10 January 2021 (inclusive) was not included within the 61 days as part of the official exhibition period. The length of the exhibition period for the environmental impact statement was substantially greater than the minimum 28 day requirement in recognition of the timing of the exhibition period over the Christmas and school holiday period, and as directed by the Department of Planning, Industry and Environment. The duration of the exhibition period was in line with the public exhibition periods for both the WestConnex M4-M5 Link and Western Harbour Tunnel and Warringah Freeway Upgrade projects.

Refer to Section A2.3.2 of this submissions report for further details on engagement carried out during the exhibition period.

B12.5.2 Complexity of the document

Issue raised

Page 39

Council acknowledges that Transport for NSW has endeavoured to provide information in a variety of different mediums for stakeholders including the use of technology to assist stakeholder understanding with the complex and technical aspects of the project design, such as traffic flow, through the interactive portal.

The complexity of environmental impact statement information was broken down and simplified through the introduction of the Guide to the environmental impact statement to reduce the overwhelming extent of information into something more easily digestible. However, residents have raised significant concern about the volume and density of information that needed to be absorbed in such a short period of time.

Response

Transport for NSW acknowledges Council's comments regarding use of different communication mediums and the development of the Guide to the environmental impact statement.

The environmental impact statement assesses the potential construction and operational impacts due to the project in accordance with the Secretary's environmental assessment requirements. Transport for NSW acknowledges that the environmental impact statement was large and detailed. However, this was necessary due to the complexity of the project and the need to summarise a large amount of technical information and to be transparent with the detailed assessments carried out.

During the exhibition of the environmental impact statement, a comprehensive community consultation and engagement program was carried out to notify local communities and stakeholders that the environmental impact statement was on exhibition, provide accessible information, encourage submissions, and increase transparency of the project including benefits and possible impacts. The project used a diverse range of communication methods and platforms to achieve a significant reach and provide local communities and stakeholders information relevant to them. Refer to Section A2 of this submissions report for details of the community engagement activities conducted during the exhibition period.

B12.5.3 Community communication strategy

Issue raised

Pages 38, 52, 91, 93, 94, 95, 96, 97 and 98

Council recommends that conditions of approval include that Transport for NSW is to prepare and implement a Community Communication Strategy:

- The strategy should be developed in consultation with Council, residents, businesses and other key stakeholders such as Parents and Citizens' (P&C) associations and Progress Associations, and must detail the framework, methods and indicators that will be used to engage in direct, early and meaningful consultation. In particular, Transport for NSW is to engage with Council and relevant stakeholders to address impacts created during the construction phase of the project

- The strategy must detail how Council, residents, businesses and other key stakeholders would be consulted and given notice of construction works, to ensure peak times for vibration and noise are known in advance
- In relation to the Middle Harbour cofferdam construction support sites (BL7 and BL8), the strategy should include procedures, mechanisms and measures to advise impacted businesses and waterway users to minimise financial loss, inconvenience, safety, amenity and access impacts
- Transport for NSW is to engage in early and meaningful consultation with Council and the community to agree on post-construction options for temporary construction support sites.

Response

As required by the Secretary's environmental assessment requirements, a community consultation framework was prepared (refer to Appendix E (Community consultation framework)), identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback and procedures for resolving stakeholder and community complaints during construction and operation. Should the project be approved, a community communication strategy would be prepared in accordance with Appendix E (Community consultation framework) that outlines the community consultation and engagement activities that would support the design, construction and opening phases of the project. The community communication strategy would guide the project team's interactions with the community and stakeholders, including Council, and set standards for proactive engagement. The Department of Planning, Industry and Environment would decide on consultation requirements for the community consultation strategy during their assessment of the project and include these as a condition of approval if required.

Communication tools and activities for informing and consulting with stakeholders would be flexible, to suit the nature and scale of each stakeholder's interests and issues, and to reflect any restrictions on face to face engagement, as outlined in Section 6 of Appendix E (Community consultation framework). The community communication strategy would outline the application of communication tools to help in community and stakeholder engagement activities, as well as the timing for consultation. Mechanisms for distributing information and seeking feedback from the community and stakeholders are discussed in Section 5, and proposed methods of engagement with different stakeholders are listed in Table 6-1 of Appendix E (Community consultation framework). The method of communication would be based on the level of information being provided and the timeframe for the delivery of information. Timing for consultation would be determined and included in the community communication strategy.

Transport for NSW is committed to engaging with the community and stakeholders in the lead up to and during construction to identify specific concerns and implement relevant measures to help mitigate potential impacts. Transport for NSW will work closely with the appointed contractor/s to ensure the objectives and outcomes of the community communications strategy are delivered to a high standard. Specific consultation will be carried out with businesses potentially impacted during construction in accordance with environmental management measure BU2 (refer to Table D2-1 of this submissions report). Consultation will aim to identify specific potential construction impacts for individual businesses. Based on consultation with businesses, specific feasible and reasonable measures to maintain business access, visibility and, parking and address other potential impacts as they arise through the construction phase will be identified and implemented, in accordance with environmental management measure BU3 (refer to Table D2-1 of this submissions report). A phone hotline that enables businesses to find out about the project or register any issues will be maintained.

Specific issues management is discussed in Section 7 of Appendix E (Community consultation framework). Commitments to community consultation for traffic, land use, noise and vibration, and social (including impacts to maritime users) construction impacts are included in environmental management measures, including CTT2, CTT6, CTT7, CTT12, CTT16, CNV3, CNV7, CNV9, CNV13, LP1, LP3, LP4, LP5, LP6 and V13 (refer to Table D2-1 of this submissions report for full wording of these environmental management measures), and would be incorporated in the relevant management plans. The requirements for the construction noise and vibration management plan for the project is outlined in revised environmental management measure CNV1 (refer to Table D2-1 of this submissions report).

Meetings would be held with stakeholders near temporary construction support sites and construction sites, especially residents and businesses, to understand and address their issues and improve outcomes where reasonable and feasible, as discussed in Section 7.3 of Appendix E (Community consultation framework). Notifications would be issued to explain construction activities, work hours, and potential impacts from construction activities prior to work occurring.

A complaints management system would be developed and implemented before the start of construction activities for the project and would be maintained during construction and operation. The system would also be made available to the Secretary of the Department of Planning, Industry and Environment. A typical enquiries and complaints handling process which the project is likely to adopt is demonstrated in Figure 3-1 of Appendix E (Community consultation framework).

Land subject to temporary use, including areas of public open space, will be rehabilitated in consultation with the relevant landowner, the local council and the community (where appropriate) in accordance with environmental management measure LP5 (refer to Table D2-1 of this submissions report).

With respect to the Flat Rock Drive construction support site (BL2), at the end of construction, the impacted portion of Flat Rock Reserve would be rehabilitated in consultation with Willoughby City Council and the community and returned to Council. As identified in Table D2-1 of this submissions report, the following new environmental management measure LP8 has been developed accordingly:

> Transport for NSW will work closely with Willoughby City Council on its preferred final form of the Flat Rock Drive construction support site (BL2) in consultation with the local community. The site will be rehabilitated in line with the land use zoning. Vegetation and landscaping will be determined in consultation with Willoughby City Council and the community and will be implemented as soon as practicable at the completion of construction.

B12.5.4 Maritime communication strategy and working group

Issue raised

Pages 33, 34, 35, and 36

Council notes that materials and equipment would be supplied to construct and support works at the cofferdams via support from the water.

Council recommends that conditions of approval include that Transport for NSW is to consult with Willoughby City Council and the community regarding works required at the cofferdams and any restrictions on recreational activities, as well as to prepare and implement a Maritime Communication Strategy:

- The strategy is to provide mechanisms to facilitate communication about restrictions to waterways, changes in berthing and moorings, pre-construction and construction activities
- The strategy is to address who in the maritime community, relevant councils and maritime agencies will be engaged, and how/timing of engagements
- The strategy is to address various matters outlined in the Council's submission including communications planning, program for upcoming work and notifications processes
- Transport for NSW is to gain endorsement of the Maritime Communication Strategy from the Planning Secretary, prior to the commencement of pre-construction activities, unless otherwise agreed by the Planning Secretary.

Council also recommends that conditions of approval include that Transport for NSW establishes an independent Maritime Working Group to provide input into the Maritime Communication Strategy, into the maritime planning and design elements of the project, pre-construction detailed planning and maritime construction risks, hazards and mitigations for the project. The Maritime Working Group is to be established before relevant works commence, including any intrusive excavations, and membership should comprise maritime planning, geotechnical and engineering experts independent of the design and construction team.

The working group is to contain a representative selection of regular waterway users, of immediately adjacent potentially affected landowners and local Aboriginal groups. The working group is to meet bi-monthly during the pre-construction phase and then quarterly during the primary construction phase, unless agreed otherwise by the parties. Transport for NSW is to gain endorsement of the Maritime Working Group composition from the Planning Secretary, prior to the commencement of pre-construction activities, unless otherwise agreed by the Planning Secretary.

Response

As discussed above, should the project be approved, a community communication strategy would be prepared in accordance with Appendix E (Community consultation framework) that outlines the community consultation and engagement activities that would support the design, construction and opening phase of the project. The community communication strategy would guide the project team's interactions with the community and stakeholders, including Council and maritime stakeholders, and set standards for proactive engagement.

Since the exhibition of the environmental impact statement, engagement with a number of maritime businesses and waterway users has been carried out. This has included Mosman Rowing Club, Northbridge Sailing Club, 1st Northbridge Sea Scout Group and 1st Sailors Bay Sea Scouts. Further information on the engagement is provided in Section A2.4 of this submissions report. Transport for NSW is committed to continuing to engage with the community and stakeholders in the lead up to and during construction to identify specific concerns and implement relevant measures to help mitigate potential impacts. Transport for NSW will work closely with the appointed contractor/s to ensure the objectives and outcomes of the community communications strategy are delivered to a high level.

Specific environmental management measures which require consultation with maritime stakeholders include (refer to Table D2-1 of this submissions report):

- Transport for NSW (inclusive of NSW Maritime) will consult with the owners and/or leaseholders and/or licence holders of jetties and moorings that require temporary relocation to determine alternative arrangements. Moorings impacted during construction will be temporarily relocated elsewhere in Middle Harbour in consultation with the lease holder(s) and coordination with the Port Authority of NSW. All efforts will be made to relocate facilities as close to their original

locations as possible. Impacted mooring licence holders may be entitled to a fee waiver or fee reimbursement where appropriate (revised environmental management measure CTT2)

- Harbour closures scheduling will be carried out in consultation with Port Authority of NSW, other divisions of Transport for NSW and other relevant stakeholders (environmental management measure CTT5)
- The community will be notified in advance of proposed transport network changes, and maritime restrictions through appropriate media and other appropriate forms of community liaison (environmental management measure CTT7)
- Consultation will be carried out with surrounding water-based users of Middle Harbour including Mosman Rowing Club, 1st Northbridge Sea Scout Group, 1st Sailors Bay Sea Scouts and Northbridge Sailing Club to develop reasonable and feasible management measures to minimise construction impacts (revised environmental management measure CTT16)
- Specific consultation will be carried out with businesses potentially impacted during construction. Consultation will aim to identify specific potential construction impacts for individual businesses (environmental management measure BU2).

Transport for NSW does not intend to develop a specific maritime working group; rather, maritime stakeholders would be engaged with in accordance with the environmental management measures detailed above, as well as per the community consultation strategy.

The Department of Planning, Industry and Environment would decide on consultation requirements for the community consultation strategy during their assessment of the project and include these as a condition of approval if required.

B12.6 Construction traffic and transport

B12.6.1 Construction worker parking

Issue raised

Pages 44, 45, 46, 47 and 77

Council considers that construction worker motor vehicle parking should occur wholly within the temporary construction support sites located in the Artarmon industrial area sites (Punch Street (BL3), Dickson Avenue (BL4), and Barton Road (BL5) construction support sites). Council does not consider it to be acceptable for worker motor vehicles to park in nearby local road network in Naremburn and Artarmon as parking is highly valued by residents and visitors. Workers should be strongly encouraged to use bus services and walk or be transported by shuttle bus services. It is recommended that the shuttle bus service start/end at St Leonards Station and the future Crows Nest Metro Station. Should construction workers be identified to be parking in the local road network, then Council reserves the right to request that Transport for NSW funds any resident and visitor street parking permit system to manage street parking to Council's satisfaction.

Construction worker vehicle parking should occur wholly within the Flat Rock Drive construction support site (BL2) (Council considers use of nearby local road network for parking by construction staff to be unacceptable), with workers encouraged to use bus services, walk or shuttle bus services. Council recommends shuttle bus services to/from site and St Leonards Station and future Crows Nest Metro Station.

Response

Transport for NSW understands the importance of minimising impacts on local communities, including impacts related to construction worker parking. Locating temporary construction support

sites to support large scale infrastructure projects in urban environments is a complex issue, and requires consideration of a variety of factors, including:

- Minimising property acquisitions, especially private residential dwellings
- Connectivity of the site with arterial roads to minimise haulage and heavy vehicle movements through local streets
- Ensuring the sites are of a size to accommodate all of the work requirements, including parking.

In urban environments, it is difficult to achieve all of these requirements. Where possible, temporary construction support sites have been located to accommodate provision for parking, and the project has sized temporary construction support sites balancing the different constraints in each location, with a particular emphasis on minimising property acquisitions. As a result of this, for some sites, not all required parking is able to be accommodated within the temporary construction support sites and additional demand management and/or supply measures may be required.

The number of car parking spaces and tailored complementary demand management strategies at each temporary construction support site would be determined during detailed construction planning, when the contractor/s has been engaged.

Transport for NSW has revised environmental management measure CTT11 to better reflect the intention to, as far as reasonably practical, minimise construction worker parking in local streets where local existing demands are high through a range of complementary supply and demand initiatives. These initiatives would be tailored to suit the needs and geographical spread of the workforce to ensure maximum uptake, once the contractor/s has been engaged (refer to Table D2-1 of this submissions report):

> Impacts resulting from on- and off-street parking changes during construction will be minimised where reasonable and feasible. Depending on the location, options to manage construction staff and worker parking and manage impacts to stakeholders may include:
>
> a) Proactively encouraging usage of public transport for workers through site induction information sessions
> b) Provision of shuttle buses from public transport hubs where appropriate
> c) Staged removal and replacement of parking
> d) Provision of alternative parking arrangements such as off-site contractor managed parking lots
> e) Managed staff parking arrangements
> f) Working with relevant council(s) to introduce appropriate parking restrictions adjacent to construction sites and support sites or appropriate residential parking schemes.

Section A5.1.1 of this submissions report provides details on the broad strategies currently under consideration for temporary construction support sites north and south of Middle Harbour, in addition to further detail on which sites would provide on-site parking for workers. For temporary construction support sites south of Middle Harbour (including sites in the Artarmon industrial area and the Flat Rock Drive construction support site (BL2)), worker parking strategies could include encouraging workers to catch public transport, and provision of shuttle buses to/from an alternate additional parking site, and shuttle busses to/from public transport centres.

It is also noted that in consultation with the Department of Planning, Industry and Environment, Transport for NSW has carried out a parking study to better understand existing parking supply and demand in the vicinity of temporary construction support sites. The results of this study are included

in Appendix B of this submissions report, and will help to inform the further development of parking impact mitigation strategies.

B12.6.2 Removal of on-street parking in the Artarmon industrial area

Issue raised

Pages 23, 29, 46 and 48

The temporary removal of 36 on-street parking spaces within the Artarmon industrial area is not acceptable and would have a material impact on the operation of the Artarmon industrial area. A plan to replace the missing parking should be created with alternate parking of the same number provided.

Response

Construction works at Artarmon would result in the temporary removal of:

- Six on-street parking spaces on Hampden Road for the duration of construction (to support construction work at Artarmon Road)
- 20 on-street parking spaces on Hampden Road during northern abutment work
- Up to 10 parking spaces on other local roads such as Cleg Street, Dickson Avenue and Barton Road to provide suitable access to temporary construction support sites.

The temporary loss of on-street parking in Artarmon would impact the availability of on-street parking in the area for the duration of construction, and the cumulative loss of parking spaces associated with the establishment of temporary construction support sites would have some impact on on-street parking in surrounding streets in Artarmon that currently have high parking demand.

Impacts to businesses in the Artarmon industrial area are described in Annexure A (Technical working paper: Business impact assessment) of Appendix U (Technical working paper: Socio-economic impact assessment), in particular Section 5.2 of Annexure A. The assessment notes that competition for parking may increase with additional construction workers in the area, and there may be some impacts to services and deliveries.

Transport for NSW has carried out a parking impact assessment to confirm existing parking supply and demand surrounding temporary construction support sites (refer to Appendix B of this submissions report). The parking impact assessment found that in the vicinity of the Punch Street (BL3) and Barton Road (BL5) construction support sites, loss of parking on Cleg Street, Lambs Road and Barton Road can be mitigated by spare capacity on nearby streets (in terms of accommodating existing parking demand); however there is limited capacity for potential construction worker overflow parking. The temporary removal of parking spaces on Hampden Road would result in a significant impact, based on current supply and demand. As such adequate supply of parking on-site and implementation of other supply and demand management measures are essential for the Dickson Avenue construction support site (BL4) to manage construction worker parking.

As discussed above in Section B12.6.1, Transport for NSW has revised environmental management measure CTT11 (refer to Table D2-1 of this submissions report) to better reflect the intention to, as far as reasonably practical, minimise construction worker parking in local streets where local existing demands are high through a range of complementary supply and demand initiatives. These initiatives would be tailored to suit the requirements and geographical spread of the workforce to ensure maximum take up, once the contractor/s have been engaged.

It should be noted that 12 commercial properties are proposed to be acquired for the project in Artarmon. While some of these properties have on-site parking, the acquisition of the properties would reduce demand in the area from former employees, customers, students and visitors that were parking on the street. While the cumulative construction impact on employee and customer access, and servicing and delivery was assessed as moderate, the increase in competition for parking was a smaller element of the assessment and would be addressed through effective implementation of environmental management measures. Overall, construction would likely have a temporary discernible negative impact on the Artarmon industrial area, but the area would have minimal vulnerabilities to the change and the change would be short term, as noted in Appendix U (Technical working paper: Socio-economic impact assessment).

Specific consultation will be carried out with businesses potentially impacted during project construction in accordance with environmental management measure BU2 (refer to Table D2-1 of this submissions report). Consultation will aim to identify specific potential construction impacts for individual businesses. Based on consultation with businesses, specific feasible and reasonable measures to maintain business access, visibility, parking and address other potential impacts as they arise through the construction phase will be identified and implemented, in accordance with environmental management measure BU3 (refer to Table D2-1 of this submissions report). A phone hotline that enables businesses to find out about the project or register any issues will be maintained.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.6.3 Construction traffic in the Artarmon industrial area

Issue raised

Pages 46 and 47

Where possible, construction vehicle movements should be based on the following road network hierarchy: motorways, arterial roads, regional roads and, lastly, local roads. In relation to Artarmon industrial area construction support sites, it is preferable that all construction vehicle movements to/from the sites be via the Gore Hill Freeway to maximise safety and efficiency at the Artarmon industrial area.

Should the Artarmon industrial area road network be used for construction vehicle access, the routes identified are satisfactory. Council recommends that these are mandated in contracts so that construction vehicles use these routes at all times. Turning paths should be checked for safe operation and the operation of intersections should be monitored to minimise worsening of traffic safety and movements.

Council recommends that conditions of approval include the requirement for a Site Access and Movement Management Plan for temporary construction sites addressing safety of motor vehicle movements and the interaction with the adjacent road network.

Response

Construction access routes have been developed to provide access to major arterial roads as directly and efficiently as possible and would use local roads only where needed to directly access arterial roads. Indicative construction vehicle routes in Artarmon are illustrated in Figure 5-16 of Appendix F (Technical working paper: Traffic and transport).

The temporary construction support site generating the most heavy vehicle movements in the Artarmon industrial area would be the Punch Street construction support site (BL3), which would

have a heavy goods vehicle exit constructed and staged with the cut and cover works to connect directly to the Gore Hill Freeway westbound. The Dickson Avenue (BL4), Barton Road (BL5) and Gore Hill Freeway median (BL6) construction support sites would operate as smaller support sites and generate substantially fewer heavy vehicle movements. Relatively low impacts are expected on Hampden Road, Barton Road, Butchers Lane and Reserve Road north of the Gore Hill Freeway given the low number of construction vehicles on these roads.

The contribution of construction related heavy and light vehicle traffic would be relatively minor compared to existing background traffic flows along most construction routes, as outlined in Section 8.4.2 of the environmental impact statement.

Vehicle access to and from temporary construction support sites, including consideration of turn paths, would continue to be developed during further design development and construction planning, and be designed in accordance with relevant Austroads guidelines, Transport for NSW standards and Australian Standards.

A traffic management plan would be prepared for the construction phase of the project and is discussed in detail in Section B12.6.5 below. Potential impacts from construction traffic, including proposed access arrangements from temporary construction support sites, would be managed through the implementation of the environmental management measures provided in Table D2-1 of this submissions report, ensuring appropriate traffic management and safety measures are in place. For example, environmental management measure CTT9 (refer to Table D2-1 of this submissions report) requires vehicle movements to and from construction sites to be managed to ensure pedestrian, cyclist and road user safety.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.6.4 Construction traffic generated by the Middle Harbour cofferdam construction support sites (BL7 and BL8)

Issue raised

Page 52

Council considers that the impact of construction road traffic generated by maritime works at the Middle Harbour cofferdam construction support sites (BL7 and BL8) is not clear. Council is concerned that maritime works may lead to worsening of road traffic on the local road network such as Sailors Bay Road. In relation to the Middle Harbour cofferdam construction support sites (BL7 and BL8), a construction traffic management plan should be prepared which provides details on how road-based construction traffic would be avoided or at least be minimised.

Response

The Middle Harbour cofferdam construction support sites (BL7 and BL8) would be accessed from Spit West Reserve construction support site (BL7), as noted in Table 6-21 of the environmental impact statement. This would occur via marine transport (eg small boats for transporting the construction workforce and barges for concrete deliveries). As such, there would not be road-based construction traffic impacts on Sailors Bay Road as a result of these temporary construction support sites. Sailors Bay Road would not be used for construction vehicle access. In the unlikely event of an incident at the harbour crossing, Sailors Bay Road would likely be used for access for emergency services. For further detail regarding marine traffic which would be generated between the Middle Harbour cofferdam construction support sites (BL7 and BL8) and the Spit West Reserve construction support site (BL9), refer to Table 6-40 of the environmental impact statement

Refer to Section B12.6.5 below for further details regarding the development of traffic management plans for the construction phase.

B12.6.5 Traffic management plans

Issue raised

Pages 41, 42, 43 and 52

Willoughby City Council states that construction traffic impacts would be significant and management of these impacts are important to ensure the safety of the community. Council considers that the increase in heavy vehicle traffic would lead to congestion and potential incidents on the local road network. It is critical safety hazards and incidents are identified and managed quickly and effectively to return traffic operations to 'normal' conditions as quickly as possible to minimise the negative impacts of incidents on the community and maximise safety.

Council recommends that conditions of approval include:

- A construction transport management framework be prepared for construction traffic, to support the effective integration, management and operation of construction transport generated by the project, with Council to be consulted on and to concur with the framework
- A construction transport management plan be prepared for each temporary construction support site, with Willoughby City Council to be consulted on and to concur with the plans for all sites within the Willoughby local government area
- Implementation of environmental management measures CTT1 to CTT16, with Council being a stakeholder in CTT12
- A transport study of the Artarmon industrial area be prepared, covering both construction and operational phases. This study should identify traffic demands and intersection performance within the area and works required to ensure safety, accessibility and efficient operation of the road network for all users. This should occur prior to the installation of traffic control signals
- Complete a detailed transport and traffic management study of the Naremburn to Roseville and Northbridge to Roseville road corridors, investigating and responding to impacts in the Willoughby local government area (including cumulative impacts during construction due to the Western Harbour Tunnel and Warringah Freeway Upgrade project)
- Relevant permits to be obtained for work on Willoughby City Council's road network in accordance with Council policies.

Response

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project. Notwithstanding, Section D1 of this submissions report builds upon the environmental management plan framework identified in Section 28.5 of the environmental impact statement, identifying the framework for the management of key issues. Table D1-1 provides the likely sub-plans, along with the relevant guidelines or requirements of each plan, which would support the implementation of the construction environmental management plan.

One of the construction environmental management plan sub-plans would be a traffic management plan. The traffic management plan which would be prepared in accordance with *Traffic control at work sites Technical Manual* (Transport for NSW, 2020g), Australian Standard *AS 1742.3-2019: Manual of Uniform Traffic Control Devices, Part 3: Traffic Control for Works on Roads* (Standards Australia, 2019b), and other relevant standards, guides or manuals. The content and purpose of the

traffic management plan would be developed in consultation with relevant stakeholders including those determined by the Department Planning, Industry and Environment.

The traffic management plan would incorporate relevant construction traffic and transport environmental management measures provided in Table D2-1 of this submissions report. These measures, which aim to avoid and minimise impacts on the local road network, would include environmental management measures CTT1 to CTT16 as requested by Council, as well as any other conditions imposed by the Minister for Planning and Public Spaces.

Transport for NSW is committed to engaging with the community and stakeholders in the lead up to and during construction to identify specific concerns and implement relevant measures to help mitigate potential impacts, as outlined in Section B12.5.3 of this submissions report. Transport for NSW will work closely with the appointed contractor/s to ensure the objectives and outcomes of the community communications strategy are delivered to a high standard.

A community communication strategy will guide engagement with Willoughby City Council and other stakeholders, as outlined in Appendix E (Community consultation framework), as discussed in Section B12.5.3 in this submissions report. A traffic and transport liaison group would be established, including representatives from appropriate councils and other transport stakeholder groups to discuss traffic management, pedestrian management and road safety during construction, as outlined in Section 7.1 of Appendix E (Community consultation framework).

A transport study of the areas of the Artarmon industrial area which have the potential to be materially impacted during construction and operation is included in the traffic and transport assessment presented in Appendix F (Technical working paper: Traffic and transport) and Chapter 8 (Construction traffic) of the environmental impact statement. The assessment indicates that construction activities in the area are expected to create temporary increases in traffic, and as a consequence delays and congestion during peak periods. Section 8.4.6 of the environmental impact statement also provides a summary of cumulative impacts of the project and the Western Harbour Tunnel and Warringah Freeway Upgrade project. Options to mitigate potential impacts would be developed as the project progresses into construction planning, including the development of a traffic management plan as sub-plan to the construction environmental management plan, and would include the relevant environmental management measures included in Table D2-1 of this submissions report.

The preparation of a transport and traffic management study of the Naremburn to Roseville and Northbridge to Roseville road corridors is not within the scope of the project. For further discussion regarding operational traffic impacts to the Artarmon industrial area refer to Section B12.7.3.

In relation to the need to obtain relevant permits to conduct work on Council's road network, Section 64(1A) of the *Roads Act 1993* provides for Transport for NSW to exercise the functions of a roads authority with respect to any road, for approved State significant infrastructure. Notwithstanding, ongoing consultation will be carried out with Willoughby City Council and relevant emergency services and bus operators to minimise traffic and transport impacts, in accordance with environmental management measure CTT6 in Table D2-1 of this submission report.

B12.6.6 Safety and Traffic Management Plan for Flat Rock Drive and Brook Street

Issue raised

Pages 43, 44 and 45

Installation of traffic signals at Flat Rock Drive is supported. Council is concerned about safety and operational impacts in this area given the proposed increase in construction traffic using Flat Rock Drive and Brook Street. Operational impacts relate to the increase in difficulty accessing the local

roads, particularly right turn movements out and into the local roads, as a consequence of the increased traffic flows. It is also understood that Flat Rock Drive and Brook Street is used by school buses and school children. Council requests that all vehicles accessing Flat Rock Drive construction support site (BL2) do so from the south.

Council recommends that conditions of approval include a Safety and Traffic Management Plan for Flat Rock Drive and Brook Street to be developed in consultation with Willoughby City Council and the community. Suggestions of safety options that should be considered include:

- A 'left turn on red' sign to allow this movement from Merrenburn Avenue, eastbound, into Brook Street, northbound
- A right-turn arrow and traffic signal phase is introduced in Brook Street, southbound, at Merrenburn Avenue at the intersection of Brook Street and Merrenburn Avenue
- The eastern footpath along Brook Street between Marks Street and Warringah Freeway on-ramp is widened and designated a shared path.

Response

Access in and out of the Flat Rock Drive construction support site (BL2) would be via a temporary signalised intersection at Flat Rock Drive. Indicative construction vehicle routes associated with the site are shown on Figure 5-11 of Appendix F (Technical working paper: Traffic and transport). Given that Flat Rock Drive/Brook Street is a regional sub-arterial road, this corridor is considered to be an appropriate route for construction vehicles, and avoids use of local streets in the area.

As regional roads, this corridor already carries a significant amount of traffic, with 720 vehicles northbound (nine per cent of which are heavy vehicles) and 2070 southbound (two per cent heavy vehicles) during the morning peak hour, and 1660 vehicles northbound (two per cent heavy vehicles) and 1020 southbound (six per cent heavy vehicles) during the evening peak hour (refer to Table 4-5 of Appendix F (Technical working paper: Traffic and transport)). While additional light and heavy vehicle traffic would be generated as a result of the project, it is considered that this would not materially change existing traffic conditions nor present additional safety issues.

Assessment of the performance of key locations in the road network affected by construction activities indicates that the road network in the Flat Rock Drive area would not materially change under construction conditions, and that the temporary impact of construction on traffic operation would be manageable, as outlined in Section 5.2.4 of Appendix F (Technical working paper: Traffic and transport). The Brook Street/Merrenburn Avenue intersection currently operates at capacity during peak periods, and would continue to operate at a comparable level of service during construction activities. Midblock traffic volumes on Brook Street would increase slightly when compared to pre-construction conditions.

Pedestrian, cyclist and motorist safety is a priority for Transport for NSW. As discussed in Section B12.6.5 above, key issues would be addressed in the traffic management plan once further construction planning and design development has occurred. Key issues that would be addressed in the traffic management plan, along with relevant guidelines and requirements which must be considered in the development of the traffic management plan, would include construction traffic, transport and access management objectives and documentation.

The traffic management plan would incorporate relevant environmental management measures for applicable activities during construction, which would be prepared by the contractor/s once engaged. Vehicle movements to and from construction sites will be managed to ensure pedestrian, cyclist and road user safety, in accordance with environmental management measure CTT9 (refer to Table D2-1 of this submissions report)). Depending on the location, this may require manual

supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence. Directional signage, barriers and/or linemarking will be used as required to direct and guide motorists, cyclists and pedestrians past construction sites and on the surrounding network. This will be supplemented by Variable Message Signs to advise all road users of potential delays, traffic diversions, speed restrictions or alternative routes (refer to environmental management measure CTT10 in Table D2-1 of this submissions report).

B12.6.7 Construction impacts to active transport facilities

Issue raised

Pages 44, 45, 46, 47, 48 and 51

Council considers that insufficient detail is provided in the environmental impact statement regarding the diversion of the shared user paths near Flat Rock Drive. Council is of the view that the temporary shared user paths must be a minimum of three metres wide and clear of any obstructions. A barrier treatment such as a guard rail or concrete jersey barrier is to be provided between the temporary shared user path alongside Flat Rock Drive so that there is an acceptable level of protection between the shared user path and Flat Rock Drive.

Council also considers there to be insufficient detail provided in the environmental impact statement regarding the temporary detour of the Gore Hill Freeway shared user path, and suggested an alternative detour route. Council requests that a similar standard of facility to the existing shared user path is to be delivered along the alternative route.

Council considers that for cyclists, an on-road mixed treatment is only suitable in the lowest-traffic streets, and only considers this to be acceptable in Taylor Lane (if used as per Council's suggestion), the Lambs Road rail overpass, Francis Street and Station Street. The exact route and standard of facility is to be designed and constructed in consultation with Council and relevant cyclist organisations and user groups. Council is concerned regarding the use of Dickson Avenue, as it would lead to the mixing of construction traffic with bicycle riders.

Council notes that temporary shared user paths must be designed in accordance with Australian Standards and relevant NSW policies and guidelines, noting that lighting in particular would be important and must meet relevant Australian Standards. Wayfinding signs would also be required to ensure effective guidance along new routes.

Council notes that Hampden Road is a designated bicycle route. Council requests that the work site on Hampden Road during the modification works on the existing overpass and narrowing of the road should provide a safe road environment for cyclists including consideration of advanced warning signs, a lower speed limit (40 km/h) and speed cushions in Hampden Road.

Council recommends that conditions of approval include the requirement of an active transport review be carried out by Transport for NSW for the construction and operational phases of the project.

Response

<u>Flat Rock Drive shared user path</u>

Construction impacts to active transport at Naremburn are illustrated in detail in Figure 8-9 of the environmental impact statement. The shared user path at Flat Rock Drive would be temporarily realigned along the western perimeter of the Flat Rock Drive construction support site (BL2), resulting in an extra travel distance of up to 100 metres, as outlined in Section 8.4.1 of the environmental impact statement. The existing walking tracks along the eastern perimeter of the

temporary construction support site would be largely maintained with two minor temporary diversions needed.

Given that existing connectivity would be maintained and the small potential increase in travel distance, impacts on pedestrians and cyclists using the shared user path are expected to be minor.

Gore Hill Freeway shared user path

Temporary impacts to the shared user path next to the Gore Hill Freeway are noted in Section 8.4.2 of the environmental impact statement and includes temporary adjustment of the shared user path along the Gore Hill Freeway between Reserve Road and Station Street. Alternative routes would divert these users resulting in an extra travel distance of about 550 metres. This would have a moderate impact on pedestrians and a minor impact on cyclists and would be managed by providing advanced notification to the community and appropriate linemarking and signs to clearly show the proposed detour route to pedestrians and cyclists.

The proposed detour due to the works at Gore Hill Freeway, based on the current level of design and construction planning, would divert users along Station Street, Francis Street, Lambs Road, Cleg Street and Reserve Road, as per the text provided on page 202 of Appendix F (Technical working paper: Traffic and transport). It is noted that Figure 8-12 of the environmental impact statement and Figure 5-32 of Appendix F (Technical working paper: Traffic and transport) incorrectly shows the proposed detour (ie the detour would not go along Waltham Street and Dickson Avenue). The detour route would be finalised once the contractor/s have been engaged and construction planning and staging is progressed.

Transport for NSW is continuing to develop the design and construction planning in the Gore Hill Freeway area, including detailed staging of the work. The contractor/s would finalise and complete plans for staging the work during further design development and construction planning in consultation with Transport for NSW. At this time appropriate sequencing of the work in the Gore Hill Freeway area would be confirmed, including cut and cover work and water quality basin upgrade work in and near Punch Street which impacts the existing shared user path along the Gore Hill Freeway, and finalisation of complex sewer and stormwater relocations in this constrained area, and in consideration of any interface required between contractors if the project is staged. The intention is to plan this work so as to reduce the current distance and duration of impact of the detour, including consideration of cyclist safety.

This has been included as a clarification in Table A5-13 of this submissions report.

The project is continuing to engage with key stakeholders within Transport for NSW and external interested parties such as bike groups with respect to this proposed detour.

Design of shared user facilities

Direct impacts to existing pedestrian and cycling facilities will be minimised to the extent reasonably practicable and any detours and adjustments will be designed to maximise user safety and convenience in line with revised environmental management measure CTT15 (refer to Table D2-1 of this submissions report). This would include compliance with relevant Transport for NSW and Australian Standards.

Directional signage, barriers and/or linemarking will be used as required to direct and guide motorists, cyclists and pedestrians past construction sites and on the surrounding network, in accordance with environmental management measure CTT9 (refer to Table D2-1 of this submissions report). The community will be notified in advance of proposed transport network changes, and maritime restrictions through appropriate media and other appropriate forms of

community liaison, in accordance with environmental management measure CTT7 (refer to Table D2-1 of this submissions report).

Cyclist safety at Hampden Road

Works at Hampden Road bridge are generally limited to the underside of the bridge at the two abutments, as described in Table 6-7 of the environmental impact statement. Surface works at Hampden Road bridge would involve piling behind and strengthening of the existing northern abutment. It is noted that a new overpass would not be constructed, and the road would not be permanently narrowed.

Potential impacts to cyclists at Hampden Road are discussed in Section 8.4.2 of the environmental impact assessment. Northern abutment work at Hampden Road would impact cyclists who currently travel on the road shoulder on either side of Hampden Road. During construction, one lane in each direction would be provided and cyclists would need to travel on-road in traffic. Impacts would be minor given that this work is short in duration and parking would be removed on both sides of the road for the duration of construction. Vehicle movements to and from construction sites will be managed to ensure pedestrian, cyclist and road user safety in line with environmental management measure CTT9 (refer to Table D2-1 of this submissions report).

Active transport review

Based on the above, the construction impacts to the Flat Rock Drive and Gore Hill Freeway shared user paths are known and are expected to result in minor to moderate impacts. As such, the need for an active transport review during the construction phase is considered unnecessary.

Further, considering that there would be no changes to the Flat Rock Drive and Gore Hill Freeway shared user paths during operation of the project, an active transport review is also considered unnecessary for the operational phase of the project. Refer to Section B12.7.8 below for further discussion on active transport review.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.6.8 Impacts at Clive Park

Issue raised

Pages 52

Council does not support temporary or permanent access tunnels in Clive Park or the road network surrounding Clive Park.

In the event of potential changes to the project associated with design development of the project and the associated potential for the lodgement of related planning modifications by Transport for NSW seeking to establish either temporary tunnel access, evacuation tunnel or permanent tunnel access at Clive Park, Council request that Transport for NSW complete a transport study of Northbridge, to ensure safety, accessibility and efficient operation of the road network for all users.

Response

Transport for NSW confirms that there are no temporary or permanent tunnel portals in Clive Park or the road network surrounding Clive Park. The tunnel alignment under Clive Park would be about 50 metres below ground level as indicated in Figure 5-10 in the environmental impact statement, and no surface accesses, permanent or temporary, are proposed. It is noted that there is a chamber offset from the driven tunnel shown on Figure 6-26 of the environmental impact statement in the

vicinity of Clive Park. It should be noted that this is not a tunnel connection – rather this is for an underground high voltage substation.

Further design development would however be carried out following project approval. If the detailed design is inconsistent with the approved project, further assessment and approval would be needed under the *Environmental Planning and Assessment Act 1979*. If further assessment/approval is needed due to project design changes, the applicable statutory process would be followed prior to commencement of construction of the relevant aspect of the project. This may be in the form of a modification request lodged with the Department of Planning, Industry and Environment, depending on the scale of the proposed change and the potential for environmental or social impacts. The potential effects of a proposed modification would be compared and assessed against the impacts documented in the environmental impact statement, submissions report and preferred infrastructure report, including the safety, accessibility and efficiency of road network operations. Stakeholder and community consultation, including with Willoughby City Council, would also be carried out at this time.

B12.6.9 Cumulative impacts

Issue raised

Page 53

Council is concerned that the performance of the Warringah Freeway, Gore Hill Freeway and the Willoughby Road and Brook Street interchanges would worsen should construction of the Western Harbour Tunnel and Warringah Freeway Upgrade project, and the Beaches Link and Gore Hill Freeway project occur concurrently.

Response

The environmental impact statement acknowledges that the greatest cumulative construction impact in the Warringah Freeway and surrounds study area is on the Warringah Freeway in the southbound direction (refer to Section 8.4.6 of the environmental impact statement). This is the route via which most construction traffic is expected to leave the area (to minimise impacts on local roads). As a result there is the potential for increased congestion, and general travel times, on this route during morning peak periods, which could flow back onto connecting routes such as Willoughby Road and Brook Street – as demonstrated by the microsimulation network modelling carried out as part of the traffic and transport assessment (refer to Appendix F (Technical working paper: Traffic and transport)).

Once there is greater certainty of actual concurrent construction activities and traffic intensities in the area, tailored construction traffic planning measures including the timing and routing of traffic on common access routes would be developed to mitigate this potential impact.

Considered and tailored multi-party engagement and cooperation will be established prior to construction to ensure all contributors to impacts are working together to minimise adverse impacts or enhance benefits of multiple projects occurring concurrently or consecutively, in accordance with environmental management measure CI1 (refer to Table D2-1 of this submissions report). Haulage routes and road occupancy will be coordinated with other major transport projects via Greater Sydney Operations. This, along with the other traffic and transport environmental management measures provided Table D2-1 of this submissions report, would be incorporated in a traffic management plan to be prepared by the construction contractor/s as outlined in Section B12.6.5 above.

B12.6.10 Monitoring to manage cumulative impacts of the program

Issue raised

Page 53

Council recommends that conditions of approval include:

- A Construction Traffic Monitoring and Operational Management Plan to introduce technology to monitor, respond and report on the performance of road networks and local roads identified by Council
- A Construction Road Transport Operational Management Forum chaired by Transport for NSW and including Council and other stakeholders, where road network performance information would be shared and meetings regularly held to discuss the operation of the road network and address locations with worse performance.

Response

As outlined above, a traffic and transport management plan is one of the sub-plans that would be prepared to address potential impacts on safety, accessibility and efficiency of road network operations during construction. The content and purpose of the traffic management plan would be developed in consultation with relevant stakeholders, including those determined by the Department Planning, Industry and Environment. Key issues to be addressed by the traffic management plan includes construction traffic, transport and access mitigation, including monitoring and inspection requirements.

The traffic management plan would incorporate relevant construction traffic and transport environmental management measures provided in Table D2-1 of this submissions report. This includes ongoing consultation, as relevant to the location, that will be carried out with Greater Sydney Operations, the Port Authority of NSW, local councils, emergency services and bus operators to minimise traffic and transport impacts in accordance with environmental management measure CTT6 (refer to Table D2-1 of this submissions report).

Considered and tailored multi-party engagement and cooperation will be established prior to construction to ensure all contributors to impacts are working together to minimise adverse impacts or enhance benefits of multiple projects occurring concurrently or consecutively, in accordance with environmental management measure CI1 (refer to Table D2-1 of this submissions report). Haulage routes and road occupancy will be coordinated with other major transport projects via Greater Sydney Operations.

Consultation would also continue to be carried out with Willoughby City Council throughout further design development and construction planning for the project in accordance with the community communication strategy outlined in Appendix E (Community consultation framework) and discussed in Section B12.5.3 of this submissions report.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.7 Operational traffic and transport

B12.7.1 Urban renewal opportunities

Issue raised

Pages 2, 9, 10, 11 and 42

Council identifies that the project may create opportunities or be a catalyst for urban renewal via reduced and redistributed traffic along the Penshurst Street/Willoughby Road corridor, with the potential to improve safety and amenity in Chatswood by reducing rat-running.

Council identifies several road treatment and traffic management opportunities to support urban renewal and movement and place outcomes along the Penshurst Street/Willoughby Road corridor.

Assuming that forecast decreases in trip travel times and traffic demands are realised, Council notes that there are the following opportunities:

- Capitalise on the surplus road capacity provided by the project and repurpose this road space for other more important uses
- Maximise the use of the new connected motorway network as the primary road network for regional journeys
- Change the surface road network to balance regional road network capacity with safety, access and amenity of current and future centre and land use provision and operation.

Willoughby City Council seeks a condition of approval requiring that a Roseville to Naremburn Corridor Transport Plan be prepared, investigating and responding to impacts in the Willoughby local government area (including cumulative impacts due to the Western Harbour Tunnel and Warringah Freeway Upgrade project). The plans should be prepared in consultation with relevant councils that incorporates plans for urban renewal and changes to traffic management.

Response

The project would provide a new underground motorway bypass of the Military Road/Spit Road and Warringah Road/Eastern Valley Way corridors, providing travel time savings and reliability benefits for users of the project, as well as for users of existing key corridors which would benefit from reduced traffic demand on including the congested the Warringah Road/Eastern Valley Way corridor.

Modelled forecast traffic demands across Middle Harbour indicate reduction in demand on major arterial routes around northern Sydney, including a forecast decrease in daily traffic demand on Eastern Valley Way of up to 40 per cent by 2037. Reduced congestion on existing surface arterial routes is expected to improve network resilience due to the provision of new road capacity and connectivity, and reduce the attractiveness of rat-running on these roads, including Eastern Valley Way, reducing traffic through surrounding urban and residential areas. By providing additional motorway capacity and bypassing communities underground, the project would reduce through traffic volumes in many areas. This would result in reduced noise and improved amenity in these areas. This includes reduced through traffic on Eastern Valley Way and down through Willoughby, Naremburn, Cammeray and Northbridge.

Transport for NSW notes that Council has identified several potential road treatment and traffic management opportunities to support urban renewal in the Penshurst Street/Willoughby Road corridor as a result of the reduced and redistributed traffic made possible by the project. While this corridor is not a specific focus of assessment in the environmental impact statement, the project benefits include reduced congestion and a diversion of surface through traffic from existing roads

into the Beaches Link tunnel, as discussed above. This in turn would result in improvements to safety and amenity in these neighbourhoods.

The development of a Roseville to Naremburn Corridor Transport Plan and consideration of potential future road treatment and traffic management opportunities in the Penshurst Street/Willoughby Road corridor are considered outside the scope of this project. Notwithstanding, the project would enable other divisions of Transport for NSW and other agencies (including Council) to explore opportunities for urban renewal, public transport, active transport and changes to transport management on key corridors. This includes working with local council and other government stakeholders to develop a place based transport plan for the lower North Shore, which would identify potential transport opportunities to respond to the changing needs of the community, including movement types, and initiatives for mode shift and network operation across all transport modes. The development of the plan would consider the transport needs for the area based on transport and land use changes within the area, including their purpose, connections between centres and modal priority, eg light vehicle, freight, buses and cyclists, and changes to the transport network as a result of major infrastructure projects currently proposed and being delivered in the area. Transport for NSW is commencing engagement with Willoughby City Council, Mosman Council, North Sydney Council and Lane Cove Council in the last quarter of 2021.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.7.2 Impacts to Artarmon local roads

Issue raised

Pages 23, 56 and 57

Concern exists about what impact the design will have on the Artarmon local centre, given the main on ramp to the Beaches Link tunnel in this area would be located on Reserve Road. While it is clearly intended for the Pacific Highway and Dickson Avenue to be the main routes for traffic to both join and leave the tunnel, Council is concerned that traffic coming from the north would instead use Council's local road network.

Response

The primary motorway connectivity to and from the Beaches Link tunnels in Artarmon is provided via the Gore Hill Freeway.

A summary of the forecast traffic differences with and without the project at key locations surrounding the project (including Artarmon) for 2037 is presented in Annexure B of Appendix F (Technical working paper: Traffic and transport). Annexure B demonstrates that there is not predicted to be any material change to traffic volumes north of the Reserve Road interchange or through Artarmon local centre as a result of the project. Traffic modelling for the project indicates that only a relatively small amount of the traffic forecast to use the Beaches Link tunnels (approximately 10 per cent) is anticipated to travel to/from the Beaches Link via the Reserve Road interchange. Traffic forecasting also does not predict that traffic travelling from north of the Willoughby local government area would utilise Beaches Link to travel to the Northern Beaches. It should be noted that road users from areas to the north of the Willoughby local government area would benefit from reduced traffic and congestion on the existing routes such as Warringah Road and Mona Vale Road.

Assessment of the project's impacts to the Artarmon local road network is outlined in Section 9.4.3 of the environmental impact statement. Network performance measures for the Gore Hill Freeway and Artarmon study area indicate that the network integration works associated with the project

would facilitate additional traffic travelling through the corridor while maintaining a similar level of overall network performance. While the introduction of the project would increase demand in the area, marginally reducing broader network speeds during PM peaks, the additional regional connectivity from the Artarmon area added by the Western Harbour Tunnel and Beaches Link program of works would not create residual impacts to traffic through the Artarmon area.

Further traffic analysis and modelling of the Gore Hill Freeway and Artarmon area has also been carried out for the preferred infrastructure report. This analysis (refer to Section 6.3.2 of the preferred infrastructure report) confirms that traffic conditions on Reserve Road and surrounds are not expected to be materially adversely affected by Beaches Link (nor the broader Western Harbour Tunnel and Beaches Link program).

Notwithstanding, environmental management measures OT1 and OT2 (refer to Table D2-1 of this submissions report) reflects Transport for NSW's commitment to investigate options to mitigate potential localised network issues:

- A review of operational network performance will be carried out 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections. The assessment will be based on updated traffic data at the time and the methodology used will be comparable with that used in Appendix F (Technical working paper: Traffic and transport). Where required, additional feasible and reasonable environmental management measures will be identified in consultation with the Department of Planning, Industry and Environment and the relevant council to manage any additional traffic performance impacts identified during the review of operational network performance (environmental management measure OT1)
- Where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network. Such measures will be determined in consultation with relevant councils and implemented where feasible and reasonable (environmental management measure OT2).

B12.7.3 Impacts to Artarmon industrial and residential areas

Issue raised

Pages 21, 22, 23, 42, 57 and 55

The project would have significant impacts upon the Artarmon industrial and residential areas, including loss of industrial land and changes to road configuration and operation.

Council suggests that conditions of approval include:

- A transport study of the Artarmon industrial area, addressing construction and operation phases of the project, be prepared in consultation with Council. This study should identify traffic demands and intersection performance within the area and works required to ensure safety, accessibility and efficient operation of the road network for all users
- Reclassification of certain roads in the Artarmon industrial area from local to regional roads, in particular part of Reserve Road, Frederick Street, part of Herbert Street and Dickson Avenue.

Response

<u>Transport study of the Artarmon industrial area</u>

It is noted that the traffic and transport assessment presented in the environmental impact statement (Appendix F (Technical working paper: Traffic and transport)) includes a transport study of the areas of the Artarmon Industrial Area which have the potential to be materially impacted

during construction and operation. The assessment indicates that the operation of the project is not expected to have a material adverse effect on the Artarmon Industrial area.

Environmental management measures to minimise any unexpected traffic and transport impacts are identified in Table D2-1 of this submissions report, and include a review of operational network performance, that will be carried out 12 months and five years after opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections (environmental management measure OT1) and where required, investigation of local area traffic management measures to minimise the impact of the project on the surrounding local road network (environmental management measure OT2).

Reclassification of roads

Re-classification of roads is outside the scope of the environmental impact assessment.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.7.4 Traffic signals at the intersection of the Pacific Highway and Dickson Avenue

Issue raised

Pages 51

Willoughby City Council notes that the timing for the installation of traffic signals at the Pacific Highway and Dickson Avenue intersection and the design of the traffic signals are not outlined in the environmental impact statement. The design would determine the impact of the traffic signals on the Pacific Highway including access and street parking. The design, construction and commissioning of the new traffic control signals is important due to the impacts on the local road network and traffic movements in the Artarmon industrial area.

Response

The project includes the upgrade and inclusion of traffic signals at the Dickson Avenue/Pacific Highway intersection, as outlined in Table 5-12 of the environmental impact statement. The installation of traffic signals at the intersection of Pacific Highway with Dickson Avenue would result in the following traffic impacts, as described in Section 9.4.3 of the environmental impact statement:

- Temporary lane closures on the Pacific Highway during removal of existing median and linemarking, minor pavement works and relocation of the existing southbound bus stop on the Pacific Highway west of Dickson Avenue
- Temporary closure of Dickson Avenue during linemarking, minor kerb adjustment and minor pavement works
- Removal of about six motorbike parking spaces and three time-limited (four-hour) car parking spaces.

The existing mail zone on Dickson Avenue would be permanently relocated nearby in consultation with Australia Post, and the bus stop on the Pacific Highway would be relocated within 50 metres of its existing location. Temporary lane and road closures would be carried out outside peak periods and the impacts of these closures would be low.

The design of the traffic signals would be confirmed during further design development and the timing of their installation confirmed during construction planning. Likely the new traffic signals would be made operational at project opening. As noted in Section A4.9 of this submissions report the project may be staged, depending on future decisions regarding the delivery of the project. It is anticipated that the Gore Hill Freeway Connection component would be constructed following

enabling and early works. Transport for NSW would consult with Willoughby City Council about the traffic signals and other matters throughout these phases of the project in line with the community communication strategy outlined in Appendix E (Community consultation framework) and discussed in Section B12.5.3 of this submissions report.

A clarification has been included in Section A5.1.4 of this submissions report presenting intersection performance results for the Pacific Highway/Dickson Avenue intersection during operation (years 2027 and 2037). The Pacific Highway/Dickson Avenue intersection is expected to operate at a satisfactory Level of Service (LoS) during AM (LoS B) and PM (LoS A) peak periods through to the 2037 design year.

B12.7.5 Operational parking impacts

Issue raised

Pages 23, 46, 48 and 56

The permanent removal of 25 on-street parking spaces within the Artarmon industrial area is not acceptable and would have a material impact on the operation of the Artarmon industrial area. A plan to replace the missing parking should be created with alternate parking of the same number provided. Council suggests that one option would be to widen the Hampden Road overpass to provide a separate two-way bicycle lane as well as parking on both sides of the overpass. Willoughby City Council seeks a condition of approval requiring that parking issues caused by the removal of on-street parking in Punch Street are explored and resolved.

Response

The project is currently expected to result in the permanent removal of up to 25 parking spaces on Lambs Road and Punch Street, due to the closure of Lambs Road in conjunction with the requirement to detour pedestrians and cyclists due to the adjustments to the Gore Hill Freeway shared user path. Transport for NSW has carried out a parking study that has analysed current parking demand/availability in the area (refer to Appendix B of this submissions report). Findings from the parking study show that while Lambs Road and Punch Street parking is of high demand, there are other streets nearby with moderate or high capacity which could help to mitigate the lost parking on Lambs Road and Punch Street (considering existing parking demand levels). Further, it is noted that 12 commercial properties are being acquired for the project in this locale. While some of these properties have onsite parking, the acquisition of the properties would reduce demand in the area from former employees, customers, students and visitors that were parking on the street. As such, this is expected to decrease parking demand in the area.

Notwithstanding, Transport for NSW is committed to reducing and/or offsetting permanent parking loss, which is reflected in the new environmental management measure OT3 (refer to Table D2-1 of this submissions report):

> Opportunities to reduce and/or offset the permanent loss of parking spaces in Artarmon due to the project will be investigated during further design development.

It is noted that works at Hampden Road bridge are generally limited to the underside of the bridge at the two abutments, as described in Table 6-7 of the environmental impact statement. Surface works at Hampden Road bridge would involve piling behind and strengthening of the existing northern abutment. Widening of Hampden Road bridge is therefore considered out of scope of the project.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.7.6 Public transport improvements

Issue raised

Pages 6, 13, 14, 15, 16, 57 and 58

The environmental impact statement advises the project would provide an opportunity for improved bus services, but does not propose any specific improvements. Opportunities to improve bus services and interchanges need to be addressed as part of any approval.

Willoughby City Council identifies potential bus improvement opportunities for the Warringah Road/Babbage Road/Boundary Street (to Archbold Street) corridor, St Leonards bus interchange and Chatswood Bus Interchange.

Willoughby City Council suggests that to realise potential bus improvement opportunities, conditions of approval should include the creation and implementation of a Road-Based Public Transport Plan to be prepared and implemented in consultation with Willoughby City Council. This review should incorporate future bus services and interchanges and identify bus priority measures to be implemented on corridors that would see a reduction of general traffic due to due to the project to maximize benefits for bus travel times. The plan should incorporate:

- Consideration of bus priority measures for the Warringah Road/Babbage Road/Boundary Street corridor
- A proposed St Leonards Bus Interchange
- Upgrades to the existing Chatswood Bus Interchange to improve its efficiency and operation.

Response

The Western Harbour Tunnel and Beaches Link program of works presents an opportunity to improve travel times and consequent patronage on peak express bus services by re-directing bus services from the Northern Beaches through the new motorway to North Sydney, north western Sydney including Macquarie Park, and the Sydney CBD, as outlined in Section 3.6.3 of the environmental impact statement. Existing services would benefit from reduced traffic demand on key arterial bus corridors including the Warringah Road/Eastern Valley Way corridor, by improving travel times and travel time reliability on these roads as a result of reduced traffic demand and congestion. It also provides an opportunity to consider new express bus services that could use the Beaches Link to provide more direct public transport access to and from the Northern Beaches (including, for example, St Leonards via Reserve Road). For example, the reduced vehicle congestion on Warringah Road between Frenchs Forest and Roseville would support the implementation of a proposed rapid bus service between Dee Why and Chatswood, similar in nature to that of the existing B-Line.

Refer to sections B12.1.1 and B12.1.2 of this submissions report for further commentary regarding public transport opportunities.

The development of a road-based public transport plan for the Warringah Road/Babbage Road/Boundary Street corridor, a proposed St Leonards Bus Interchange and upgrades to the existing Chatswood Bus Interchange are considered outside the scope of this project, however they would not be precluded by the project. The proposed scope of the project complements other public transport planning being carried out by other divisions within Transport for NSW. The project would enable other divisions of Transport for NSW and other agencies (including Council) to explore opportunities for urban renewal, public transport, active transport and changes to transport management on key corridors. This includes working with local Council and other government stakeholders to develop a place based transport plan for the lower North Shore, which would

identify potential transport opportunities to respond to the changing needs of the community, including movement types, and initiatives for mode shift and network operation across all transport modes. The development of the plan would consider the transport needs for the area based on transport and land use changes within the area, including their purpose, connections between centres and modal priority, eg light vehicle, freight, buses and cyclists, and changes to the transport network as a result of major infrastructure projects currently proposed and being delivered in the area. Transport for NSW is commencing engagement with Willoughby City Council, Mosman Council, North Sydney Council and Lane Cove Council in the last quarter of 2021.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.7.7 Gore Hill Freeway shared user path

Issue raised

Pages 24 and 58

The new bicycle and pedestrian link adjacent the Gore Hill Freeway should lead to maximum user safety and amenity. The new bicycle and pedestrian link must be realigned and reconstructed with a similar and preferably better alignment and capacity than the existing facility. The design standard for the new facility should incorporate contemporary design standards, guidelines and practices. The design should also integrate seamlessly with the existing bicycle links and facilities along and connecting to the Gore Hill Freeway bicycle and pedestrian link.

Response

The existing shared user path on the southern side of the Gore Hill Freeway would be replaced in areas directly impacted by the project west of the T1 North Shore and Western line and T9 Northern line, as noted in Section 9.4.3 of the environmental impact statement. Existing connections to the shared user path would be reinstated, however further extensions to the existing network are outside the scope of the project. Pedestrian fencing would be installed along the northern side of the shared user path to improve the safety of the active transport network.

The urban design framework includes urban design requirements to ensure the delivery of well-designed and attractive shared user bridges that provide safe access for all pedestrians and cyclists, as outlined in Appendix V (Technical working paper: Urban design, landscape character and visual impact). The urban design framework would be used to inform further design development to ensure high quality links.

The detailed design of the project, including active transport infrastructure, would be carried out in accordance with relevant design standards and guidelines of Transport for NSW and other organisations eg Austroads. The designs are reviewed by road design subject matter experts to ensure compliance to the relevant design standards and guidelines.

B12.7.8 Active transport review

Issue raised

Pages 16, 24, 44, 46, and 58

Willoughby City Council seeks a condition of approval requiring that, in consultation with relevant councils and user groups, an active transport review be carried out for both the construction and operational phases of the project. In particular, for the operational phase of the project, a Forestville to Chatswood Bicycle Route Plan should be required as part of this review.

Response

The project is one part of a complementary integrated multi-modal strategy being implemented by the NSW Government. As part of this overarching integrated transport network, the project includes the development of new or upgraded active transport links in a number of locations, generally associated with surface works for the project. These links would improve connectivity between communities, open space areas, public transport modes and the existing active transport network. The improvements to active transport infrastructure proposed by the project are identified in Section 5.1.1 of the environmental impact statement.

Section 9.5 of the environmental impact statement assesses the potential operational impacts to active transport in accordance with the Secretary's environmental assessment requirements and concludes that overall, the project would result in improved active transport connectivity.

Specific to the Willoughby local government area, as noted in above responses, modelled forecast traffic demands across Middle Harbour indicate reduction in demand on major arterial routes around northern Sydney, including a forecast decrease in daily traffic demand on Eastern Valley Way of up to 40 per cent by 2037. Reduced congestion on existing surface arterial routes is expected to improve network resilience due to the provision of new road capacity and connectivity, and reduce the attractiveness of rat-running on these roads, including Eastern Valley Way. By providing additional motorway capacity and bypassing communities underground, the project would reduce through traffic volumes through surrounding urban and residential areas. This in turn would result in improvements to safety and amenity in these neighbourhoods, including increased safety for active transport users.

As a consequence of the forecast reduction in traffic on existing surface roads, the project would also enable other divisions of Transport for NSW and other agencies (including Council) to explore opportunities for urban renewal, public transport, active transport and changes to transport management on key corridors. This includes working with local Council and other government stakeholders to develop a place based transport plan for the lower North Shore, which would identify potential transport opportunities to respond to the changing needs of the community, including movement types, and initiatives for mode shift and network operation across all transport modes. The development of the plan would consider the transport needs for the area based on transport and land use changes within the area, including their purpose, connections between centres and modal priority, eg light vehicle, freight, buses and cyclists, and changes to the transport network as a result of major infrastructure projects currently proposed and being delivered in the area. Transport for NSW is commencing engagement with Willoughby City Council, Mosman Council, North Sydney Council and Lane Cove Council in the last quarter of 2021.

For active transport connections outside the scope of the project, councils can apply for funding for cycleways under the NSW Government's Walking and Cycling Program. In line with the NSW Government's Future Transport Strategy 2056, this program focuses on improving the convenience of walking and cycling for short trips to key destinations and within centres, and making walking and cycling safe and reliable by prioritising infrastructure that supports pedestrian and cycling movement. Further information is available at www.transport.nsw.gov.au/projects/programs/walking-and-cycling-program.

Transport for NSW notes Council's most recent successful application for funding via the walking and cycling infrastructure program in 2019/20 which included upgrade of the pedestrian refuge on Herbert Street, St Leonards, near the Ella Street intersection. Applications for the NSW Government's 2022/2023 Walking and Cycling Program will commence shortly and Transport for NSW encourages Council to continue to apply for funding for specific initiatives via the program.

Specific conditions of approval relating to active transport are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

Further discussion on active transport links on Warringah Road/Babbage Road, including the suggested Forestville to Chatswood Bicycle Route Plan, is provided in Section B12.2.2 of this submissions report.

B12.7.9 Travel time savings

Issue raised

Pages 54 and 55

The routes used for travel time assessments have not been provided. Transport for NSW to provide further detail on what routes have been used for travel time assessments. Claims on travel time savings seem questionable (e.g. 56 minutes saved on a trip from Dee Why to Sydney Airport, a trip which currently takes circa 40-55 minutes).

Response

Change in travel times in the AM peak as a result of the program of works by 2037 is shown on Figure 3-8 of the environmental impact statement. The travel times were modelled based on the quickest route between a particular origin and destination, rather than road specific routes. It should be noted that the travel time savings outlined in Chapter 3 (Strategic context and project need) of the environmental impact statement considers forecast traffic demand in 2037, as opposed to current travel times and traffic demands.

Modelled travel time for a journey between Dee Why and Sydney Airport during the AM peak in 2037 is 95 minutes, in the absence of the Western Harbour Tunnel and Beaches Link program of works, taking into account 15-20 years of forecast land use and economic growth and consequent increases in traffic demand. The modelled travel time, considering the same origin and destination during the AM peak in 2037, is 39 minutes when including the program of works which would provide onward motorway connectivity directly to Sydney Airport via WestConnex. This results in a travel time saving of approximately 56 minutes.

B12.7.10 Tolls

Issue raised

Pages 24 and 25

Council notes that tolling and related equipment is to be implemented as part of the project; however there is no specific information on what toll levels would be. Toll levels would have a significant influence on usage of the project. Council notes that Transport for NSW has deferred consideration of this aspect to the NSW Government at a later date. Appropriate toll levels need to be proposed and assessed to maximise use of the project and reduce toll avoidance. Further analysis to be provided regarding tolling options and what impacts tolls will have upon usage of the project and adjacent roads.

Council objects to any additional Sydney Harbour crossing tolls as a consequence of either the Western Harbour Tunnel and Warringah Freeway Upgrade project or Beaches Link and Gore Hill Freeway Connection project.

Response

Transport for NSW acknowledges Council's observation that toll levels may impact patronage of the tunnel, adjacent roads and alternative routes. The decision to apply a toll to a road is a NSW Government decision and is not made at the project level.

Tolling is taken into account in the scenarios assessed by the environmental impact statement, including traffic modelling presented in Chapter 9 (Operational traffic and transport) of the environmental impact statement and Appendix F (Technical working paper: Traffic and transport). Tolling scenarios and implications are discussed in Section 7.2.4 of Appendix F (Technical working paper: Traffic and transport). As noted by Council, tolling infrastructure has been included as part of this environmental assessment to provide the NSW Government with the option to apply tolls to traffic using the Beaches Link tunnels. Although no decision on the final tolling strategy has been made, if tolls were introduced, it should be noted that the traffic assessment and modelling carried out for the environmental impact statement assumes that tolls would apply to all north and southbound trips on all harbour crossings in future, including two-way tolling on the Beaches Link tunnel.

B12.7.11 Design and operation of signs and ramp metering

Issue raised

Page 24

Willoughby City Council notes that guide signs and ramp metering would be installed as part of the project (refer to page 5-42 of the environmental impact statement). Council suggests that conditions of approval include that Transport for NSW consult with Willoughby City Council regarding the design and operation of signs and ramp metering so that issues can be understood and measures taken to minimise impacts to the regional and local road network.

Response

Signs, CCTV and other traffic control systems, including ramp metering where functionally appropriate, would be installed as outlined in Section 5.2.7 of the environmental impact statement. Signs would be consistent with the requirements of applicable Australian Standards and guidelines published by Austroads and Transport for NSW. In accordance with the community communication strategy outlined in Appendix E (Community consultation framework) and discussed in Section B12.5.3 of this submissions report, engagement would continue to be carried out with Willoughby City Council throughout further design development for the project. Transport for NSW will continue to collaborate on the planning of operational features such as signs and ramp metering with councils and other key stakeholders as appropriate.

Transport for NSW is currently not planning on implementing ramp metering on the associated new works on the Gore Hill Freeway.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.7.12 Spit Bridge openings

Issue raised

Page 59

Willoughby City Council considers that the number, frequency and duration of openings of the Spit Bridge should be reviewed in light of forecasted decreases in traffic volumes. This could be investigated in the future post-construction of the project.

Council recommends that conditions of approval include the requirement that an operational road network performance review be completed within 12 months of completion of the project, with the possibility of increasing the number, frequency and duration of the openings of the Spit Bridge to be considered.

Response

Analysis of the modelled forecast traffic demands across Middle Harbour with the project in 2037 indicates that peak period traffic demand on Spit Road would decrease by up to 33 per cent as a result of the project.

A review of the operational network performance will be carried out 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, in accordance with environmental management measure OT1 (refer to Table D2-1 of this submissions report).

The management of Spit Bridge openings is outside the scope of this project however the opportunity to increase the openings of the Spit Bridge would be considered following review of network performance.

B12.7.13 Induced demand

Issue raised

Pages 17, 18 and 19

Information in Appendix F (Technical working paper: Traffic and transport) relating to induced demand is questioned, including what the 0.3 per cent induced demand figure means, particularly in terms of new vehicle movements at a local level. Council considers that quoting this small figure in the context of the whole Sydney metropolitan obscures the reality of induced traffic demand to be created by the program of works. The impact of induced demand upon the project and adjacent arterial and local roads should be addressed, with a time horizon past 2027 and 2037.

Response

The modelling approach adopted for the project is the standard NSW Government approach, which has been endorsed and applied for all recent major transport projects. The transport modelling is informed by the NSW Government's standard integrated land use and multi-modal transport forecasting approach. This is an industry standard four stage transport forecasting approach which accounts for the trip generation, trip distribution, mode choice, and route assignment factors. It also accounts for other key factors including the potential for induced demand. An overview of this approach is provided in Section 9.2.2 of the environmental impact statement and Section 3 of Appendix F (Technical working paper: Traffic and transport). Time horizons assessed in the environmental impact statement are stipulated by the regulator, being the assumed year of opening (2027) and design year 10 years beyond opening (2037).

The SMPM, which informed the traffic and transport assessment, includes changes in traffic associated with the following:

- Regional increase in number of trips due to population growth and increased economic activity
- Trips attracted from competing routes or modes as a result of improved travel times on the new or upgraded road
- Induced demand (new trips) as a result of improved travel times between homes and destinations, such as workplaces, shopping centres and education facilities, which cause changes to region-wide trip patterns.

As such, the SMPM includes induced demand effects within the forecasting methodology, which means that all areas of the environmental impact statement assessment considers and presents project impacts, inclusive of induced demand, including operational travel benefits.

As an example, Table 7-3 of Appendix F (Technical working paper: Traffic and transport) indicates that total daily traffic crossing Middle Harbour in 2037 would be around 230,000 vehicles per day in the 'Do minimum' (without Beaches Link) scenario, and around 240,000 vehicles per day in the 'Do something' (with Beaches Link) scenario. This indicates an induced demand crossing Middle Harbour of around 10,000 vehicles per day, or about 4 to 5 per cent. Similarly, as a more detailed example Table 7-21 and Table 7-22 of Appendix F (Technical working paper: Traffic and transport) provide details of peak period demands in the Gore Hill Freeway and surrounds microsimulation modelling area. These tables indicate that for the design year of 2037 the project is forecast to increase (induce) peak period demand in this area by between five and 13 per cent. The traffic performance assessment metrics presented in the environmental impact statement (network speeds, corridor travel times, intersection level of service etc) reflect the effects of demand increases created by the project in localised areas.

B12.7.14 Request for a multi-agency framework

Issue raised

Page 54

The benefits of reduced traffic volumes on key arterial routes would not be sustained over the long term due to the effects of induced demand. A comprehensive multi-agency framework, supported by plans, monitoring and forums is considered essential to ensure safety, amenity, access and efficient movement is maintained across the road network.

Willoughby City Council requests that conditions of approval include that a Willoughby Integrated Transport and Planning Forum is to be created and implemented to plan, develop and deliver proposed traffic and transport changes that maximises benefits and minimises impacts to the Willoughby local government area.

Response

Induced demand is discussed in sections B12.1.1 and B12.7.13 of this submissions report, and is reflected throughout the environmental impact statement's technical assessments.

While the establishment of a Willoughby Integrated Transport and Planning Forum is beyond the scope of the project, the project would enable other divisions of Transport for NSW and other agencies (including Council) to explore opportunities for urban renewal, public transport, active transport and changes to transport management on key corridors. This includes working with local Council and other government stakeholders to develop a place based transport plan for the lower North Shore, which would identify potential transport opportunities to respond to the changing needs of the community, including movement types, and initiatives for mode shift and network operation across all transport modes. The development of the plan would consider the transport needs for the area based on transport and land use changes within the area, including their purpose, connections between centres and modal priority, eg light vehicle, freight, buses and cyclists, and changes to the transport network as a result of major infrastructure projects currently proposed and being delivered in the area. Transport for NSW is commencing engagement with Willoughby City Council, Mosman Council, North Sydney Council and Lane Cove Council in the last quarter of 2021.

It is also noted that environmental management measures OT1 and OT2 (refer to Table D2-1 of this submissions report) reflect Transport for NSW's commitment to review operational traffic

performance and address unexpected project impacts to the Willoughby local government area (should they occur):

- A review of operational network performance will be carried out 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections. The assessment will be based on updated traffic data at the time and the methodology used will be comparable with that used in Appendix F (Technical working paper: Traffic and transport). Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and the relevant council to manage any additional traffic performance impacts identified during the review of operational network performance (environmental management measure OT1)
- Where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network. Such measures will be determined in consultation with relevant councils and implemented where feasible and reasonable (environmental management measure OT2).

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.7.15 Impacts of COVID-19 on traffic patterns

Issue raised

Pages 20 and 21

While it is probably too early to fully understand what permanent impacts the pandemic would have on travel patterns, greater consideration needs to be given to how changed mobility behaviours and travel patterns associated with COVID-19 will impact on forecast demands for the project and existing surface roads. Further analysis should be provided regarding the impacts from the COVID-19 pandemic on travel patterns and traffic volume forecasts for the program and project.

Council considers this issue of inaccurate traffic forecasts is particularly important given the still recent experience of other Australian tunnel projects, in which forecast traffic demands were significantly overstated (eg Cross City Tunnel and Lane Cove Tunnel in Sydney, Clem Jones Tunnel and Airport Link in Brisbane), resulting in the financial failure of these projects.

Response

The COVID-19 pandemic is an unprecedented event that has changed the way people work and their travel patterns, while creating uncertainty about the future, as discussed in Section 3.1 of the environmental impact statement.

The impact of COVID-19 on the transport network has been multi-faceted, and is largely broken down into immediate and medium term impacts:

- Immediate: major reductions in public transport and car trips, reductions in public transport capacity, increased second hand car purchases, increased intrastate visitation, reduction in public transport preference, increased online shopping, and deliveries, reductions in overseas and interstate visitors
- Medium term: Reduction in overseas migration, leading to a period of decrease in NSW and Sydney population growth rates, reducing overall projected travel demand; reduced commuter trips due to more people working from home, changing spatial distribution of interpeak/daily non-commute trips.

Significant uncertainty still exists about how long the impacts of COVID-19 will last. In response to the evolving Delta outbreak of COVID-19, areas of Greater Sydney and NSW have gone into

lockdown in mid-2021 to manage the spread of the virus while the vaccination program is rolled out. Once vaccination targets have been met and rules have been eased, outbreaks could continue to occur in 2021 and into the future, depending on the timing and efficacy of the vaccination program. It is not possible to accurately predict when immediate and medium term impacts would finish, or when a return to pre-pandemic travel patterns will occur. At this time, the duration of impacts to transport demands and behaviours from the COVID-19 pandemic are still unknown, and current traffic conditions and travel behaviours are the result of a variety of temporary factors, including reduced public transport capacity and demand.

While the COVID-19 pandemic presents immediate to medium-term challenges for Sydney (and NSW more broadly), the project has been developed with a long-term view to address the challenges Greater Sydney will face over the next 40 years, to enable and accommodate growth, and to deliver long-lasting benefits for road users, communities and businesses. As Sydney continues to grow, faster and more reliable trips are essential to reducing congestion and providing new levels of access to jobs, recreation, and services such as schools and hospitals. Mona Vale Road, Military Road/Spit Road and Warringah Road/Eastern Valley Way road corridors generally operate well over capacity during peak periods, as described in Chapter 3 (Strategic context and project need) of the environmental impact statement. This contributes to high levels of congestion, long and unreliable journey times and, consequently, poor accessibility to and from the region. Beaches Link would create an alternative to the Military Road/Spit Road and Warringah Road/Eastern Valley Way corridors to separate out through and by-pass traffic, reducing pressure on congested road corridors servicing the Northern Beaches and North Shore.

As such, the need for the project and other strategic transport projects to meet the demands of a growing population and economy remains critical to ensuring the future success of Sydney.

Given the immediate to medium term nature of current conditions, the modelling approach used for the environmental impact statement is considered to be the most appropriate methodology for long-term planning and was completed in accordance with appropriate standards and guidelines.

While it is difficult to fully assess the long-term impact of the event, evidence of Greater Sydney's resilience to such disruptions is already apparent. Ongoing traffic and transport monitoring shows that traffic levels on most roads in the project area returned to those levels near that of the pre-COVID-19 pandemic period in early 2021, prior to the mid-2021 lockdown (acknowledging that public transport capacity and user behaviours are still in a temporary state). It is expected that similar trends will be observed once the lockdown rules have been eased, and traffic levels will return to those levels in the pre-COVID-19 pandemic period. Transport for NSW will continue to monitor and analyse the potential long-term effects of the COVID-19 pandemic on travel demand, including changes to existing travel conditions as well as future travel behaviours and underlying economic demand drivers.

B12.8 Construction noise and vibration

Issue raised

Page 60

Willoughby City Council recommends that conditions of approval include the requirement the construction environmental management plan be provided to Council with further detailed analysis and details of measures to mitigate noise and vibration impacts during the construction phase.

Council requests they and the community be provided with assurances that there would be no detrimental effects due to noise and vibration and that impacts can be managed and mitigated

through appropriate environmental management measures. This is of particular importance for properties in the vicinity of the Flat Rock Drive construction support site (BL2).

Council recommends that all relevant noise management, mitigation and consultation provisions in the recent Western Harbour Tunnel and Warringah Freeway Upgrade project planning approval be made conditions of approval for the Beaches Link and Gore Hill Freeway Connection project, including the appointment of an Acoustic Advisor and the requirement that for works outside standard construction hours respite periods be identified in consultation with Council and the community.

Response

A construction environmental management plan would be prepared for the project, and would include a construction noise and vibration management plan, as outlined in Section 28.5.1 of the environmental impact statement and Section D1.1 of this submissions report. The construction noise and vibration management plan will be prepared in accordance with revised environmental management measure CNV1 (refer to Table D2-1 of this submissions report) and will:

- Identify relevant criteria and management levels in relation to noise and vibration
- Identify noise and vibration sensitive receivers and features in the vicinity of the project
- Include standard and additional mitigation from the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016a) and detail how and when these will be applied in the project
- Ensure appropriate respite is provided for works outside standard construction hours in accordance with environmental management measures CNV9 and CNV13 (refer to Table D2-1 of this submissions report).

In addition, all relevant environmental management measures in Table D2-1 and Appendix J of this submissions report will be incorporated into the construction noise and vibration management plan. These measures would be applied where applicable at the Flat Rock Drive construction support site (BL2).

The potential impact of construction noise and vibration, including ground-borne noise, in residential areas near the project is discussed in Section 10.6 of the environmental impact statement with further detail provided in Section 5 of Appendix G (Technical working paper: Noise and vibration). It is anticipated that residents may experience noise levels greater than the noise management level during and outside standard construction hours during initial site establishment activities at the Flat Rock Drive construction support site (BL2), including utility modifications, vegetation clearing, access decline excavation and road modification works. Following the commencement of tunnelling and tunnel fitout at this site no exceedances of the day, evening or night time noise management levels are anticipated at residential receivers.

While the assessment identifies the potential for some impacts of construction noise, vibration and ground-borne noise in residential areas near the project, environmental management measures to minimise these impacts are included in Table D2-1 and Appendix J of this submissions report. It is also be noted that the noise modelling assumes a ‘reasonable worst-case’ scenario eg assuming all machinery and equipment is used at the same time, at its loudest and in the location on site where it would have the highest impact on residents, and this scenario is unlikely to occur as the work will be staged to reduce overlap of noisy work activities, where possible.

Specific conditions of approval related to construction noise and vibration management are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.9 Operational noise and vibration

Issue raised

Page 62

Willoughby City Council state that noise and vibration from the operational phase of the project needs to be actively managed to avoid negative impacts on the health and wellbeing of affected residents and businesses.

Council recommends that conditions of approval include the preparation of an Operational Noise Review to confirm noise control measures that would be implemented for the project.

The Operational Noise Review is to provide Council with further analysis and plans for impact mitigation in relation to noise and vibration that would be generated during the operational phase. Council and the community are to be provided with assurances there would be no detrimental effects due to noise and vibration from ongoing traffic, and that impacts can be managed and mitigated through the proposed noise control measures as described in Chapter 11 (Operational noise and vibration) of the environmental impact statement (in particular Table 11-12).

Response

The project has been designed and assessed to consider operational noise and include operational noise mitigation measures where feasible and reasonable to manage and minimise impacts.

Operational noise and vibration environmental management measures for project operation are identified in Table D2-1 of this submissions report. Existing and indicative new noise barrier locations are shown on Figures 5-21 to 5-24 of the environmental impact statement.

To further mitigate construction noise from works outside standard construction hours, operational noise treatments would be proactively implemented at eligible properties adjacent to the project as early as possible in the construction program as outlined in Appendix I of this submissions report. In addition, consideration would be given to implementing other additional operational noise and vibration measures as early as possible, including at-receiver treatments for operational noise not included in Appendix I). The project team would also work closely with sensitive receivers and vulnerable community members to tailor the approach to best suit individual needs and minimise impacts wherever possible.

The locations of receiver buildings to be considered for at-property noise treatment are identified in Table 11-9 of the environmental impact statement and Annexure R of Appendix G (Technical working paper: Noise and vibration). Properties along Warringah Freeway and in nearby areas are included in Annexure R of Appendix G (Technical working paper: Noise and vibration). Mitigation for road traffic noise, including at-property treatment, for Warringah Freeway and surrounds would be carried out as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project.

As is normally the case for complex major infrastructure projects progressing through an environmental planning and assessment process, the project design is subject to further refinement and development. The final design might differ from the concept design described and assessed in the environmental impact statement, which may in turn affect operational road traffic noise levels.

It is therefore appropriate to review operational road traffic noise levels post-approval in line with relevant guidelines to confirm the specific mitigation measures that would be implemented. Accordingly, the details of new barriers, any changes to existing barriers and the eligibility and suitability of receiver buildings for at-property treatment would be confirmed during detailed design. Relevant environmental management measures are as follows (and refer to Table D2-1 of this submissions report):

- The operational noise performance of the project will be reviewed during further design development and functionally appropriate operational noise mitigation (quieter pavements eg open grade asphalt, noise barriers, at-property treatments or a combination of treatments) will be confirmed in accordance with *NSW Road Noise Policy* (Department of Environment, Climate Change and Water (DECCW), 2011b), *Noise Criteria Guideline* (Roads and Maritime Services, 2015a) and *Noise Mitigation Guideline* (Roads and Maritime Services, 2015b) (environmental management measure ONV1)
- Within 12 months of the commencement of the operation of the project, actual operational noise performance will be compared to predicted operational noise performance (as reviewed during further design development) to analyse the effectiveness of the operational road traffic noise mitigation measures. Additional reasonable and feasible mitigation will be considered where any additional receivers are identified as qualifying for consideration of noise mitigation in accordance with the *Noise Mitigation Guideline* (Roads and Maritime Services, 2015b) (revised environmental management measure ONV2).

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.10 Air quality

B12.10.1 Construction air quality management

Issue raised

Pages 64 and 95

Willoughby City Council noted that there is potential for construction dust to impact on the health and wellbeing of groups in the community who may be more sensitive to changes in air quality, such as children and the elderly. Council recommends that conditions of approval be provided which require:

- Provision of a detailed analysis and plan for air quality impact mitigation, demonstrating that there would be no detrimental effects of airborne contaminants or from contaminated land during construction activity
- The assessment should also consider measures to mitigate potential airborne contaminants or impacts from contaminated land during and post construction
- The provision of monitoring, with access to real time air quality monitoring data for the community. Monitoring should include alerts and an on-site monitoring screen at the Bicentennial Reserve Ovals and Flat Rock baseball diamond to alert sport users to poor air quality events
- The Environment Protection Authority install and maintain permanent air quality monitoring equipment, including at Bicentennial Reserve, Willoughby
- Air and dust level monitoring to be made publicly available. Council and residents are to be consulted and given notice of construction works, to ensure peak times for reduction in air quality are known in advance.

Response

Potential health impacts associated with construction air quality are discussed in Section 13.4.1 of the environmental impact statement and are based on the air quality impacts assessed in Chapter 12 (Air quality). The health impact assessment found that potential air quality impacts during construction are unlikely to result in any health related impacts. For almost all construction activities, substantial impacts on receivers would be avoided through project design and the implementation of effective, industry standard mitigation and management measures. However, dust management

measures may not be fully effective all the time and in situations where this occurs impacts on the community would generally be temporary and short-term and are considered to be minor. The effectiveness of dust control measures would be monitored and adjusted as required to ensure impacts on the health of the community are minimised.

A construction environmental management plan would be prepared for the project, as outlined in Section 28.5.1 of the environmental impact statement, which will include an air quality management plan. This plan would include mitigation and management measures to minimise construction air quality impacts, odour management measures for odour from contaminated soil and monitoring requirements, as outlined in Table D1-1 of this submissions report. All relevant environmental management measures included in Table D2-1 of this submissions report will be adopted and incorporated into the management plan. These measures include:

- Selection of construction equipment and/or materials handling techniques that minimise the potential for dust generation (revised environmental management measure AQ1)
- Management measures to minimise dust generation during the transfer, handling and on-site storage of spoil and construction materials (revised environmental management measure AQ1)
- Adjustment or management of dust generating activities during unfavourable weather conditions, where appropriate (revised environmental management measure AQ1)
- Minimisation of exposed areas during construction (revised environmental management measure AQ1)
- Measures for managing odour generation likely to result in odour impacts at sensitive receivers in the vicinity during the disturbance, handling and storage of potentially odorous materials, including any contingency measures (revised environmental management measure AQ1)
- Internal project communication protocols to ensure dust-generating activities in the same area are coordinated and mitigated to manage cumulative dust impacts of the project (revised environmental management measure AQ1)
- Site inspections to monitor the effectiveness of implemented measures and identify any additional measures to be implemented (revised environmental management measure AQ1)
- Where site investigations and modelling indicate there is potential for odorous materials to be uncovered or odorous gases to be released resulting in unacceptable off-site impacts appropriate mitigation and management measures will be identified to minimise potential impacts (revised environmental management measure AQ2)
- Managing dust and air quality complaints and taking corrective actions where required (environmental management measure AQ3).

In NSW the Department of Planning, Industry and Environment monitors, analyses and publishes information on air quality within the State.

Specific conditions of approval related to the management and monitoring of air quality are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

Air quality impacts during construction works would likely be localised, temporary and of relatively short duration, depending on the works taking place at the particular location and time. For all construction works, the aim would be to prevent air quality impacts through the implementation of best management practices routinely used on construction sites. These measures are considered to be sufficient to mitigate the effects of construction work on local air quality, the community and environment and therefore real time air quality monitoring during construction is not proposed.

During operation, the project would continuously monitor air quality within the ventilation outlets and tunnel 24 hours a day, using this real-time data to demonstrate compliance with strict air quality criteria set for the project. This monitoring is discussed further in Section C11.5.1 of this submissions report.

B12.10.2 Construction silica dust

Issue raised

Page 65

Council raised that exposure to silica dust (that may come from sandstone) is a known major health risk, and may lead to lung cancer, silicosis and other ailments and requested clarification be provided regarding the measures proposed to reduce and mitigate potential exposure to silica dust.

Council recommends that the conditions of approval include the requirement for the project to prepare a detailed analysis and plan addressing impacts from exposure to silica dust and mitigation to ensure there will be no detrimental effects of exposure to silica dust during both the construction and operational phases of the project.

Response

In 2020 the NSW Governments' Silicosis Reduction Strategy came into effect which introduced a new minimum silica workplace exposure standard and banned uncontrolled dry cutting and grinding of stone and manufactured stone. In addition, the *NSW Dust Strategy 2020-2022* (Safework NSW, 2020) was launched which aims to prevent occupational diseases and protect workers from hazardous dust exposure through a coordinated approach for the safe handling of hazard dust including silica. Although targeted at protecting workers, the implementation of these strategies on the project would also mitigate risks to the community.

There is potential for crystalline silica emissions to occur during tunnel excavation due to the high temperatures caused at the excavation face as discussed in Section 7 of Appendix H (Technical working paper: Air quality). Potential silica dust emissions generated during construction would be managed at source so as to minimise risks to workers and would therefore not be expected to remain airborne for an extended period nor pose health risks to the community. For construction workers, the risk of exposure to silica dust would be managed in accordance with the SafeWork NSW crystalline silica – technical fact sheet (available online at www.safework.nsw.gov.au/resource-library/hazardous-chemicals/crystalline-silica-technical-fact-sheet).

Once on the surface, the handling of tunnel spoil would typically occur within an acoustic shed with haulage off site via load covered trucks, to further minimise the potential for dust emissions. As such, the risk of silica emissions and exposure in areas adjacent to temporary construction support sites where tunnelling is occurring is very low.

The risk of silica emissions and exposure from other surface works, including activities within the temporary construction support sites, would be minimised through implementation of the environmental management measures including dust suppression, selection of excavation methods to minimise dust generation, and adjusting dust generation activities during unfavourable weather conditions, as per revised environmental management measure AQ1 (refer to Table D2-1 of this submissions report).

A construction environmental management plan would be prepared for the project, and would include an air quality management plan as outlined in Section 28.5.1 of the environmental impact statement and Section D1.1 of this submissions report. This plan will include environmental

management measures to minimise construction air quality impacts, as outlined in Table D1-1 of this submissions report. All relevant environmental management measures included in Table D2-1 of this submissions report will be adopted and incorporated into the air quality management plan.

Through the implementation of environmental management measures to suppress dust, it is considered unlikely that silica dust would impact on sensitive receivers surrounding temporary construction support sites. Silica dust would not be generated during operation of the project, however the project would monitor the levels of solid particles and particulate matter in the ventilation outlets with further detail on this monitoring provided in Section C11.5.1 of this submissions report.

Specific conditions of approval related to the management of construction air quality are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.10.3 Operational ventilation outlets

Issue raised

Page 65

Willoughby City Council notes that ventilation outlets are potential sources of higher air pollution and request confirmation that there would only be a single location (in Cleg Street, Artarmon) for the proposed Beaches Link ventilation outlet in the Middle Harbour (Flat Rock Creek) catchment and that no additional ventilation outlets would be in the Willoughby local government area.

Council recommends that conditions of approval include a detailed analysis and plan addressing impacts from air quality and measures to mitigate health concerns.

Response

One ventilation outlet is proposed for the project within the Willoughby local government area, in the industrial area next to the Gore Hill Freeway at Artarmon. No other ventilation outlets are proposed within the Willoughby local government area.

The potential air quality and human health impacts of the project, including from this ventilation outlet, have been assessed in accordance with the requirements of the Secretary's environmental assessment requirements in Chapter 12 (Air quality) and Chapter 13 (Human health) of the environmental impact statement and Appendix H (Technical working paper: Air quality) and Appendix I (Technical working paper: Health impact assessment).

The tunnel ventilation system would be designed so that there would be no emissions from tunnel portals. All emissions would be via ventilation outlets. The project is expected to result in a redistribution of impacts associated with vehicle emissions, specifically from vehicles using surface roads. This would generally result in no change or a small improvement in air quality for the community although some areas located near key surface roads may experience a small increase in pollutant concentrations. Potential health impacts associated with these changes have been assessed and are considered to be acceptable.

The project's ventilation systems would be designed and operated in compliance with strict air quality criteria. Further, ventilation outlet emissions would be continuously monitored during operation and would be regulated under an environment protection licence for the project, prescribed under the *Protection of the Environment Operation Act 1997*.

Specific conditions of approval related to ventilation outlets are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project, noting that the

project's ventilation system would be designed and operated to comply with any conditions of approval set.

B12.10.4 Operational particulate emissions from traffic

Issue raised

Page 64

Council request clarification be provided regarding the extent of expected increases in particulate emissions due to traffic growth verses reductions linked to improvements in engine efficiency and how the resulting emissions will impact the long-term health and well-being of Willoughby communities.

Response

An assessment of changes in air quality during the operation of the project was completed as part of the development of the environmental impact statement and is included in Appendix H (Technical working paper: Air quality). A summary of total traffic emissions expected both with and without operation of the project is provided in Figure 8-7 in Appendix H (Technical working paper: Air quality). The figure shows that unlike nitrous oxides (NO_x), carbon monoxide (CO) and hydrocarbons, particulate matter (PM_{10} and $PM_{2.5}$) levels are expected to remain fairly constant with and without the operational project, and slightly increase from the years 2027 and 2037 with operation of the project. The maximum health risks associated with these changes in particulate matter concentrations would be less than or equal to one in ten thousand, for exposures in residential, commercial and industrial areas, childcare centres, schools, aged care homes and open space areas, which is considered to be tolerable or acceptable (refer to Section 13.5.1 of the environmental impact statement). In addition, in terms of the change in incidence of the relevant health impacts for $PM_{2.5}$ in the community (being the change in the number of cases per year of mortality, hospital or emergency department admissions), the total change in the number of cases was mostly negative (ie a decrease in incidence as a result in the project) however if there was an increase this was less than one case per year and therefore would not be measurable in the community.

For non-particular emissions (CO, NO_x and hydrocarbons) overall changes in emissions associated with the project are smaller than the underlying reductions in emissions from the traffic on the network as a result of improvements in emission-control technology. Particulate matter levels are mostly attributed to the non-exhaust component of emissions, eg brake and tyre wear, therefore whilst improvements in engine technology will reduce the tailpipe emissions (eg CO, NO_x and hydrocarbons) this will not have a significant effect on non-exhaust particles.

Although improvements in emission-control technology will not have a significant impact on expected particulate emission levels, it is noted that a significant uptake of electric vehicles was not included in the modelling projections and the air quality modelling provides a conservative estimate. Should the uptake in electric vehicle increase by more than expected in the model between 2027 and 2037, it is likely the air quality impacts would be less than predicted. This greater uptake may result from the NSW Governments' Electric Vehicle Strategy, which includes an investment of almost half a billion dollars in tax cuts and incentives to drive uptake and reduce barriers for electric vehicle purchases over the next four years. The aim of this strategy is to drive sales of electric vehicles to more than 50 per cent of new car sales by 2030-31 and transition the entire NSW government passenger fleet to electric vehicles by 2030.

B12.11 Human health

B12.11.1 Construction noise and vibration impacts and application of lessons learnt

Issue raised

Pages 60 and 95

Willoughby City Council notes there is significant community concern regarding other Sydney tunnelling projects and the potential for vibration impacts and damage at properties located above the alignment of the proposed tunnel, notwithstanding the significant depth of the tunnel at certain points from the construction works. They noted significant noise and vibration impacts may be caused by tunnelling activities, particularly in the vicinity of the temporary construction support sites with close proximity to residential areas, including the Flat Rock Drive (BL2), Barton Road (BL5) and the Middle Harbour south cofferdam (BL7) construction support sites. In addition, the community may be impacted by construction activities outside of standard working hours and heavy vehicle construction activity during peak demand transit times, noting that some construction works have the potential to create sleep disturbance.

Council raised the concern that, given the nature of the construction activities, the construction noise and vibration environmental management measures may not be adequate and may lead to significant negative impacts on the health and wellbeing of Northbridge residents.

Council requests that Transport for NSW and future contractors be required to review the issues that cause significant concern on other major projects, and apply the lessons learned to ensure the best outcomes for all potentially affected residents and businesses.

Response

An assessment of construction noise and vibration impacts is included in Chapter 10 (Construction noise and vibration) of the environmental impact statement and Appendix G (Technical working paper: Noise and vibration). The outcomes of this assessment were used to assess the impacts of construction noise and vibration on the health of residents and other receivers in Chapter 13 (Human health) of the environmental impact statement and Appendix I (Technical working paper: Health impact assessment). This includes impacts resulting in sleep disturbance, annoyance, hearing impairment, interference with speech and other daily activities, children's cognitive function, and cardiovascular health. During tunnelling with both roadheaders and rock hammers, no properties are expected to exceed the vibration screening criterion for structural or cosmetic damage. However, vibration levels during rock hammering at two heritage items (Cammeray Park (including golf course) and Artarmon Park PAD (45-6-3362)) would potentially exceed the vibration screening criterion for cosmetic damage (unsound structure). An assessment of ground settlement induced by tunnel excavation and groundwater drawdown has also been carried out for development in proximity to the tunnel and is further discussed in Section B12.14.3 of this submissions report.

Unmitigated construction work may have the potential to result in health impacts for the affected community, as acknowledged in Section 7.4.1 of Appendix I (Technical working paper: Health impact assessment). However, the noise, vibration and settlement impacts identified can be mitigated through the implementation of the environmental management measures outlined in Table D2-1 of this submissions report. These measures include:

- Preparation of location and activity specific construction noise and vibration impact statements which will outline feasible and reasonable mitigation and management measures in accordance with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009) and the

Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016a) (refer to environmental management measure CNV2)

- Developing an out of hours work protocol with mitigation and management measures to manage potential impacts associated with works outside standard construction hours (refer to revised environmental management measure CNV3)
- Implementing shoulder periods where appropriate (refer to revised environmental management measure CNV4)
- Monitoring noise and vibration impacts throughout construction (refer to revised environmental management measure CNV5)
- The management of vibration generating activities through the establishment of minimum working distances and mitigation and management measures such as equipment substitution and alternatives methods to avoid damage (refer to environmental management measure CNV7)
- Identified heritage items would be further investigated to determine the susceptibility of the items to damage from vibration in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed (refer to environmental management measure CNV7)
- Specific measures to be implemented during surface road works (refer to revised environmental management measure CNV9)
- Replacing existing noise barriers as soon as possible (refer to environmental management measure CNV11)
- Minimising cumulative impacts (refer to environmental management measure CNV13)
- Restrictions on the hours of impact piling to provide respite (refer to environmental management measure CNV14)
- Pre-construction and post-construction building structure condition surveys will be offered and prepared (where the offer is accepted by the owner) for properties (and heritage assets) within the zone of influence of tunnel settlement where the degree of severity has been assessed as ‘slight’ or above or within the minimum working distances for cosmetic and structural damage due to vibration (refer to revised environmental management measure SG7)
- Establishment of an Independent Property Impact Assessment Panel to verify building condition survey reports and resolve property damage disputes (refer to environmental management measure SG5).

To further mitigate construction noise from works outside standard construction hours, noise treatments would be proactively implemented at eligible properties adjacent to the project as early as possible in the construction program as outlined in Appendix I of this submissions report.

Furthermore, community consultation regarding construction noise and vibration would be detailed in the community communication strategy for the project. Where appropriate, this would include details on how community preferences would be identified and taken into account in the design of mitigation measures, as outlined in Section 7.4 of Appendix E (Community consultation framework). These mitigation measures would be further developed during further design development by the contractor/s and provided in a construction noise and vibration management plan (refer to revised environmental management measure CNV1).

In addition, the proposed construction methodology and environmental management measures (refer to Table D2-1 of this submissions report) for the project have both been informed by lessons learnt from other major projects constructed in Sydney, NSW and Australia and Transport for NSW would continue to review the methodology and mitigation in light of future lessons learnt.

B12.11.2 Operational noise impacts

Issue raised

Page 61

Willoughby City Council noted that the ventilation outlets will contain high velocity fans and acknowledged that whilst noise from these outlets is proposed to meet relevant Australian Standards, noise management and control should be well below standard levels.

Response

Noise levels from operational fixed facilities, including ventilation outlets, were assessed in accordance with *Noise Policy for Industry* (NSW Environment Protection Authority (EPA) 2017), which includes both intrusiveness and amenity criteria. The results from the assessment are provided in Table 11-10 of the environmental impact statement with further detail included in Section 7.4 of Appendix G (Technical working paper: Noise and vibration). No exceedances of relevant criteria are predicted.

Notwithstanding the noise assessment findings, further assessment of operational fixed facilities would be carried out when actual types, makes and models of the plant and equipment are confirmed during detailed design. Operational fixed facilities will be designed to meet project specific noise criteria derived in accordance with the *Noise Policy for Industry* (NSW EPA, 2017) as required by environmental management measure ONV4 (refer to Table D2-1 of this submissions report). This requirement would ensure potential impacts are minimised.

B12.11.3 Suspended sediment impacts to human health

Issue raised

Page 84

There has been no quantification of pathogenic bacteria or resting dinoflagellate cysts (a major cause of red tides) in the sediments that might be released during dredging activities and pose a human health risk.

Response

It is acknowledged that there is a connection between the extent of pollution and the abundance and diversity of pathogenic organisms in marine sediments. Hence, it is possible that the top metre of the dredge profile, which is known to include contaminants, may harbor pathogenic organisms. As is the case for sediment bound contaminants, there would be very little potential for pathogenic bacteria to be resuspended and dispersed during dredging given the top layer of sediment would be dredged using a closed environmental clamshell bucket.

It is anticipated that there would be minimal leakage from the closed environmental clamshell bucket during transit of material from the bed of the harbour to the hopper barge, however a small amount of material from the bed of the harbour may be resuspended in the process. Floating silt curtains are therefore proposed to prevent most of this resuspended material from being dispersed to other areas.

Given the rapid dispersion of suspended sediments that would occur in Middle Harbour, and the potential for only a small amount of pathogenic bacteria or resting dinoflagellate cysts in the sediments (a major cause of red tides) to be released during dredging of the top layer, it is expected that this would not lead to a bloom of toxic dinoflagellates or multiplication of pathogenic bacteria to levels that could cause harm to humans, either within Middle Harbour or further afield.

Monitoring during the dredging activities would provide data to assess the compliance of the activities with this assessment. Dredging would also be carried out in accordance with the dredge management plan, as outlined in Section D1 of this submissions report. Further consideration of the potential health risks associated with dredging of marine sediments is provided in Appendix C1 and C2 of this submissions report.

B12.12 Non-Aboriginal heritage

B12.12.1 Impacts to Clive Park and Tidal Pool at Northbridge

Issue raised

Pages 67, 69 and 70

Willoughby City Council raises concern about potential impacts on the Clive Park and Tidal Pool, Northbridge heritage item, given proximity to the western cofferdam (Middle Harbour south cofferdam (BL7)). The environmental management measures as detailed in Table 14-5 of the environmental impact statement should be included as conditions in any approval to ensure impacts are avoided or at least minimised.

Response

Consideration of heritage during design development

During design development, opportunities to avoid temporary and permanent impact to heritage items have been considered alongside other design considerations including:

- Avoidance of direct impact by design
- Reduction in the footprint or scale of project components
- Mitigation in the potential scale of impact through the selection of construction methodologies.

Specifically, throughout design development and refinement, the project's alignment and associated required infrastructure have been modified where possible to avoid or reduce the impact to identified heritage sites. In summary this includes:

- Most of the project would be constructed and located underground, avoiding direct impacts through the subsurface tunnelling of the project
- The construction methodology for the project has been selected to avoid direct impacts on heritage items in Clive Park and its immediate foreshore including Clive Park Tidal pool
- The construction methodology includes cofferdams to allow the construction of the interface structures to be offshore, so as to avoid direct impact on foreshore heritage items including Harbour Foreshore at Seaforth and nearshore sensitive marine habitats.

Chapter 4 (Project development and alternatives) of the environmental impact statement provides a detailed analysis of the alternatives that were considered as part of the project development process and explains the selection of the preferred alternative. Selection of the preferred corridor required consideration of various technical, environmental and community factors including heritage.

Non-Aboriginal heritage items at Clive Park

All environmental management measures outlined in Table D2-1 of this submissions report would be implemented to avoid, minimise or manage potential non-Aboriginal heritage impacts as a result of the project and would be incorporated into management plans for the project, including the construction environmental management plan (refer to Part D of this submissions report).

Clive Park is a site with both terrestrial and maritime heritage elements. The heritage item Clive Park and Tidal Pool is listed as having local heritage significance under the *Willoughby Local Environmental Plan 2012*.

The construction methodology for the project has been selected to avoid direct impacts to Clive Park and its immediate foreshore, as stated above and also outlined in Section 14.4.2 of the environmental impact statement. There is potential for the site to be physically impacted from anchoring by construction related vessels, as identified in Table 14-3 of the environmental impact statement. However, this is unlikely as the area will be marked as a restricted zone, as required by environmental management measures NAH3 and NAH11 (refer to Table D2-1 of this submissions report). The Clive Park Tidal pool would also be separated from the adjacent works area with a shallow floating silt curtain preventing direct entry to the tidal pool area.

Indirect impacts would potentially occur due to vibration, settlement and temporary changes to the visual setting of the item. Vibration impacts will be managed through the establishment of minimum buffer distances to achieve screening levels. Where vibration levels are predicted to exceed screening levels, a more detailed assessment of the impacted structure will be carried out as described in environmental management measure CVN7 (refer to Table D2-1 of this submissions report). For heritage items, this assessment will specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed. In addition, pre-construction building structure condition surveys will be carried out in accordance with environmental management measure SG7 (refer to Table D2-1 of this submissions report). Any building and/or structure damage caused by the project will be repaired by the project.

With the implementation of the non-Aboriginal heritage environmental management measures and other measures relating to other disciplines for example construction vibration and water quality (refer to Table D2-1 of this submissions report), the level of impact on the heritage item has been assessed as being minor.

B12.12.2 Impacts to Naremburn Central Township and Walter Burley Griffin Incinerator

Issue raised

Pages 67, 68, 69, 70 and 71

Willoughby City Council note that the southern leg of the tunnel would pass directly beneath the Naremburn Central Township (Conservation area). Naremburn is a conservation area with historical significance. Given the age of buildings and existing ground movement, residents already invest heavily in maintenance to preserve the character of the area. Council raises concern that construction traffic (particularly heavy truck movements) and works would cause damage to buildings in the Naremburn Central Township (Conservation Area) and consequently risk health and safety. The risk of impacts labelled as ‘Negligible’ is questioned.

The western leg of the tunnel would pass very close to the Walter Burley Griffin Incinerator heritage item. The risk of impacts labelled as ‘Negligible’ is questioned. Council notes that while the depth of the tunnel at this location would be approximately 39 metres, there may still be a potential for impacts in terms of noise, vibration and settlement from tunnelling works.

Response

Transport for NSW is committed to preserving heritage items along the project corridor and minimising project impacts.

The non-Aboriginal heritage assessment is included in Chapter 14 of the environmental impact statement, Appendix J (Technical working paper: Non-Aboriginal heritage) and Appendix K (Technical working paper: Maritime heritage).

The methodology adopted for the assessment of non-Aboriginal heritage is outlined in Section 2 of Appendix J (Technical working paper: Non-Aboriginal heritage) and Section 2 of Appendix K (Technical working paper: Maritime heritage). The assessment was carried out to meet the Secretary's environmental assessment requirements and in accordance with relevant guidelines and current industry best management practice. The assessment has been carried out by experienced, qualified heritage specialists and is considered to be a robust assessment of potential project impacts on non-Aboriginal heritage.

The potential for vibration impacts at Naremburn Central Township (Conservation Area) and Walter Burley Griffin Incinerator is assessed in Table 14-3 of the environmental impact statement. Walter Burley Griffin Incinerator is located at 2 Small Street, Willoughby, and is in the vicinity of tunnelling work for the ramp tunnel connection to the Gore Hill Freeway. Maps identifying heritage items and the minimum working distances for vibration from mainline and ramp tunnelling and surface works are provided in Annexures K and L respectively of Appendix G (Technical working paper: Noise and vibration). On this mapping, both items have been identified as being outside of minimum working distances for vibration from mainline and ramp tunnelling and surface works. Both items have been assessed as having potential for temporary vibration impacts due to construction activities and very slight permanent settlement and ground movement impacts caused by tunnel excavation, as described in Table 14-3 of the environmental impact statement. However, the level of impact on these heritage items was assessed as being negligible with the implementation of the environmental management measures proposed in Table D2-1 of this submissions report.

Vibration generating activities will be managed through the establishment of minimum working distances to achieve vibration screening levels, as required by environmental management measure CNV7 (refer to Table D2-1 of this submissions report). Where vibration levels are predicted to exceed the screening levels, a more detailed assessment of the impacted structure will be carried out. For heritage items, this will specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.

Building condition surveys will be prepared for properties (and heritage assets) where the project has the potential to cause cosmetic or structural damage prior to the commencement of construction, as per revised environmental management measure SG7 (refer to Table D2-1 of this submissions report). For most structures, vibration levels would generally be below levels that may cause potential damage. Within three months of the completion of construction, a post-construction survey will then be offered to property owners of buildings where a pre-construction survey was carried out. Any damage caused by the project will be rectified.

An Independent Property Impact Assessment Panel comprising geotechnical and engineering experts will be established prior to the commencement of works to independently verify building condition survey reports, resolve any property damage disputes relating to construction and establish ongoing settlement and vibration monitoring requirements, in accordance with environmental management measure SG5 (refer to Table D2-1 of this submissions report).

B12.12.3 Requested non-Aboriginal heritage conditions of approval

Issue raised

Pages 66, 71 and 72

In relation to non-Aboriginal heritage, Willoughby City Council refers to notable and significant community concern regarding other Sydney tunnelling projects in terms of vibration and damage to non-Aboriginal heritage items caused by construction works. Council requests that Transport for NSW and future contractors be required to review the issues that cause significant concern on other major projects, and apply the lessons learned to ensure the best outcomes for all potentially affected residents and businesses.

Council recommends that conditions of approval include the implementation of the environmental management measures in Table 14-5 of Chapter 14 (Non-Aboriginal heritage) of the environmental impact statement. In particular, Council recommends that:

- Council and the local community are to be consulted in the design of heritage protection and interpretation measures
- Appropriate conditions relating to noise and vibration are included to ensure impacts are mitigated for all heritage conservation areas and items in the Willoughby local government area as identified in Chapter 14 (Non-Aboriginal heritage) of the environmental impact statement
- Council's Heritage Officer is to receive a copy of the Maritime Heritage Management Plan for the maritime heritage sites and copy of archival recordings proposed of the unlisted maritime heritage sites as identified in Table 14-5 of the environmental impact statement
- Council's Heritage Officer is to receive copies of the photographic archival of the listed item, Clive Park Tidal Pool, as well as dilapidation reports for the Incinerator and to have dilapidation reporting available for concerned residents within the Naremburn Central Township Conservation Area.

Council notes that there are several unlisted maritime heritage items included in the environmental impact statement, including:

- Clive Park Unidentified Shipwreck No.1
- Middle Harbour Unidentified Shipwreck No. 1
- Pearl Bay Unidentified No. 1 Shipwreck

Council considers that the environmental management measures for these items, as listed in Table 14-5 of the environmental impact statement, are expected and reasonable, and should be included as conditions in any approval issued.

Response

Transport for NSW is committed to preserving heritage items along the project corridor and minimising project impacts.

Transport for NSW would seek a construction contractor/s experienced in tunnelling projects with appropriate environmental performance credentials as part of its tendering process.

All environmental management measures outlined in Table D2-1 of this submissions report will be implemented to avoid, minimise or manage potential non-Aboriginal heritage impacts as a result of the project and would be incorporated into management plans for the project, including the construction environmental management plan (refer to Part D of this submissions report).

As discussed in Section B12.11.1, the proposed construction methodology and environmental management measures (refer to Table D2-1 of this submissions report) for the project have both been informed by lessons learnt from other major projects constructed in Sydney, NSW and Australia and Transport for NSW would continue to review the methodology and mitigation in light of future lessons learnt.

Consultation would continue to be carried out with Willoughby City Council throughout further design development in accordance with the community communication strategy outlined in Appendix E (Community consultation framework) and discussed in Section B12.5.3 of this submissions report. The community communication strategy would define the mechanisms for the provision of information and/or responding to requests for information from Council. The project team would also work closely with sensitive receivers and vulnerable community members to tailor the approach to best suit individual needs and minimise impacts wherever possible.

As part of the project urban design and landscape plan, a non-Aboriginal heritage interpretation strategy will be developed for the project (refer environmental management measure NAH1 in Table D2-1 of this submissions report). Non-Aboriginal heritage interpretation will be incorporated into the project urban design and landscape plan in accordance with the interpretation strategy. In accordance with environmental management measure V1 (refer to Table D2-1 of this submissions report), the urban design and landscape plan will be made available to the public (including councils and agencies) for feedback.

Information on the requirement for building condition surveys is provided in Section B12.12.2 above and included in environmental management measures SG12 (refer to Table D2-1 of this submissions report).

The Maritime Heritage Management Plan and copies of relevant proposed archival recordings that would be provided to relevant councils as appropriate.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.13 Aboriginal cultural heritage

Issue raised

Pages 72, 73 and 74

Willoughby City Council acknowledges that they have limited expertise in assessing Aboriginal heritage and suggests that the Metropolitan Local Aboriginal Land Council should be consulted to ensure that the impacts described in the environmental impact statement have been properly assessed.

Council details a range of recommended construction phase conditions of approval relating to potential impacts to Aboriginal cultural heritage sites, including specific pre-construction investigations and ongoing monitoring and reporting requirements, communication with the Maritime Working Group and detailed construction planning requirements to avoid potential impacts to Aboriginal heritage items in the Clive Park area.

Willoughby City Council has particular concerns regarding any potential need for blasting in the Clive Park area and potential impacts on Aboriginal heritage sites at Clive Park including caves, shelters and rock carvings within 50 metres of Middle Harbour South cofferdam (BL7).

Response

Consideration of heritage in the design process

As stated in Section B12.12.1, opportunities to avoid temporary and permanent impact to heritage items have been considered during design development.

Throughout design development and refinement, the project's alignment and associated required infrastructure have been modified where possible to avoid or reduce the impact to identified Aboriginal heritage sites, particularly those of high significance (refer to Chapter 4 (Project development and alternatives) of the environmental impact statement). In summary this includes:

- Most of the project would be constructed and located underground, avoiding direct impacts through the subsurface tunnelling of the project
- The construction methodology for the project has been selected to avoid direct impacts on Clive Park and its immediate foreshore
- At the Wakehurst Parkway, project work has been contained within the existing road reserve
- The project has avoided the following potential archaeological deposits identified in the archaeological survey:
  - Artarmon Park potential archaeological deposit (PAD) (45-6-3362)
  - Flat Rock Creek PAD (45-6-3361)
  - Burnt Bridge Creek PAD (45-6-3363)
- Chapter 4 (Project development and alternatives) of the environmental impact statement provides a detailed analysis of the alternatives that were considered as part of the project development process and explains the selection of the preferred alternative. Selection of the preferred corridor required consideration of various technical, environmental and community factors including heritage.

All recorded Aboriginal heritage sites within the study area have been considered in relation to the proposed construction and operation of the project, and wherever possible, Transport for NSW has sought to avoid and reduce impacts to Aboriginal cultural heritage sites (refer Section 8.1 of Appendix L (Technical working paper: Aboriginal cultural heritage assessment report)).

Aboriginal cultural heritage assessment report and consultation with the Metropolitan Local Aboriginal Land Council

Transport for NSW is committed to preserving Aboriginal cultural heritage items along the project corridor and minimising project impacts.

The Aboriginal cultural heritage assessment for the environmental impact statement is included in Appendix L (Technical working paper: Aboriginal cultural heritage assessment report). The assessment was carried out in accordance with the Secretary's environmental assessment requirements and the *Procedure for Aboriginal and Cultural Heritage Consultation and Investigation* (Roads and Maritime Services, 2011a), which is consistent with and gives effect to the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010b). The *Procedure for Aboriginal and Cultural Heritage Consultation and Investigation* (PACHCI) outlines a four stage process for investigating potential impacts on Aboriginal cultural heritage, and includes consultation with Aboriginal people that hold cultural knowledge relevant to the study area at relevant stages of the PACHCI process.

In addition, the assessment has been carried out by experienced, qualified Aboriginal cultural heritage specialists, as detailed in Section 1.9 of Appendix L (Technical working paper: Aboriginal cultural heritage assessment report). Please note that Section A5.1.10 of this submissions report includes a minor update on the authorship of this report.

An overview of the assessment methodology and application of the PACHCI's stages of assessment to the project is provided in Section 15.2 of the environmental impact statement, with further detail provided in Appendix L (Technical working paper: Aboriginal cultural heritage assessment report). All areas within 300 metres of the project's construction footprint were considered in the Aboriginal cultural heritage assessment. As project refinements were made during the Stage 3 PACHCI process, this search area was refined to 50 metres. Site surveys were carried out in May, June and August 2017 by a qualified archaeologist accompanied by a representative of the Metropolitan Local Aboriginal Land Council. Aboriginal site officers were also engaged for archaeological field inspections in January 2018. Additional assessments were carried out with nominated site officers representing the Metropolitan Local Aboriginal Land Council in August 2018, February and September 2020 and May 2021.

Registered Aboriginal Parties were identified in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010a) and invited to an Aboriginal focus group (AFG) meeting on the project, held on 28 September 2017. A second AFG was held on 3 November 2020. Through these meetings, Registered Aboriginal Parties have been provided an opportunity to review site surveys and the assessment methodology. Further detail on Aboriginal stakeholder consultation for the project are provided in Section 3 of Appendix L (Technical working paper: Aboriginal cultural heritage assessment report).

Before the second AFG meeting held on 3 November 2020, the draft Aboriginal cultural heritage assessment report was issued to the Registered Aboriginal Parties for review and comment, allowing for the minimum statutory response time of 28 days. At the end of the review and comment period, multiple Registered Aboriginal Parties had expressed support for the level of assessment and environmental management measures proposed.

Further consultation with the Metropolitan Local Aboriginal Land Council will be carried out as required by the environmental management measures included in Table D2-1 of this submissions report.

Clive Park

Transport for NSW is committed to incorporating all proposed environmental management measures to avoid and minimise potential impacts to sites of Aboriginal cultural heritage (refer to Table D2-1 of this submissions report).

As discussed above, throughout design development and refinement, the project has been modified where possible to avoid or reduce the impact to identified Aboriginal heritage sites, particularly those of high significance. In particular, the location of temporary construction support sites has been selected to avoid direct impacts to Aboriginal heritage sites and areas of high archaeological potential identified in Appendix K (Technical working paper: Maritime heritage) and Appendix L (Technical working paper: Aboriginal cultural heritage assessment report). Most of the project would be constructed and located underground, avoiding direct impacts to Aboriginal heritage sites through the subsurface tunnelling of the project. In addition, the construction methodology for the project has been selected to avoid direct impacts on Clive Park and its immediate foreshore.

It should be noted that as a result of issues raised by the Aboriginal Heritage Office in the Northern Beaches Council submission (refer Section B11.14 of this submissions report), a new search of the Aboriginal Heritage Information Management System (AHIMS) register was carried in February

2021 to confirm site locations for Aboriginal cultural heritage sites along the project alignment. The results of this new search, additional site inspections and an updated impact assessment is included in Appendix A of this submissions report.

An assessment of potential impacts to known Aboriginal cultural heritage sites at Clive Park is included in updated Table 15-7 in Appendix A of this submissions report. Four Aboriginal cultural sites have been identified at Clive Park within the study area including AHIMS sites 45-6-3012 (Clive Park 8, Shelter and Midden), 45-6-0654 (Clive Park 1; Northbridge), 45-6-0271 (Clive Park, Northbridge) and 45-6-0996 (Clive Park 2; Taplin's Cicada Pupa Cave). Site 45-6-2111 (Clive Park 3, Northbridge) is situated just outside the study area but has still been assessed. These Aboriginal cultural heritage sites include rock shelters, artefact scatter, middens and art. There would be no direct impacts to any of these sites as a result of the project. Indirect impacts have all been assessed as negligible with the exception of minor indirect settlement impacts at site 45-6-0654 (Clive Park 1; Northbridge), due to the large rock overhang and high significance of this site.

With implementation of the Aboriginal heritage environmental management measures included in Table D2-1 of this submissions report potential impacts on Aboriginal heritage during construction will be minimised. A number of sub-plans of the construction environmental management plan would be prepared, including a heritage management plan, as outlined in Section 28.5.1 of the environmental impact statement. The heritage management plan would be developed in consultation with relevant stakeholders in accordance with the community communication strategy outlined in Appendix E (Community consultation framework) of the environmental impact statement and any relevant conditions of approval.

Conditions of approval

As stated above, Transport for NSW is committed to incorporating all proposed environmental management measures to avoid and minimise potential impacts to Aboriginal cultural heritage sites (refer to Table D2-1 of this submissions report). These measures are considered to be appropriate to address the concerns raised by Willoughby City Council in their submission.

Willoughby City Council's request for a Maritime Working Group, including Aboriginal representatives, is addressed in Section B12.5.4 of this submissions report.

Requests for conditions of approval from Willoughby City Council are noted. Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

Controlled blasting

Underground controlled blasting may be used for discrete elements of subsurface excavation for the project. Where blasting is proposed during construction planning, potential overpressure and ground vibration impacts from blasting would be managed through site and blast specific assessments. All controlled blasting would be carried out in accordance with relevant project conditions of approval. Overpressure and vibration would be predicted during blast design, which would include test blasts to establish and develop site rules and confirm appropriate blast charges and configurations to ensure the objectives and criteria identified in Australian Standard *AS 2187.2-2006 Explosives: Storage and Use – Part 2 Use of Explosives* (Standards Australia, 2006) are achieved. All blasting and associated activities would be carried out in a manner that would not generate unacceptable noise and vibration impacts or pose a significant risk to nearby structures (including heritage items and structures) and sensitive receivers in accordance with the construction noise and vibration environmental management measures outlined in Table D2-1 of this submissions report, including revised environmental management measure CNV12. Prior to any blasting, all potentially affected

sensitive receivers in the vicinity will be identified and kept informed about proposed blasting activities, as also required by management measure CNV12.

B12.14 Geology, soils and groundwater

B12.14.1 Risks and management approach at Flat Rock Reserve

Issue raised

Pages 76, 77, 83 and 102

Willoughby City Council has significant concerns in relation to the disturbance of the former rubbish disposal site at the Flat Rock Drive construction support site (BL2), due to the potential for exposing contaminated materials and for contaminants to enter ground and surface water bodies. Willoughby City Council recommends that a Phase 2 Contamination Study is carried out around the Flat Rock Drive construction support site (BL2) and that the study is provided to Council and the results published for further consultation with the community before project approval.

Willoughby City Council seeks conditions of approval in relation to the following:

- Landfill gas monitoring and an odour management plan are required for potential issues when the landfill is opened
- Project tunnels between Bicentennial Reserve, Flat Rock Gully and Middle Harbour are fully lined to minimise groundwater drawdown
- A Remedial Action Plan or equivalent be prepared and provided to Council that details how the waste will be removed or retained and groundwater will be managed at the Flat Rock Drive construction support site (BL2).

Willoughby City Council also seeks written confirmation from Transport for NSW that disturbance of the contaminated fill at Flat Rock Drive and construction of the wastewater treatment plant will not mean that Council is responsible for the ongoing management of contamination issues at the site under the Contaminated Land Management Act 1997.

Response

Risks from disturbance of former landfill site

The location of the proposed Flat Rock Drive construction support site (BL2) within Flat Rock Reserve has the potential to encounter contamination in soils and groundwater given the history of landfilling activities and known groundwater contamination in adjoining areas including Willoughby Leisure Centre and Bicentennial Reserve.

Transport for NSW recognises the multi-disciplinary issues and potential risks associated with the proposed use of a portion of Flat Rock Reserve for a temporary construction support site. Over five years, between 2016 and 2020, Transport for NSW investigated options for a mid-tunnel site between Naremburn and Middle Harbour and two sites were determined to be feasible. This is further discussed in Section 2 of the project preferred infrastructure report. Option A was located on the Flat Rock Baseball Diamond in Willoughby (and to a lesser extent Naremburn) on the western side of Flat Rock Drive adjacent the Willoughby Leisure Centre, the netball courts and associated car parks. The site is atop a former landfill and infilling materials could comprise historic residential, industrial and furnace waste from the on-site incinerator including the potential for large amounts of putrescible waste. Option B (Flat Rock Drive construction support site (BL2)) was located in Flat Rock Reserve in Northbridge (and to a lesser extent Naremburn). The proposed site is also atop a former landfill site, which relative to the Option A site, was more recently filled with predominantly building waste and revegetated over the past 20 years by Willoughby City Council and the

community. The site is not expected to uncover substantial amounts of historical putrescible waste at the depths of required excavation, as discussed further in Section 2 of the preferred infrastructure report.

To manage the potential risks associated with the historic use of the area, the Flat Rock Drive construction support site (BL2) has been designed to minimise depth of piling and excavations. The location of the access decline has also been chosen to minimise the amount of excavation required to reach bedrock. This reduces the potential to encounter putrescible landfill materials (if present) that could generate odour, as well as the potential for the release of landfill gases (if present).

A suite of environmental management measures have been proposed to further identify and manage potential contamination (and related) risks at the site, including the following:

- Potentially contaminated areas directly affected by the project will be further investigated and managed in accordance with the requirements of guidance endorsed under Section 105 of the *Contaminated Land Management Act 1997.* This includes, but is not limited to, further investigation in potential areas of environmental interest within the project footprint, including Flat Rock Reserve. Subject to the outcomes of the investigations, a Remediation Action Plan will be implemented in the event that site remediation is warranted. An independent NSW Environment Protection Authority Accredited Site Auditor will be engaged where contamination is complex to review applicable contamination reports and evaluate the suitability of sites for a specified use as part of the project (revised environmental management measure SG8)
- A Construction Waste Management Plan will be prepared and implemented during construction. The plan will include but not be limited to procedures for handling and storing potentially contaminated substances (environmental management measure SG12)
- The discovery of previously unidentified contaminated material will be managed in accordance with an unexpected contamination discovery procedure, as outlined in the *Guideline for the Management of Contamination* (Roads and Maritime Services, 2013) (environmental management measure SG13)
- Ground gas investigations will be carried out in Flat Rock Reserve to further assess the potential presence of landfill generated gas which could impact on the construction and/or operation of the project. Ground gas investigations will be carried out in accordance (where applicable) with the *Assessment and Management of Hazardous Ground Gases* (NSW EPA, 2020b). If ground gas risks are established, appropriate design and/or management measures will be developed and implemented to remove or reduce the associated risk (revised environmental management measure SG15)
- The groundwater monitoring program will consider additional locations for monitoring that are subject to medium and high risk of groundwater contamination during construction and operation (revised environmental management measure SG18)
- Any surplus material requiring offsite disposal to land will be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014b) (environmental management measure WM3)
- Wastes will be appropriately transported, stored and handled according to their waste classification and in a manner than prevents pollution of the surrounding environment (environmental management measure WM4)
- Further investigations will be carried out at the Flat Rock Drive construction support site (BL2) to determine the feasibility of encapsulation of contaminated materials on site. Where contaminated soils and other materials are to be encapsulated on site, encapsulation will be designed in accordance with the requirements detailed in the *Guidelines for the Assessment of On-site Containment of Contaminated Soil* (Australian and New Zealand Environment and Conservation Council (ANZECC), 1999) (environmental management measure WM9)

- Further site investigations will be carried during the detailed design and construction planning phase to determine the potential to encounter odorous gases or materials during the proposed excavations at the Flat Rock Drive construction support site (BL2). If the investigations indicate that there is potential for odorous materials to be uncovered or odorous gases to be released, the potential for off-site impacts (informed by meteorological studies and modelling as required) will be investigated. If unacceptable off-site impacts are predicted, appropriate mitigation and management measures will be identified to minimise potential impacts, with consideration of the investigation results, proposed site activities and meteorological conditions, and the identified measures will be implemented during relevant site activities. Odour monitoring will be carried out during relevant site activities and mitigation and management measures adjusted as required to minimise potential off-site impacts (revised environmental management measure AQ2)
- Any areas of exposed material at the Flat Rock Drive construction support site (BL2) that have the potential to generate odour will be kept to a minimum during site establishment works and while the area is uncovered. If odorous areas are to remain uncovered at the end of the work shift, temporary cover or other suitable measures to minimise odour emissions will be implemented (revised environmental management measure AQ4).

Further information in relation to the potential contamination risks, including for surface and groundwater contamination and the proposed management measures is provided in Section B12.14.2 and B12.14.3 of this submissions report. Refer also to Section B12.10.1 of this submissions report for more details regarding odour management.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

Measures to reduce groundwater drawdown

The maximum predicted groundwater drawdown and associated impacts are considered to be conservative because groundwater modelling was based on limited geotechnical data and conservative (worst case) assumptions that there would be continuous saturation (and hydraulic connectivity) between the tunnel and the water table and no controls on groundwater inflows to the tunnel, as noted throughout Appendix N (Technical working paper: Groundwater).

Using these assumptions, all groundwater drawdown at the tunnel would be realised at the surface. However in reality, stratification in the hydrogeological units would limit connectivity between the tunnel and the water table, which would reduce the extent of groundwater drawdown. Where the hydraulic connectivity between the tunnel and the water table is poor, the presence or absence of tunnel linings might not have a large effect on overall drawdown.

As more hydrogeological information is collected during detailed design, including site geotechnical data and groundwater levels from ongoing groundwater monitoring (environmental management measure SG1), groundwater modelling and drawdown predictions will be updated, in accordance with revised environmental management measure SG2 (refer to Table D2-1 of this submission report). Tunnel groundwater inflow predictions will also be updated prior to finalising detailed design and appropriate measures will be implemented during tunnel construction to ensure that groundwater inflows into each tunnel during the operation phase do not exceed 1L/s/km across any given kilometre in accordance with revised environmental management measure SG16 (refer to Table D2-1 of this submissions report). If refined predictions of groundwater levels and drawdown indicate that impacts would be greater than the impacts presented in the environmental impact statement, feasible and reasonable mitigation measures will be incorporated into the detailed design and implemented, in accordance with revised environmental management measure SG2 (refer to Table D2-1 of this submissions report).Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

Further contamination investigations and need for Remediation Action Plans

As indicated above, potentially contaminated areas directly affected by the project, including Flat Rock Reserve, will be further investigated and managed in accordance with guidance endorsed under Section 105 of the *Contaminated Land Management Act 1997.* Subject to the outcomes of the investigations, a Remediation Action Plan will be implemented in the event that site remediation is warranted. An independent NSW Environment Protection Authority Accredited Site Auditor will be engaged where contamination is complex to review applicable contamination reports and evaluate the suitability of sites for a specified use as part of the project (refer to revised environmental management measure SG8 in Table D2-1 of this submissions report).

Stage 2 investigations including additional boreholes to assess further for potential contamination and landfill gas, would be carried out prior to construction activities so that contamination (if present) can be adequately planned for and managed.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

Ongoing management responsibilities of Council

As outlined above, Transport for NSW have designed the Flat Rock Drive construction support site (BL2) to minimise the depth of excavation in order to minimise the potential for interaction with contaminated soils and groundwater. A suite of mitigation measures are proposed to address potential contamination risks which will be further defined and analysed prior to construction by additional site contamination investigations. Where warranted and subject to the outcomes of these investigations, a Remediation Action Plan will be implemented. An independent NSW Environment Protection Authority Accredited Site Auditor will be engaged where contamination is complex to review applicable contamination reports and evaluate the suitability of sites for a specified use as part of the project in accordance with revised environmental management measure SG8 (refer to Table D2-1 of this submissions report).

Transport for NSW intend to develop an Interface Agreement with Willoughby City Council which would provide more detail on the scope, rights and obligations for both the construction and operational phases of the project. This would include agreement regarding any ongoing site management at this location following the completion of construction and certification by the NSW Environment Protection Authority Accredited site auditor that the land is suitable for the intended purpose agreed with Council.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.14.2 Contamination of surface water and groundwater during construction at Flat Rock Reserve

Issue raised

Pages 76, 79, 80, 83, 88 and 103

Willoughby City Council note that the environmental impact statement indicates that groundwater under Bicentennial Reserve is contaminated and that it may move through and around the site if the landfill downstream is disturbed. Council requests that recent testing results at Bicentennial Reserve and Flat Rock Gully be released.

Willoughby City Council note that construction activity would require removal of the capping/topsoil and excavation of potentially contaminated material below, having an impact on site hydrology,

increasing the likelihood of contaminants polluting Flat Rock Creek and eventually Middle Harbour with follow on effects.

Willoughby City Council highlight potential contamination risks associated with construction activities around Bicentennial Reserve, Hallstrom Park and Flat Rock Reserve (all known former landfill and tip sites), noting that contaminants may become wind-borne or be carried off-site in groundwater and erosion/run-off events. Council indicates that removal of the capping/topsoil, excavation of potentially contaminated material below, and construction of a wastewater treatment plant are likely to have negative impacts on site stability and hydrology and increase the likelihood of pollution of Flat Rock Creek and eventually Middle Harbour.

Willoughby City Council seeks a condition of approval requiring Transport for NSW to provide Council with a detailed analysis and plan for impact mitigation to ensure there would be no detrimental effect on groundwater quality during both the construction and post-construction/operational phases of the project.

Willoughby City Council also requests a condition of approval requiring Transport for NSW prepare, and provide to Council, a detailed analysis and management plan (including results of further groundwater testing in the Long Bay catchment) to mitigate potential groundwater impacts focusing on Bicentennial Reserve and Flat Rock Gully. Transport for NSW should also provide containment solutions for contaminated groundwater prior to construction commencement.

Response

Request for recent testing results at Bicentennial Reserve and Flat Rock Gully

The assessment of existing contamination sources provided in Section 16.3.5 of the environmental impact statement and Appendix M (Technical working paper: Contamination) was developed using desktop methods and included a review of contaminated site investigations conducted during the course of the environmental impact statement. The reports reviewed included a contamination factual report (AECOM and Coffey 2018) and various groundwater monitoring reports by Douglas Partners and Golder Associates in 2017 and 2018 and another by AECOM and Coffey (AEC) in 2019.

As discussed earlier, Stage 2 investigations including additional boreholes to further assess potential for contamination (and landfill gas), would be carried out prior to construction activities so that contamination can be adequately planned for and managed.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

Movement of contaminants by wind, or in groundwater or site runoff

Future site investigations at Flat Rock Drive construction support site (BL2) (refer to revised environmental management measure SG8 in Table D2-1 of this submissions report) will determine whether any landfill materials or capping are present at the Flat Rock Drive construction support site (BL2) and whether the proposed access decline or other intrusive work at the site, including the wastewater treatment plant, will interact with landfill materials or contaminated groundwater. Based on these results, further site planning and design would occur in order to manage the identified issues and risks. The current construction methodology for the support site works involves raising the site to a level and minimising cut to fill operations. Excavation works are to be largely limited to the decline excavation works which will be piled on the sides and capped along the floor to minimise potential for wind exposure of deeper excavation works within the potential contaminated materials, likely mostly building rubble. A suite of mitigation measures are outlined in Section B12.15.1 to address the identified risks. The temporary wastewater treatment plant, which would be removed at

the end of construction, is not be located over either the mainline, ramp or decline tunnels and therefore, no structural damage would be expected. Discharges from the temporary wastewater treatment will meet the discharge criteria included in revised environmental management measures WQ11 (refer to Table D2-1 of this submissions report) and would also be in accordance with criteria specified in the project environment protection licence so as to maintain or improve existing water quality in the receiving water.

Potential construction phase impacts on surface water and groundwater quality are discussed in Section 16.4 of the environmental impact statement. Additional information on potential surface water quality impacts is provided in Section 17.4.3 of the environmental impact statement.

Erosion and sediment control measures will be implemented at all construction support sites and surface road upgrades in accordance with the principles and requirements in *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004), *Managing Urban Stormwater: Soils and Construction – Volume 2D Main Road Construction* (DECC, 2008) and relevant guidelines, procedures and specifications of Transport for NSW, as required by revised environmental management measure SG9 (refer to Table D2-1 of this submissions report). As part of this environmental management measure, a soil conservation specialist will be engaged for the duration of construction of the project to provide specialised advice regarding erosion and sediment control including review of erosion and sediment control plans. In addition, a freshwater quality monitoring program for the construction of the project will be developed and implemented, in accordance with environmental management measure WQ10 (refer to Table D2-1 of this submissions report). All proposed mitigation measures will be included in a site-specific soil and water management plan as part of the construction environmental management plan, as discussed in Section D1 of this submissions report.

Management of contamination risks including erosion and sedimentation, acid sulfate soils, soil salinity, areas of contamination and areas of environmental interest for contamination will be managed through the application of the proposed suite of environmental management measures (refer to Table D2-1 of this submissions report). Further information in relation to the potential contamination risks and the proposed management measures relevant to soil and groundwater contamination is provided in Section B12.14.1.

Migration of contaminated groundwater during construction and operation

The existing groundwater monitoring program for both groundwater levels and quality will be continued through construction and the requirements for operational monitoring will be identified in accordance with environmental management measure SG1 (refer to Table D2-1 of this submissions report). The groundwater monitoring program will consider additional locations for monitoring that are subject to medium and high risk of groundwater contamination during construction and operation, in accordance with revised environmental management measure SG18 (refer to Table D2-1 of this submissions report). If the groundwater quality monitoring and associated analysis identifies potential impacts to beneficial aquifer use from the migration of contaminated groundwater, the quality of groundwater tunnel inflows, or migration of potential contaminant hazards, feasible and reasonable management measures will be identified and implemented, as required by revised environmental management measure SG19 (refer to Table D2-1 of this submissions report).

If contaminated groundwater was to occur during tunnel construction, the likelihood of the contaminated groundwater migrating away from the site/tunnel is considered very low, as described in Section 16.4.6 of the environmental impact statement. This is because groundwater drawdown in these areas is predicted to be up to 21 and 22 metres respectively at Flat Rock Reserve and Willoughby Leisure Centre and Bicentennial Reserve, noting that this prediction is conservative. If

contaminants are encountered and/or mobilised from unsealed areas during construction, they would travel towards the source of the drawdown ie the tunnel. Groundwater inflows to the tunnel during construction would be collected and treated at the Flat Rock Drive construction wastewater treatment plant prior to discharge. As stated above in this response, discharges from the wastewater treatment plants would be in accordance with criteria specified in the project environment protection licence to maintain or improve existing water quality in the receiving water.

Similarly, during operation, any groundwater infiltration and road runoff in the tunnel would be collected and pumped to the Gore Hill Freeway operational wastewater treatment plant. Following treatment, the water would then be discharged into Flat Rock Creek. The Gore Hill Freeway wastewater treatment plant will be designed to treat wastewater to meet the discharge criteria outlined in revised environmental management measure WQ17 (refer to Table D2-1 of this submissions report). Opportunities to reuse treated groundwater during project operation will be considered where feasible and reasonable, as required by environmental management measure WM12 (refer to Table D2-1 of this submissions report).

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.14.3 Ground settlement and management

Issue raised

Pages 79, 80, 102, 103 and 104

Willoughby City Council notes that the geotechnical studies show limited settlement during the 10-year assessment period.

Willoughby City Council seeks conditions of approval requiring that:

- Transport for NSW provide Council with settlement predictions for all road assets, utilities, community, residential and commercial buildings within 100 metres of where groundwater drawdown is predicted to be greater than five metres
- Where more than 10 millimetres of ground settlement is predicted over time, settlement and mitigation processes are to be adjusted for the 10 millimetre perimeter trigger area
- Transport for NSW convene an Independent Property Impact Assessment Panel of geotechnical and engineering experts to independently review condition survey reports, resolve property damage disputes, and establish ongoing settlement and vibration monitoring requirements. Council requests to be invited to observe the panel to comment on risks to Council assets and property
- Transport for NSW establishes a protocol for Panel operations
- A Dilapidation Report is carried out on potentially affected properties along the tunnel route by a suitably qualified engineer, independent of Transport for NSW and project contractor/s (at the request of an affected owner and subject to access being granted). Council recommends that the Dilapidation Report is carried out, completed, and issued to property owners before construction commencement to establish a benchmark of existing conditions of buildings and structures
- Transport for NSW must, at their own cost, rectify any damage in a timely manner caused to other properties during the construction of the project
- The contracts between the NSW Government and private contractor/s are made public to provide certainty on the safeguards or legal avenues available to residents and other affected property owners to rectify any potential damage caused by tunneling for the project.

Response

Transport for NSW notes the comment from Council regarding the limited settlement predictions in the 10-year assessment period contained in the environmental impact statement.

An assessment of ground settlement induced by tunnel excavation and groundwater drawdown has been carried out for development in proximity to the tunnel and is summarised in Section 16.4.2 of the environmental impact statement. A summary of the maximum predicted surface settlement along the tunnel alignment is provided in Table 16-9 and shown in Figure 16-8 and Figure 16-9 of the environmental impact statement.

In accordance with the building and structure settlement damage classifications presented in Table 16-8 of the environmental impact statement, ground movement of between 10 to 50 millimetres would be considered 'slight', with cracks possibly visible externally with a typical width of one to five millimetres, which are easily filled.

A maximum total settlement of 85 millimetres is predicted at Flat Rock Creek Reserve. However, there are no buildings present at Flat Rock Reserve and this prediction assumes that groundwater inflows into the tunnel beneath Flat Rock Reserve are unconstrained. As stated in Section 16.5.2 of the environmental impact statement and Section 7.1 of Appendix N (Technical working paper: Groundwater), the modelling is conservative and assumes full hydraulic connectivity between the surface and the underlying geology, which may not be the case. Additional modelling and settlement predictions were completed at this location assuming measures to limit groundwater inflows into the tunnel were incorporated during construction. When the reduced tunnel inflows and groundwater drawdown were taken into account, the maximum predicted settlement reduced to 35 millimetres. This demonstrates that by reducing tunnel inflows and thereby groundwater drawdown, settlement can also be reduced.

Utility and infrastructure owners (including councils) will be consulted prior to the commencement of excavation or tunnelling works which may potentially affect their assets to identify settlement criteria and appropriate mitigation measures to ensure, where possible, that the assets will not experience exceedances of the relevant criteria, in accordance with new environmental management measure SG21 (refer to Table D2-1 of this submissions report). Detailed predictive settlement models will be developed for areas of concern to guide tunnel design and construction methodology, including the selection of options to minimise settlement where required, in accordance with environmental management measure SG4 (refer to Table D2-1 of this submissions report).

Pre-construction building structure condition surveys will be offered and prepared (where the offer is accepted by the owner) for properties (and heritage assets) within the zone of influence of tunnel settlement where the degree of severity of ground movement has been assessed as 'slight' or above or is within the minimum working distances for cosmetic and structural damage due to vibration, as required by revised environmental management measure SG7 (refer to Table D2-1 of this submissions report). The surveys will be carried out by a suitably qualified person prior to the commencement of the tunnelling and vibration intensive activities in the vicinity with the potential to affect the building or structure. Within three months of the completion of construction activities that have the potential to cause settlement or vibration-related damage to the subject surface/subsurface structure, all property owners of buildings for which a pre-construction building condition survey was carried out will be offered a second building condition survey. Where an offer is accepted, a post-construction building condition survey will be carried out by a suitably qualified person. The results of the survey will be documented in a post-construction building condition survey report for each building surveyed.

Copies of building condition survey reports will be provided to the owners of the buildings surveyed within one month of the survey being completed. Any building and/or property damage from

settlement caused by the project will be repaired at no cost to the owner and any repairs to listed heritage items required because of the settlement damage, will be carried out under the guidance of a suitably qualified and experienced heritage professional.

An Independent Property Impact Assessment Panel, comprising geotechnical and engineering experts, will be established prior to the commencement of works to independently verify building condition survey reports, resolve any property damage disputes and establish ongoing settlement monitoring requirements, as required by environmental management measure SG5 (refer to Table D2-1 of this submissions report).

Transport for NSW will support the Independent Property Impact Assessment Panel with a range of requirements including, but not limited to, the establishment of panel protocols and terms of reference, administrative and clerical support, management of governance and coordinate matters between the project and the Panel. To ensure independence, the Panel will make their determination without oversight or observation from Transport for NSW or any other parties. As such it would not be appropriate for Council to observe or make comment on Panel operations. The governance framework for the Independent Property Impact Assessment Panel would be made publicly available.

Contractor/s will be required to comply with the project's conditions of approval. Contracts between the NSW Government and private contractor/s will be publicly disclosed in accordance with the requirements of the *Government Information (Public Access) Act 2009 (NSW)*.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.15 Hydrodynamics and water quality

B12.15.1 Treatment capacity of wastewater plants

Issue raised

Pages 81, 82 and 83

Willoughby City Council raised concern regarding the treatment capacity and processes of the wastewater treatment plants at Flat Rock Drive construction support site, Punch Street construction support site and the Gore Hill Freeway operational wastewater treatment plant. Willoughby City Council is concerned that the discharge (in particular the salinity and total dissolved solids) would affect the sensitive habitat and ecosystem at Flat Rock Gully and stormwater harvesting schemes in the Flat Rock Creek stormwater system used by Council to irrigate ovals and parks.

Willoughby City Council seeks conditions of approval requiring that water discharged from any site at any time must have total dissolved solids or salinity below 500 milligrams per litre and total suspended solids below 50 milligrams per litre. Where discharge from the Gore Hill Freeway/Punch Street wastewater treatment plant exceeds these limits, an alternative discharge point into Flat Rock Channel downstream of Fleming Park stormwater harvest scheme offtake should instead be used.

Response

The wastewater collection and treatment systems proposed for the project, including the construction wastewater treatment plants at the Flat Rock Drive (BL2) and Punch Street (BL3) construction support sites, and the operational wastewater treatment plant at Gore Hill Freeway, are described in Chapter 5 (Project description) and Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement. Indicative construction wastewater treatment discharges and approximate duration of operation of the treatment plants are presented in Table 17-15 of the

environmental impact statement. Construction wastewater treatment plants and discharge locations are shown in Figure 17-7 of the environmental impact statement.

The construction wastewater treatment plants including those at Flat Rock Drive (BL2) and Punch Street (BL3) construction support sites, will be required to treat wastewater generated from tunnelling activities to a standard suitable for discharge based on the ANZG (2018) and Australia and New Zealand Environment and Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ, 2000) guidelines in accordance with revised environmental management measure WQ11 (refer to Table D2-1 of this submissions report). Revised environmental management measure WQ11 outlines that construction wastewater treatment plants will meet the ANZG (2018) 90 per cent species protection levels for toxicants generally, with the exception of those toxicants known to bioaccumulate, which will be treated to meet the ANZG (2018) 95 per cent species protection levels. The criteria committed to for the project is considered appropriate for waterways that are influenced by urban areas and is consistent with recent project approvals for major road projects including the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Sydney Gateway project.

The project would comply with all relevant discharge requirements as detailed in the environment protection licence that would be issued for the project, the conditions of approval issued by the Department of Planning, Industry and Environment, and the revised environmental management measures included in Table D2-1 of this submissions report. A freshwater quality monitoring program for the construction of the project will be developed and implemented, in accordance with environmental management measure WQ10 (refer to Table D2-1 of this submissions report).

In addition to the appropriate treatment of wastewater from tunnelling activities, the project would also treat wastewater from tunnelling activities and implement standard erosion and sediment control measures for all construction sites and temporary construction support sites, as discussed in Section 17.4.3 of the environmental impact statement.

With the implementation of these standard, environmental management measures, potential pollutant loading to the receiving waterways is considered to be low compared to the existing pollutant loading from Willoughby Creek, Flat Rock Creek, Burnt Bridge Creek, Manly Creek and Trefoil Creek catchments. As a consequence, project construction is likely to have a negligible influence on whether the NSW water quality objectives of receiving waters are protected (if currently met) or achieved (if currently not met).

The Gore Hill Freeway operational wastewater treatment plant will be designed to treat wastewater generated from tunnel groundwater ingress and rainfall runoff in tunnel portals and the discharge requirements detailed in revised environmental management measure WQ17 (refer to Table D2-1 of this submissions report). Spill controls and water quality monitoring would be implemented to identify and manage operational impacts on ambient water quality within the receiving waterways, as described in Section 17.5.7 of the environmental impact statement. Operational phase monitoring of surface water quality of sensitive receiving environments will be described in the operational surface water quality monitoring program and carried out in accordance with environmental management measure WQ18 (refer to Table D2-1 of this submissions report).

Runoff from the Gore Hill Freeway Connection, surface connections at Balgowlah and the realigned and upgraded Wakehurst Parkway is predicted to meet or improve the existing water quality of receiving waters (Flat Rock Creek, Burnt Bridge Creek, Manly Dam, Manly Creek or Bantry Bay), as discussed in Section 17.5.3 of the environmental impact statement,. The overall impacts to ambient water quality are likely to be negligible. The project is considered to have a negligible influence on goals to achieve the NSW water quality objectives.

Water quality monitoring of all water treatment plant inflows and outflows would occur to ensure that proposed discharge criteria are being met and that the installed treatment technologies are appropriate and performing adequately.

The potential impacts to aquatic biodiversity as a result of changes to water quality during construction and operation are discussed in Section 19.5.3 of the environmental impact statement. With the implementation of appropriate environmental management measures (refer to Table D2-1 of this submission report), the likelihood of impacts to aquatic biodiversity as a result of the project would be low.

Transport for NSW intends to develop an Interface Agreement with Willoughby City Council which would provide more detail on the scope, rights and obligations for both the construction and operational phases of the project. Transport for NSW would continue to work with Willoughby City Council regarding the viability of accessing water from the Beaches Link wastewater treatment plant at Artarmon during detailed design. The Interface Agreement would include any applicable arrangements associated with Willoughby City Council's stormwater harvesting schemes in Flat Rock Creek.

B12.15.2 Stormwater capture and re-use

Issue raised

Pages 87, 88 and 89

Willoughby City Council seeks conditions of approval requiring:

- Transport for NSW provide Council with detailed analysis and a plan for impact mitigation to ensure that the project would not have a detrimental effect on waterways and catchments during construction and operation
- Dewatering of the project's Artarmon Park construction area is via an overland flow path to avoid Council's stormwater offtake at Artarmon Reserve
- Council be consulted during further design development as it relates to potential impacts to Council's existing and proposed stormwater harvesting initiatives at Flat Rock Creek, which Council requests are considered in further design development of the project
- If Council's stormwater harvesting systems are affected by poor water quality due to the project, Council seeks compensation from Transport for NSW
- Council receives details on any new drainage lines, proposed connections to major systems and details on any water reuse or treatment device details post-construction, including the frequency of proposed maintenance of such devices and their connection point to the catchment.

Response

The potential impacts to waterways during construction and operation of the project are detailed in Chapter 16 (Geology, soils and groundwater) and Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement. To address potential impacts, various environmental management measures are proposed to manage potential scour, erosion and water quality impacts during the construction and operation of the project, as detailed in Table D2-1 of this submissions report.

Transport for NSW will continue to engage with Willoughby City Council throughout further design development and construction of the project, as relevant, in accordance with the community consultation framework provided in Appendix E (Community consultation framework) and as required by environmental management measure SE3 (refer to Table D2-1 of this submissions report).

Transport for NSW acknowledges Willoughby City Council's concerns regarding the dewatering of Artarmon Park. Any dewatering activities will be carried out in accordance with the *Technical Guideline: Environmental Management of Construction Site Dewatering* (Roads and Traffic Authority (RTA), 2011b), in a manner that prevents pollution of waters as required by environmental management measure B8 (refer to Table D2-1 of this submissions report).

In addition, as outlined in Part D of this submissions report, a soil and water management plan will be prepared for the project as part of the construction environmental management plan. This will include, but not be limited to, a dewatering plan which would detail controlled outlets for any discharges.

As discussed above, Transport for NSW would continue to work with Willoughby City Council regarding the viability of accessing water from the Beaches Link wastewater treatment plant at Artarmon.

Transport for NSW intends to develop an Interface Agreement with Willoughby City Council which would provide more detail on the scope, rights and obligations for both the construction and operational phases of the project. This would include agreement, as required, regarding the stormwater harvesting scheme, details of drainage lines and connections, as well as post-construction maintenance requirements.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.15.3 Managing scouring risk at Flat Rock Creek

Issue raised

Pages 78, 79, 87 and 88

Damage to the Flat Rock Creek culvert would cause major scour of fill material and spread pollutants to the lower catchment and the harbour. Council recommends that a condition of approval requires Transport for NSW to provide Council with a detailed analysis and plan for impact mitigation to ensure there would be no detrimental effect on waterways and catchments during both the construction and post-construction/operational phases of the project.

Response

During construction, the drainage and adjustment works associated with an existing aboveground constructed surface open channel within Flat Rock Reserve will be staged to ensure creek flows and velocities are not substantially changed and to avoid downstream erosion and bed and bank stability impacts, in accordance with revised environmental management measure WQ13. The potential for scour and erosion of watercourse bed and banks will be considered during the design of new discharge outlets, in accordance with environmental management measure WQ8 (refer to Table D2-1 of this submissions report).

In relation to impacts to waterways, various environmental management measures are proposed to manage impacts from scour, erosion and a potential reduction in water quality during the construction of the project. These include the following:

- Erosion and sediment control measures will be implemented at all construction support sites and surface road upgrades in accordance with the principles and requirements in *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004), *Managing Urban Stormwater: Soils and Construction – Volume 2D Main Road Construction* (DECC, 2008) and relevant guidelines, procedures and specifications of Transport for NSW. A soil conservation specialist will be engaged for the duration of construction of the project to provide advice

regarding erosion and sediment control including review of erosion and sediment control plans (revised environmental management measure SG9)

- Construction work activities within or next to the watercourses and drainage lines will be minimised as much as reasonably practical to minimise disturbance of sediments in or near the waterway (part of environmental management measure WQ8)
- Disturbed floodplain environments next to the watercourses and/or along overland drainage lines will be stabilised as soon as practical following disturbance (revised environmental management measure WQ15).

As described in this submissions report, environmental management measure F4 has also been revised to make clear that scour countermeasures will also be provided at the outlet of new or upgraded transverse and longitudinal drainage lines, as well as in other areas where the project would otherwise result in unacceptable increases in scour potential (refer to Table D2-1 of this submissions report).

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.15.4 Requested conditions of approval – Flat Rock Drive construction support site

Issue raised

Page 81

Willoughby City Council seeks conditions of approval requiring that:

- Wastewater from the Flat Rock Drive construction support site (BL2) is discharged overland in the existing channel and that channel is restored and retained after the site use is completed
- A company independent to the construction contractor or their sub-contractors conduct water quality testing for the project and make the raw data available to Council.

Response

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project. Notwithstanding, Transport for NSW have responded to the various issues raised below.

Overland discharge of wastewater during construction

Flat Rock Drive construction support site (BL2) is located adjacent to an unnamed constructed surface open channel bordering the eastern side of the support site. Flat Rock Creek is located within a box culvert in this area.

The construction wastewater treatment plant at Flat Rock Drive (BL2) construction support site would discharge into Flat Rock Creek via the local stormwater system (refer to Table 17-15 of the environmental impact statement). Discharges from wastewater treatment plants during the construction phase will be required to meet the discharge criteria specified in revised environmental management measure WQ11 (refer to Table D2-1 of this submissions report).

Construction wastewater treatment plant discharges into Flat Rock Creek are not expected to change the form of the creek channel and banks as Flat Rock Creek is able to handle greater flows during frequent flood events, as discussed in Section 17.4.4 of the environmental impact statement. Due to establishment of the Flat Rock Drive construction support site (BL2), there would be a need to carry out box culvert drainage works associated with the existing constructed surface open channel to the east of the support site, as described in Section 6.5.4 of the environmental impact statement. This would include construction of a multicell box culvert. It would therefore not be

appropriate to discharge overland into the existing drainage line as water is best diverted away from this area where possible. The drainage line would be restored and retained after the site works are completed. Final restoration works including drainage lines will be subject to agreed final land use and extent and design of associated revegetation works.

Independent water quality monitoring contractor

A freshwater quality monitoring program for the construction of the project will be developed and implemented with consideration of the freshwater monitoring being carried out for the Western Harbour Tunnel and Warringah Freeway Upgrade project and the completed Northern Beaches Hospital road upgrade project, as required by environmental management measure WQ10 (refer to Table D-1 of this submissions report). The program will be developed in consultation with the Environment Protection Authority, Department of Planning, Industry and Environment (Natural Resources Access Regulator), Department of Planning, Industry and Environment (Water), and relevant councils.

The monitoring will be carried out in line with the approved program.

B12.15.5 Peer-reviewed literature

Issue raised

Page 84

In relation to dredging within Middle Harbour, to ensure a robust evidence-based assessment it is important that peer-reviewed scientific literature is considered alongside field-collected data from the environmental impact statement. This literature also provides an independent source of information for evaluation.

Council requests a condition approval for a comprehensive literature review to ensure accurate assessment of potential impacts.

Response

A description of the existing marine environment at Middle Harbour is provided in Appendix P (Technical working paper: Hydrodynamic and dredge plume modelling), Appendix Q (Technical working paper: Marine water quality) and Appendix T (Technical working paper: Marine ecology).

These technical working papers were prepared by independent specialists and were carried out to meet the requirements of the Secretary's environmental assessment requirements and in accordance with relevant guidelines and current industry best management practice. The assessments have been carried out by experienced, qualified specialists and are considered to be an appropriate assessment of potential project impacts.

An overview of the existing environment including marine ecology at Middle Harbour is described in Section 3 of Appendix T (Technical working paper: Marine ecology) and is based on information drawn from a number of sources including studies carried out by the Sydney Institute of Marine Science and articles published in scientific journals such as *Australian Zoologist*, *Marine and Freshwater Research* and *Estuarine, Coastal and Shelf Science*. All scientific and other material referenced in the description of existing marine ecology is included in a reference list in Section 8 of Appendix T (Technical working paper: Marine ecology).

An overview of the existing environment including water quality at Middle Harbour is described in Section 3 of Appendix Q (Technical working paper: Marine water quality). Historical water quality assessments of Middle Harbour and Sydney Harbour relevant to the project are listed in Table 2-1 of Appendix Q (Technical working paper: Marine water quality) and these were used to develop an

understanding of the natural variability in water quality at Middle Harbour. All scientific and other material referenced in the description of existing water quality is included in a reference list in Section 7 of Appendix Q (Technical working paper: Marine water quality).

The existing hydrodynamic environment at Middle Harbour is described in Section 3 of Appendix P (Technical working paper: Hydrodynamic and dredge plume modelling). The assessment of hydrodynamic impacts within Appendix P (Technical working paper: Hydrodynamic and dredge plume modelling) details the findings of numerical modelling to better understand the potential impact of construction activities and operation. To inform the assessment, available historical data has been reviewed and additional project specific data has been collected and used to inform a description of the existing environment. The project specific hydrodynamic data was then used to calibrate a three-dimensional (3D) hydrodynamic model that was used to assess potential hydrodynamic and water quality impacts as a result of the project. Where necessary, scientific literature has been used to inform the assessment of potential impacts. This is further discussed in Section 2 (Available data) and Section 3 (Description of existing environment) of Appendix P (Technical working paper: Hydrodynamic and dredge plume modelling). All scientific and other material referenced is included in a reference list in Section 9 of Appendix P (Technical working paper: Hydrodynamic and dredge plume modelling).

The literature reviews carried out to describe existing marine ecology, water quality and hydrodynamics at Middle Harbour have appropriately drawn upon information contained in a wide range of historical scientific studies to provide an accurate and detailed description of the existing environment from which to assess the potential impacts of the project.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.15.6 Middle Harbour construction support sites (BL7 and BL8) and potential marine impacts

Issue raised

Pages 78, 83, 84, 85 and 86

Willoughby City Council notes that construction activities in Middle Harbour would include extensive excavation, dredging and shoreline/water-based movement and activity causing water turbidity with potential to significantly affect marine life and existing tidal/water flow of Middle Harbour. Council has concerns that the dredging impacts at Middle Harbour would potentially release plumes of sediments which may be contaminated due to prior marine industries and the secondary effects of the resuspension of sediments within the shifting tides may have consequences upon the marine ecology, Northbridge Baths and recreational activities at Middle Harbour due to the turbidity of the water. Willoughby City Council is also concerned that the work associated with the construction of the harbour crossing would have the potential to deposit toxins and heavy contaminants as siltation upon the foreshore areas and regenerating fauna and flora in the area.

Willoughby City Council seeks a condition of approval requiring that Transport for NSW provide Council with a detailed analysis and plan for impact mitigation that identifies there would be no detrimental effect on the catchment (either long term or short term) due to the establishment, operation and decommissioning/rehabilitation of the Middle Harbour construction sites. Willoughby City Council request to receive detailed safety and environmental management plans for consideration and input.

Willoughby City Council details a number of recommended construction phase conditions of approval relating to contamination at the Middle Harbour construction sites, including the Middle

Harbour cofferdam construction support sites (BL7 and BL8) and dredging works associated with the construction of the harbour crossing. This includes conditions of approval regarding specific pre-construction investigations and ongoing monitoring and reporting requirements (including to the Maritime Working Group), as well as trigger levels for human and aquatic life exposure to contamination. Council also recommended conditions of approval regarding detailed construction planning requirements, construction methodology and mitigation measures to avoid potential impacts to water quality.

Response

Dredging of the bed of the harbour is needed to create a partially trenched foundation for the installation of the immersed tube tunnels. The potential impacts to marine water quality and marine biodiversity are outlined in Section 17.4.2 and Section 19.5.5 respectively of the environmental impact statement. The type of dredging method to be used would depend on the material being dredged as detailed in Table 6-4 of the environmental impact statement.

The proposed dredging methodology for the project (refer to Section 6.4.4 of the environmental impact statement) comprises a variety of measures, including the use of three types of silt curtains. The proposed silt curtains include two deep draft (10-12 metre) silt curtains (one on either side of the immersed tube tunnel crossing) around the dredging activities, a floating silt curtain enclosure (referred to as a 'moon pool') that will be directly attached to the dredge, and shallow (2-3 metre) silt curtains that will be installed around ecologically sensitive areas (eg seagrass and rocky reef habitat) along the shoreline. These silt curtains provide three layers of protection from the dredging works.

Impacts on marine water quality, vegetation and habitats will be minimised during dredging activities in accordance with environmental management measure WQ16 (refer to Table D2-1 of this submissions report), which requires:

- Use of a backhoe dredge with a closed environmental clamshell bucket operated within a localised floating silt curtain enclosure to a depth of two to three metres to dredge the top layer of marine sediments
- Implementation of 10 to 12 metre deep-draft silt curtains around the dredge works
- Implementation of silt curtains in accordance with environmental management measures B31 to B33.

The final extent of dredging works for the construction of the immersed tube tunnels would be confirmed during further design development and construction planning for the project, as described in Table 28-2 of the environmental impact statement. A dredge management plan is likely to be required as part of the construction environmental management plan to manage environmental impacts during construction as discussed in Section D1.1 of this submissions report.

Other measures that will be implemented to minimise potential impacts to marine life and sensitive habitats are specified in Table D2-1 of this submissions report and include:

- To minimise the potential impact of turbidity (suspended sediment) on sensitive marine vegetation and habitats, silt curtains will be installed around seagrass patches and subtidal rocky reef within 25 metres of the Middle Harbour cofferdam construction support sites (BL7 and BL8) (revised environmental management measure B31)
- Monitoring during dredging activities will be carried out to validate the effectiveness of mitigation measures implemented to manage potential impacts on the water quality and sensitive marine vegetation and habitats of Middle Harbour. The use of real-time turbidity monitoring at both potential impact and background locations, as well as adoption of a tiered (trigger level) management approach for sensitive sites to manage any potential impacts, will be included in a

dredge monitoring program. The dredge monitoring program will be developed in consultation with an appropriately qualified and experienced specialist, DPI Fisheries and the NSW EPA prior to its implementation (revised environmental management measure WQ12).

As part of the environmental impact statement, investigation into the potential for release of contaminants into the water column when sediments are disturbed by dredging was carried out, as described in Annexure C of Appendix M (Technical working paper: Contamination). The elutriate test results, when corrected for contaminant levels in the seawater and adjusted for natural dilution at the dredging site, were below the relevant water quality criteria, as described in Section 4.0 of Annexure C of Appendix M (Technical working paper: Contamination).

A detailed response to issues raised by the community on marine water quality, with further information on the dredging methodology and potential release of contaminants in the water column, is provided in Appendix C1 of this submissions report. It notes that the predicted level of suspended solids concentrations at locations of interest (such as recreational areas at Sailors Bay and Northbridge Baths) as a result of dredging activities, at the 90th percentile level for both the surface and near-bed, are less than the background total suspended solids value. Therefore, it is not expected that suspended solid concentrations due to dredging would represent a noticeable addition to background concentrations.

Further review of potential recreational exposures that may occur during proposed dredging activities is provided in Appendix C2 of this submissions report. Locations of interest have been assessed to evaluate whether there are any risk issues of concern for recreational exposures to sediments disturbed by the project. The assessment, carried out by Environmental Risk Sciences, concludes that all maximum (or worst-case) concentrations of chemicals in water, as a result of the presence of suspended sediments or dissolved phase concentrations from dredging activities, are well below recreational water guidelines. On this basis, there are no risk issues of concern for recreational use of areas surrounding the project in relation to exposure to chemicals derived from proposed dredging activities.

Transport for NSW will continue to engage with Willoughby City Council throughout further design development and construction of the project, as relevant in accordance with the community consultation framework provided in Appendix E (Community consultation framework) and as required by environmental management measure SE3 (refer to Table D2-1 of this submissions report).

Refer to Section B12.5.4 for discussion regarding Council's suggestion regarding the Maritime Working Group.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.16 Flooding

B12.16.1 Construction flood impacts

Issue raised

Page 89

Willoughby City Council notes that construction activities have the potential to exacerbate flooding conditions in adjacent development (ie the Flat Rock Drive construction support site (BL2)). Council seeks conditions of approval requiring:

- Transport for NSW provide information to Council on potential construction phase impacts on flood behaviour and to Council infrastructure due to flooding, and that these are mitigated where possible
- The Flat Rock Drive construction support site (BL2) be moved outside of the flood extents where possible, or that a temporary overland flow path through the site be constructed.

Response

To ensure that construction of the project avoids or minimises the risk of adverse impacts from infrastructure flooding, flooding hazards, or dam failure, the project has been developed such that:

- Construction would be carried out in a manner that minimises the potential for adverse flooding impacts, through staging of works and the implementation of environmental management measures
- Temporary construction support sites and construction sites would be laid out so flows are not substantially impeded.

An assessment of the potential impacts that construction activities could have on flood behaviour is provided in Section 18.5 of the environmental impact statement. The key findings of the assessment are summarised in Table 18-2 of the environmental impact assessment.

While the findings of the assessment provide an indication of the potential impacts of construction activities on flood behaviour in the absence of environmental management measures, further investigation would be carried out during design development and construction planning. Consideration would also be given to setting an appropriate hydrologic standard for mitigating the impacts of construction activities on flood behaviour, taking into account their temporary nature and therefore the likelihood of a flood of a given annual exceedance probability (AEP) occurring during the construction period.

Detailed construction planning will consider flood risk at construction sites and during construction activities. This will be carried out in accordance with environmental management measure F5 (refer to Table D2-1 of this submissions report):

- A review of site layout and staging of construction activities to avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required
- Identification of measures to not worsen flood impacts on the community and on other property and infrastructure during construction up to and including the 1% AEP flood event where reasonable and feasible
- Measures to mitigate alterations to local runoff conditions due to construction activities.

Transport for NSW would continue to engage with Council through the next phases of the project, as outlined in Section B12.5.3 of this submissions report. In addition, flood emergency management measures for construction will be prepared in consultation with Council and State Emergency

Services, and incorporated into relevant environmental and/or safety management documentation (refer to environmental management measure F3 in Table D2-1 of this submissions report).

Site facilities, including those located at the Flat Rock Drive construction support site (BL2), will be located outside high flood hazard areas based on a 1% AEP flood, in accordance with environmental management measure F9 (refer to Table D2-1 of this submissions report).

B12.16.2 Operational flood impacts

Issue raised

Pages 89 and 90

Council noted that the assessment in the environmental impact statement found that, once constructed, the project would generally have only a minor impact on flood behaviour in adjacent properties for storms up to 1% AEP in intensity; this is noted aside from properties around Elizabeth Street and Wilkes Avenue. Willoughby City Council seeks conditions of approval requiring that any afflux impacts at properties around Elizabeth Street and Wilkes Avenue in the 1% AEP event due to the project is to be avoided through flood mitigation measures which are to be discussed with Council.

Council noted the Flat Rock Creek Catchment appears to be negatively impacted post-construction for events greater than the 1% AEP (mainly the probable maximum flood (PMF)). Council requests more detail as to why this has occurred. Willoughby City Council seeks conditions of approval requiring that Transport for NSW consult with Council and the community regarding potential flooding impacts on lands, and strategies are to be provided to mitigate these flood level increases, particularly for George Place and the main arm of the Flat Rock Creek channel.

Willoughby City Council seeks conditions of approval requiring that information is provided to Council regarding new flood levels resulting from changes due to the project that cannot be mitigated.

Willoughby City Council recommends that floor level surveys of buildings be carried out for the PMF event (rather than the 1% AEP event) where property flood level increases cannot be mitigated with the same design intent.

The environmental impact statement notes that there are instabilities in the hydraulic model which could not be resolved. Instabilities should be resolved so Council and residents can accurately assess the impact of the project.

Response

<u>Flood behaviour up to the 1% AEP event</u>

The flooding assessment in the environmental impact statement found that the project, as noted by Council, would generally result in a neutral or beneficial effect on flood behaviour external to the road corridor for design floods up to 1% AEP event. There are a few exceptions, but they do not involve inundation above floor level at any buildings.

Where flood levels in the 1% per cent AEP event are predicted to increase at any residential, commercial and/or industrial buildings as a result of operation of the project, a floor level survey will be carried out. If the survey indicates existing buildings would experience above floor inundation during a 1% per cent AEP event as a result of the project, further refinements will be made (as required) to the design of permanent project components to minimise the potential for impacts (refer to environmental management measure F1 in Table D2-1 of this submissions report).

Impact of the project on flood behaviour during operation will be confirmed during further project development, in accordance with revised environmental management measure F2 (refer to Table D2-1 of this submissions report).

Impacts to Flat Rock Creek catchment in events greater than 1% AEP

While the project would generally not have an impact on flood behaviour external to the road corridor for storms of between 1% and 0.2% AEP in intensity, the project has the potential to increase peak flood levels by up to about 50 millimetres in existing commercial development that is located in George Place and by a maximum of about 110 millimetres in existing residential development that is located along the main arm of Flat Rock Creek to the east of the rail corridor during a PMF event. Updates to Figure B.6 (Sheet 3) from Appendix R (Technical working paper: Flooding) and Figure 6.6 (Sheet 3) have been provided in Appendix G of this submissions report. These figures, which illustrates the impact of the project on flood behaviour in a 0.2% AEP event and PMF event respectively, have been updated to include insets at a larger scale, showing building outlines to make it clear where modelled impacts are relative to existing structures. As can be seen from the figures, the impacts attributable to the project for floods larger than 1% AEP are considered to be minor and would not represent a significant increase in the risk to life of people occupying the floodplain of Flat Rock Creek.

The 1% AEP design flood is considered the most relevant design flood, as under development controls, minimum floor levels for properties in the vicinity of watercourses are typically set in relation to the peak levels in the 1% AEP design flood. Due to how rarely these events would occur, development controls do not typically aim to protect buildings in the vicinity of watercourses from events of magnitudes greater than 1% AEP. The assessment indicates that the project is not likely to cause any additional properties to experience peak flood levels above floor levels in the 1% AEP design flood.

Assessment of the impact of flood behaviour during operation of the project, including consideration of future climate change, will be confirmed during development of the project as required by revised environmental management measure F2 (refer to Table D2-1 of this submissions report). The project will be designed such that the flood hazard in existing residential development during floods larger than 1% AEP would not be significantly increased such that there would be an increased risk to life.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

Model instabilities

Operational flooding impacts are assessed in Section 6 of Appendix R (Technical working paper: Flooding). Appendix R includes two footnotes (on page 49 and 51), which indicate that where the report figures show impacts at locations remote from the project, these impacts are considered to be artefacts of the hydraulic model. These locations are at such a distance from the project that the impacts would not be attributable to the project. While it is possible to remove these artificial impacts through further refinement of the hydraulic model, it is not considered to be necessary at this time. As discussed above, the impact of the project on flood behaviour during operation will be confirmed during further project development, consistent with revised environmental management measure F2 (refer to Table D2-1 of this submissions report).

B12.17 Biodiversity

B12.17.1 Biodiversity risk assessment

Issue raised

Pages 91 and 92

In the vicinity of Flat Rock Gully, the environmental impact statement has identified threatened species near the construction footprint and the Flat Rock Reserve construction support site (BL2) provides habitat for these species and numerous others as identified in the Flat Rock Reserve Action Plan and associated species lists. Council considers the biodiversity risk assessment is deficient with respect to fauna that Willoughby City Council has stated as significant in Reserve Action Plans.

Response

Consideration and assessment of potential impacts to fauna at Flat Rock Drive construction support site (BL2) has been extensively documented throughout Appendix S (Technical working paper: Biodiversity development assessment report). The assessment of potential impacts to fauna at the Flat Rock Drive construction support site (BL2) has followed the requirements of the Secretary's environmental assessment requirements and the *Biodiversity Assessment Method* (Office of Environment and Heritage (OEH), 2017a).

Fauna surveys, including the survey technique, effort, timing, and target species, carried out for Flat Rock Reserve are documented in Table 2.6 of Appendix S (Technical working paper: Biodiversity development assessment report). Specific locations where surveys were carried out within Flat Rock Reserve (and Flat Rock Drive construction support site (BL2)) are shown on Figure 2-4 (map b) of Appendix S (Technical working paper: Biodiversity development assessment report).

The associated fauna habitats of Flat Rock Reserve and Flat Rock Drive construction support site (BL2) are documented in Section 3.7 of Appendix S (Technical working paper: Biodiversity development assessment report) and includes detail on vegetated habitat (refer to Figure 3-10 (map b) of Appendix S) and the habitat associated with the existing constructed surface open channel within the northern extent of Flat Rock Reserve.

The main potential impact to fauna at the Flat Rock Drive construction support site (BL2) would be the removal of vegetated fauna habitat which provides potential foraging habitat for threatened fauna species recorded next to the temporary construction support site or highly likely to occur. Species included Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Little Bent-winged Bat *(Miniopterus australis*), Varied Sittella (*Daphoenositta chrysoptera*) and Powerful Owl (*Ninox strenua*).

The existing constructed surface open channel located within the Flat Rock Drive construction support site (BL2) is included within the vegetated habitat extents as shown in Figure 3-10 (map b) of Appendix S (Technical working paper: Biodiversity development assessment report). As such, the potential impact to fauna from the proposed diversion of the existing constructed surface open channel is considered as part of the loss of vegetated habitat from Flat Rock Drive construction support site (BL2).

Several environmental management measures would apply to the establishment and operation of Flat Rock Drive construction support site (BL2) to minimise and manage impacts to fauna including B1, B6, B11-B14, B22, B23 and B43 (refer to Table D2-1 of this submissions report for the full wording of these environmental management measures). These measures would be supported by

the implementation of a flora and fauna management plan as part of the construction environmental management plan as described in Section D1 of this submissions report.

B12.17.2 Impacts to the Flat Rock Reserve site rehabilitation area

Issue raised

Pages 91 and 92

The work proposed at Flat Rock Drive construction support site (BL2) would impact 20 years of invested time, money and community engagement (in particular Bushcare groups) in site restoration and the protection and enhancement of the natural environment by Council and the community. Given the ongoing commitment by Council and the local community to invest in the site's restoration, this would generate significant community concern.

Willoughby City Council seeks a condition of approval requiring that Transport for NSW provide Council with a detailed analysis and assurance there would be engagement with Council and Bushcare groups to ensure that rehabilitation of temporary construction support sites is implemented, managed and carried out with their input and support.

Response

Transport for NSW acknowledge the work carried out by local Bushcare groups over the last 20 years at the Flat Rock Drive construction support site (BL2) and surrounding areas.

Since 2017, Transport for NSW has met with Willoughby City Council to discuss the project, including four meetings in 2018 and 2019 where options for a Willoughby/Northbridge construction support site were discussed. At these meetings Transport for NSW consulted with Council on the potential locations for the temporary construction support site in this area and the final state of the site following construction.

Consideration of alternative locations for the location of the temporary construction support site is documented in Section 4.5.7 of the environmental impact statement. Further information relating to the necessity of the temporary construction support site and other options considered is provided in Section 2 of the preferred infrastructure report.

During construction, the Flat Rock Drive construction support site (BL2) would temporarily occupy a small portion of Flat Rock Reserve, which would result in the temporary loss of access to and use of land within the construction footprint. Clearing of trees would be required to establish the temporary construction support site. Flat Rock Drive construction support site (BL2) is located in an area previously used as a landfill site comprising re-generated growth, and as such clearing of older, more established trees would be avoided where possible. It is also noted that the southern part of the site also includes a large area of cleared, mown exotic grassland, a carpark and shared user paths equating to about 27 per cent of the site area. The area required and layout of Flat Rock Drive construction support site (BL2) will be refined during further design development and construction planning to avoid direct impacts on PCT 1841, where feasible and reasonable, in accordance with environmental management measure B1 (refer to Table D2-1 of this submissions report).

Vegetation removal including the clearing of native vegetation and fauna habitat will be further minimised during further design development and construction planning, where feasible and reasonable (refer to revised environmental management measure B6 in Table D2-1 of this submissions report).

At the end of construction, the impacted portion of Flat Rock Reserve would be rehabilitated in consultation with Willoughby City Council and the community and returned to Council. As identified

in Table D2-1 of this submissions report, the following new environmental management measure LP8 has been developed accordingly:

> Transport for NSW will work closely with Willoughby City Council on its preferred final form of the Flat Rock Drive construction support site (BL2) in consultation with the local community. The site will be rehabilitated in line with the land use zoning. Vegetation and landscaping will be determined in consultation with Willoughby City Council and the community and will be implemented as soon as practicable at the completion of construction.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.17.3 Removal of vegetation

Issue raised

Pages 103 and 104

A large number of trees will be removed or impacted in the course of construction, particularly in the highly sensitive Flat Rock Reserve area. Given the proximity of residential and other buildings and the large number of hard surfaces, urban heating is already a concern.

Trees should be maintained or replaced as close as possible to existing trees in and around the Gore Hill Freeway and Flat Rock Drive construction support site (BL2).

There should be no net loss of tree canopy due to the project.

Response

Transport for NSW would minimise potential impacts to vegetation, with clearing of vegetation to be minimised, trees trimmed rather than removed, and existing trees next to the work retained and protected, where possible. This would be achieved through the implementation of environmental management measures V9 to V12 (refer to Table D2-1 of this submissions report). All areas disturbed by construction and not required for operation of the project will be restored to existing condition or as per the urban design and landscape plan, with early planting works considered to allow for the vegetation to mature before the project is fully operational. Vegetation will be re-established within the construction footprint, where feasible, in accordance with *Guide 3: Reestablishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) in accordance with environmental management measure B13 (refer to Table D2-1 of this submissions report).

The urban heat island effect results from the replacement of natural surfaces, including the tree canopy, with hard surfaces. Most of the project is underground in tunnels or involves replacing existing hard surfaces with new or upgraded hard surfaces, so the project would only make a minor contribution to the urban heat island effect in the long term.

In the short term, about 15.27 hectares of vegetation would be removed across the whole project alignment during construction activities, comprising of native plantings, planted medians, non-native species or weeds (since exhibition of the environmental impact statement, impacts to native vegetation has reduced due to a design refinement of the ramps of the Wakehurst Parkway shared user bridge - refer to Section A4.3 for details on this refinement). This may result in highly localised impacts (in terms of the urban heat island effect) to residents located next to removed vegetation, mostly due to the loss of shading that the trees provided.

Where mature amenity trees (other than trees offset under the NSW Biodiversity Offsets Scheme, established under Part 6 of the *Biodiversity Conservation Act 2016*) are removed as a result of

construction, they will be replaced at a ratio of 2:1 as outlined in revised environmental management measure V13 (refer to Table D2-1 of this submissions report). The actual number of trees, extent of planting locations and species to be replaced would be confirmed as part of the urban design and landscape plan, which will be developed during further design development and implemented in line with the strategic urban design framework for the project (refer to environmental management measure V1 in Table D2-1 of this submissions report).

B12.17.4 Impact of groundwater drawdown, settlement and flooding on vegetation

Issue raised

Pages 79 and 83

Council notes that groundwater drawdown impacts reported in the environmental impact statement are:

- Northbridge 28 metres
- Flat Rock Reserve 21 metres
- Willoughby Leisure Centre 22 metres.

Council is concerned that groundwater drawdown would result in water stress for vegetation. The drawdown in the area would have a significant impact on the ability of Council grounds to retain moisture and the viability of bushland in an area that supports endangered species. The area is already flood prone and settlement may exacerbate the issues around this as well as contamination.

The environmental impact statement does not provide commentary on the potential loss of flora and fauna due to the significant change in water table (groundwater drawdown).

Response

Conservative nature of groundwater modelling in the environmental impact statement

It is important to note that the groundwater modelling was based on conservative assumptions of continuous saturation (and hydraulic connectivity) between the tunnel and the water table and no control over groundwater inflows to the tunnels, as noted throughout Appendix N (Technical working paper: Groundwater) and associated groundwater modelling report (Annexure F of Appendix N (Technical working paper: Groundwater)). Conservative assumptions were also made about hydrogeological conditions along the alignment in lieu of site-specific information available at the time that the groundwater model was originally developed. Details of the inherent conservatism of the groundwater model are included in Section 2.1.3 of Appendix E of this submissions report.

Under these assumptions, all drawdown at tunnel depth would be realised at the surface, which could result in the predicted baseflow reduction in identified watercourses. However, in reality, stratification in the hydrogeological units would limit connectivity between the tunnel and the shallow water table, which would reduce vertical movement of groundwater. This means that not all drawdown at the tunnel would be realised at the surface and therefore predicted drawdown in the vicinity of watercourses might be substantially reduced, or might not occur at all, which would reduce actual baseflow reductions compared to the predictions. Where the hydraulic connectivity between the tunnel and the shallow water table is poor, the presence or absence of tunnel groundwater inflows might not have a large effect on overall drawdown.

The maximum groundwater drawdown and associated impacts predicted by the groundwater modelling, including baseflow reductions, are therefore considered to be conservative and actual impacts are likely to be less than described in the environmental impact statement.

Monitoring of groundwater levels and quality will be ongoing as described in environmental management measure SG1 (refer to Table D2-1 of this submissions report), and these monitoring results will inform further groundwater modelling to refine the predictions regarding groundwater levels and rates of drawdown, as set out in environmental management measure SG2 (Refer to Table D2-1 of this submissions report).

Following completion of environmental management measure SG2, a focussed study will be carried out in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Group) to confirm potential groundwater drawdown and associated baseflow reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems, in accordance with revised environmental management measure SG6 (refer to Table D2-1 of this submissions report). The study will consider how existing site features affect the interaction between surface water and groundwater along the affected reaches of these watercourses, and the hydraulic connectivity in the underlying geology. Where unacceptable ecological impacts are predicted to be worse than that presented as part of the environmental impact statement/submissions report, feasible and reasonable mitigation measures to address the impacts will be identified in consultation with a suitably qualified and experienced specialist, incorporated into the detailed design, and implemented during construction. The mitigation measures considered will include tunnel linings.

Presence of groundwater dependent ecosystems

Vegetation would only be affected by any drawdown of groundwater if it is dependent on groundwater for its survival. Groundwater dependent ecosystems mapped within the project area are shown and described in Figure 19-12 and Section 19.3.4 of the environmental impact statement, respectively. An area of the ecological community Coastal Sandstone Gully Forest Sandstone Riparian Scrub and Coastal Sand Forest is mapped along Flat Rock Creek about 280 metres south-east of the tunnel alignment and Flat Rock Drive construction support site (BL2). This vegetation is mapped as having moderate to high potential for groundwater interaction. The mapped area of vegetation extends from elevations of 0 metres AHD along Flat Rock Creek to 40 metres AHD on steep gully slopes.

Further field investigations have been carried out following public exhibition of the environmental impact statement (refer to Section A5.1.15 of this submissions report). This has included a detailed assessment of impacts on groundwater dependent ecosystems based on the revised groundwater modelling (refer to Annexure B of Appendix E of this submissions report). These investigations have confirmed the presence of additional groundwater dependent ecosystems in this area, being Coastal Sandstone Plateau Heath, Estuarine Fringe Forest and Illawarra Gully Wet Forest. All of these three additional communities are much smaller in area than those mentioned above (refer to Appendix E of this submissions report).

As discussed in Section 4.2.2 of Appendix E of this submissions report, the presence of perched aquifers, isolated from the regional water table, means that the risk to groundwater dependent ecosystems is small given that these communities are not dependent on regional groundwater. Further, the small alluvial aquifer of Flat Rock Creek at the Quarry Creek confluence would be recharged by the releases of up to about 1425 kilolitres per day of treated water from the project operational wastewater treatment plant discharge into Flat Rock Creek at Artarmon. This may replace any baseflow losses and sustain vegetation communities dependent on groundwater in the shallow alluvium. These findings are consistent with the conclusions drawn in Section 19.5.4 of the environmental impact statement; that no direct impacts on groundwater dependent ecosystems would occur as a result of the project.

There are no other areas mapped as groundwater dependent ecosystems near to the project in the Willoughby local government area.

Impact of groundwater drawdown on groundwater dependent ecosystems

Potential impacts to groundwater dependent ecosystems are discussed in Section 19.5.4 of the environmental impact statement and Section 5.6 of Appendix S (Technical working paper: Biodiversity Development Assessment Report). This assessment draws from the groundwater modelling carried out for the environmental impact statement as described in Appendix N (Technical working paper: Groundwater). The groundwater modelling predicts groundwater drawdown of up to four metres by 2028 and 11 metres by 2128 at the groundwater dependent ecosystem mapped along Flat Rock Creek.

About 10.50 hectares of Coastal Sandstone Gully Forest, Sandstone Riparian Scrub, Coastal Sandstone Plateau Heath, Estuarine Fringe Forest, Illawarra Gully Wet Forest and Coastal Sand Forest is within the area of predicted water table drawdown. The level of groundwater dependency of this vegetation is unknown. However, it is likely that this vegetation is able to draw on surface water in Flat Rock Creek and soil moisture to prevent drying out of the community, except in dry periods where there is no recharge from rainfall or surface runoff. Water table drawdown as a result of the project may contribute to trees dying or becoming stressed during periods of prolonged drought. Additional modelling was carried out for a scenario in which the section of tunnel beneath Flat Rock Creek is lined, as discussed in Section 19.5.4 of the environmental impact statement. With the linings assumed, the predicted water table drawdown after 100 years of operation was predicted to be up to eight metres less than the drawdown predicted without the lining, demonstrating that implementation of tunnel lining would help mitigate potential groundwater drawdown impacts and that potential baseflow impacts would be lower than predicted.

Revised groundwater drawdown modelling was carried out following public exhibition of the environmental impact statement, in response to submissions received (refer to Appendix E of this submissions report). A clarification is provided in Section A5.1.15 of this submissions report that summarises the additional studies carried out and the overall findings. The additional studies carried out include a revised assessment of the potential impact of the project on groundwater dependent ecosystems, which is provided in Annexure B of Appendix E of this submissions report. As discussed in the section immediately above (with reference to Section 4.2.2 of Appendix E of this submissions report), the findings of the revised groundwater modelling and groundwater dependent ecosystem impact assessment are consistent with and confirmed the findings of the environmental impact statement; that the predicted drawdown is unlikely to impact on groundwater dependent ecosystems and that the environmental management measures presented in the environmental impact statement would be sufficient to manage likely impacts.

As more information becomes available on groundwater levels and contamination through ongoing groundwater monitoring, groundwater modelling will be updated to refine the predictions. Inflow predictions will be updated prior to finalising detailed design and will include designed tunnel linings, and the detailed design will be updated based on the updated operational inflow and impact predictions. If refined predictions of groundwater levels and drawdown indicate that impacts would be greater than presented in the environmental impact statement, feasible and reasonable mitigation measures will be incorporated into the detailed design and implemented in accordance with revised environmental management measure SG2 (refer to Table D2-1 of this submissions report).

Following completion of environmental management measure SG2, a focussed study will be carried out in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science Group) to confirm potential groundwater drawdown and associated baseflow

reductions at Burnt Bridge Creek, Flat Rock Creek and Quarry Creek due to tunnelling, and confirm potential impacts on freshwater ecology in the affected watercourses and nearby groundwater dependent ecosystems, in accordance with revised environmental management measure SG6 (refer to Table D2-1 of this submissions report). The study will consider how existing site features affect the interaction between surface water and groundwater along the affected reaches of these watercourses, and the hydraulic connectivity in the underlying geology. Where unacceptable ecological impacts are predicted to be worse than that presented as part of the environmental impact statement/submissions report, feasible and reasonable mitigation measures to address the impacts will be identified in consultation with a suitably qualified and experienced specialist, incorporated into the detailed design, and implemented during construction. The mitigation measures considered will include tunnel linings.

Impact of settlement on vegetation

Maximum predicted surface settlement is presented in Table 16-9 of the environmental impact statement. Maximum total settlement of 85 millimetres is predicted at Flat Rock Reserve, primarily due to the groundwater induced settlement, as discussed in Section B12.14.3 of this submissions report. This prediction assumes that groundwater inflows into the tunnel beneath Flat Rock Reserve are unconstrained. Additional modelling and settlement predictions were completed at this location. The additional modelling included tunnel linings to preclude groundwater inflows beneath Flat Rock Reserve as discussed above. When the reduced inflows and reduced groundwater drawdown were taken into account, the maximum predicted settlement reduced to 35 millimetres. This demonstrates that appropriate measures can reduce settlement associated with groundwater drawdown at this location.

The land at Flat Rock Reserve in the vicinity of the proposed tunnel alignment that may be susceptible to subsidence consists of the revegetated area (most of which would likely be cleared to establish the temporary construction support site), some weedy vegetation on the upper slopes above Flat Rock Creek, and the creek itself, all of which is located on a historically cleared area. The creek vegetation is currently highly susceptible to weed invasion, and exotic grasses are dominant in several places on the banks of the creek bed. The maximum total settlement of 85 millimetres could make some areas along Flat Rock Creek more swampy if they are more frequently inundated. However, any changes in flooding due to this settlement are expected to be minor in nature, and are not expected to have a significant impact on the health or composition of vegetation communities.

Flat Rock Creek is in a fairly deep, wide gully in this area. It is assumed that any additional flooding would be intermittent or seasonal. Given the existing level of modification of all of this vegetation, it is considered unlikely that additional flooding would result in major changes to vegetation composition. However, if the ground around the creek were to become permanently more waterlogged, there may be a change in species composition to favour sedges and other wetland species, and at worst a risk of tree mortality if any trees on banks were to become permanently submerged. Subsidence or settlement would have to be major for this to occur.

The northern sections of Flat Rock Reserve are mapped as Sandstone Heath-Mallee and Enriched Sandstone Exposed Woodland, and are located on upper slopes. It is unlikely that subsidence of up to 85 millimetres would result in changes to vegetation composition in this area.

Impact of contaminated groundwater on vegetation

The groundwater dependent ecosystem mapped along Flat Rock Creek is not expected to be impacted by contaminant migration since the potentially contaminated fill area at Bicentennial Reserve and Willoughby Leisure Centre is immediately overlying the tunnels and would drain towards the tunnels and not towards the groundwater dependent ecosystem.

Other vegetation at Flat Rock Reserve is dependent on rainfall and surface water runoff and is not dependent on groundwater.

B12.17.5 Sydney Harbour biodiversity

Issue raised

Page 84

Willoughby City Council suggest Sydney Harbour now supports significant biodiversity and is one of the most diverse in the world. This should be acknowledged in the environmental impact statement and given more weight than threatened species such as iconic species that are rarely observed in the harbour.

Response

The environmental impact statement has been prepared in accordance with the Secretary's environmental assessment requirements issued by the Department of Planning, Industry and Environment.

To assess potential marine biodiversity impacts, the Secretary's environmental assessment requirements refer to the following policies and guidelines:

- *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW Department of Primary Industries (DPI), 2013)
- *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003)
- *Aquatic Ecology in Environmental Impact Assessment – EIA Guideline Series* (Lincoln Smith, 2003).

These documents outline the information requirements for proposed developments so that assessors can confidently assess the potential for impacts to all aquatic biodiversity, not just threatened or iconic species.

It is agreed that the Middle Harbour estuary, in combination with Sydney Harbour, has a wide range of marine habitats which support one of the most biodiverse estuarine ecosystems in Australia, and this is acknowledged in Section 3.5 of Appendix T (Technical working paper: Marine ecology).

To help understand the relative ecological value of each of the habitats in the study area, and hence the consequences of potential impacts, the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) allows classification according to 'sensitivity' (type), which refers to the importance of each habitat to the survival of fish as well as resilience to disturbance. Appendix T (Technical working paper: Marine ecology) investigated the following marine habitats and their biota within a broad study area within Middle Harbour:

- Seagrass
- Subtidal rocky reef
- Intertidal rocky shore
- Soft sediment
- Deepwater habitats:
    - Soft sediment
    - Open water (for fish and marine mammals and reptiles).

Fish passage within (or that relies upon) these habitats was also investigated.

Further assessment and modelling of potential impacts of the project on levels of dissolved oxygen and other physio chemical parameters, including salinity and temperature, was carried out and is provided in Appendix A of the preferred infrastructure report.

To reduce impact on potentially affected marine habitat or species (threatened or non-threatened), specific environmental management measures have been proposed (refer to Table D2-1 of this submissions report). These measures include the installation of silt curtains around sensitive marine habitats (including seagrass habitats) (revised environmental management measure B31), implementation of exclusion zones to avoid disturbance to sensitive marine habitats (environmental management measure B29), scour protection measures including possible velocity reduction from wastewater treatment plant discharge (environmental management measure B30) and the ongoing monitoring of dredge plumes to validate the dredge plume dispersion predictions (revised environmental management measure WQ12). The overall impact on key fish habitats during construction and operation of the project are not considered to be significant and would be adequately managed by the proposed environmental management measures.

B12.17.6 Impacts to marine biodiversity – suspended sediments

Issue raised

Pages 84 and 85

Increased turbidity from dredging activities should be prevented. Deep draft silt curtains would not be effective at full containment of contaminated resuspended sediments. Full length silt curtains anchored to the sea floor are the only viable method of restricting the movement of fines.

The abundance of micro-plastics in the sediment have not been quantified or considered as at risk of resuspension during dredging activities. Similarly, there has been no quantification of pathogenic bacteria or resting dinoflagellate cysts (a major cause of red tides) in the sediments that might be released during dredging activities or result in a harmful algal bloom.

Response

Containment of suspended sediments

Sediment sampling carried out for the project identified levels of selected contaminants within the upper 0.5 to one metre of sediments from the bed of the harbour (Douglas Partners and Golder Associates, 2018). Below one metre, the sediment is generally free of any man-made contaminants as the material dates to the pre-industrial era.

The behaviour of sediment-bound contaminants when resuspended into the water column is important for determining the potential for adverse environmental effects from dredging. In a study for the Sydney Metro City & Southwest project (Geotechnical Assessments, 2015), similar contaminants were found to occur as that found for the project by Douglas Partners and Golder Associates (2018). In the study for the Sydney Metro City & Southwest project, Geotechnical Assessments (2015) carried out laboratory elutriation tests (by simulating resuspension of sediment in ambient seawater) for identified contaminants. These tests demonstrated that trace metals and all organic contaminants would likely remain bound to sediment particles and would be unlikely to dissociate and be released into the water column as dissolved phases. The minor component of contaminants that might be released to dissolved phases would be expected to re-adsorb to suspended particulate materials and resettle to the bed of the harbour.

Contamination testing of harbour sediments for the project is further discussed in Section 4.4.1 of Appendix M (Technical working paper: Contamination). Annexure C of Appendix M (Technical

working paper: Contamination) includes a memo which outlines sediment contamination levels and results of elutriate testing that was carried out by Royal HaskoningDHV in 2020 subsequent to the investigations carried out by Douglas Partners and Golder Associates (2018), to assess the suitability of dredged sediments for offshore disposal. Offshore disposal is an activity regulated by the Australian Government under the *Environment Protection (Sea Dumping) Act 1981* (Commonwealth). Determination of the offshore disposal permit(s) is subject to assessment and approval by the Australian Government. Royal HaskoningDHV (2020) results of elutriate testing indicate that water quality impacts at the dredging site due to dissolved contaminants would not be expected.

This means that the pathway for spread of contaminants would be restricted to the component of dredged sediment that leaks from the closed environmental clamshell bucket used for dredging or from disposal barges or hoppers, and would settle back onto the bed of the harbour. Modelling indicates that deposition would be confined to soft sediment areas near the Middle Harbour south cofferdam (BL7) and the Middle Harbour north cofferdam (BL8) construction support sites and generally in soft sediment areas. As already indicated above, contaminants of various types can be found as deep as one metre below the bed of the harbour in the vicinity of the crossing. This means it is unlikely that soft sediment areas would be exposed to contaminants from dredging not already persisting in these areas.

A range of environmental management measures are proposed for the project to mitigate the generation and movement of suspended sediments due to dredging, as detailed in Table D2-1 of this submissions report and Appendix P (Technical working paper: Hydrodynamic and dredge plume modelling).

Environmental management measure WQ16 (refer to Table D2-1 of this submissions report) includes management measures that will be implemented during dredging activities to minimise impacts on marine water quality, vegetation and habitats, including:

- Use of a backhoe dredge with a closed environmental clamshell bucket operated within a localised floating silt curtain enclosure to a depth of two to three metres to dredge the top layer of marine sediments
- Implementation of 10 to 12 metre deep-draft silt curtains around the dredge works
- Implementation of silt curtains in accordance with environmental management measures B31 to B33.

These controls, in conjunction with the behaviour of sediment bound contaminants, means it would be unlikely that water quality would be impacted by contaminants mobilised from dredging and construction activities.

Potential impacts on marine habitat and biota as a result of the mobilisation of contaminants is further considered in Appendix T (Technical working paper: Marine ecology).

Use of deep draft silt curtains around dredging activities

The proposed deep draft silt curtains, which would be used around the proposed dredging activities for the Middle Harbour crossing, would extend to a depth of 10 to 12 metres below the water surface and have been demonstrated in the modelling to be effective in mitigating the movement of suspended sediments from the dredge site. The depth of the silt curtains is a balance between restricting the movement of suspended sediments, maintaining tidal flow, and being able to adequately hold the silt curtains in place.

There is a risk that full depth silt curtains which are anchored to the bed of the harbour would generate greater suspended sediment (turbidity) than lesser depth curtains, as a result of sediment

disturbance caused by the general movement/drag of the curtains on the bed of the harbour with tidal currents, and as a result of sediment disturbance caused by their placement, progressive relocation and the ultimate removal of the curtain anchoring devices located on the harbour bed, eg anchors and chains.

The use of the proposed 10 to 12 metre deep draft silts curtains combined with the environmental clamshell bucket and other environmental management measures listed in Table D2-1 of this submissions report is considered an appropriate and effective dredging methodology for the project. As such, full length silt curtains anchored to the sea floor are not considered to be required.

Further discussion regarding why the use of full length silt curtains anchored to the bed of the harbour is not proposed as part of the proposed construction methodology is provided in Appendix C1 of this submissions report.

Microplastics

Microplastics have been found in the top sediments of many parts of Port Jackson including parts of Middle Harbour and so have potential to occur in the top one metre of the dredge profile. As is the case for sediment bound contaminants, there would be very little potential for microplastics to be resuspended and dispersed during dredging given the top layer of sediment would be dredged using a closed environmental clamshell bucket. There would be very little leakage from the closed environmental clamshell bucket during transit of material from the bed of the harbour to the hopper barge. However, it is possible that a small amount of material from the bed of the harbour would be resuspended in the process.

As discussed above, the backhoe dredge with a closed environmental clamshell bucket will be operated within a localised floating silt curtain enclosure to a depth of two to three metres, and 10 to 12 metre deep-draft silt curtains would be implemented around the dredge works in accordance with environmental management measure WQ16 (refer to Table D2-1 of this submissions report). To minimise the potential impact of turbidity (suspended sediment) on sensitive marine vegetation and habitats, silt curtains will be installed around seagrass patches and subtidal rocky reef within 25 metres of the Middle Harbour cofferdams (BL7 and BL8) in accordance with revised environmental management measure B31 (refer to Table D2-1 of this submissions report). Although the very small amount of resuspended material that leaks from the closed environmental clamshell bucket on the dredge and through the floating silt curtains could potentially contain microplastics, the concentrations are expected to be negligible and not of a concern to the ecology of surrounding areas.

Release of pathogenic bacteria

As is the case for sediment bound contaminants, there would be very little potential for pathogenic bacteria to be resuspended and dispersed during dredging given the top layer of sediment would be dredged using a closed environmental clamshell bucket. As discussed in Section B12.11.3 of this submissions report, given the rapid dispersion of suspended sediments that would occur in Middle Harbour, and the potential for only a small amount of pathogenic bacteria or resting dinoflagellate cysts in the sediments (a major cause of red tides) to be released during dredging of the top layer, it is expected that this would not lead to a bloom of toxic dinoflagellates or multiplication of pathogenic bacteria to levels that could cause harm to marine biota, either within Middle Harbour or further afield.

Monitoring during the dredging activities would provide data to assess the compliance of the activities with this assessment. Dredging would also be carried out in accordance with the dredge management plan, as outlined in Section D1 of this submissions report.

B12.17.7 Impacts to marine biodiversity – stressors to marine ecology

Issue raised

Page 85

Marine ecology is currently exposed to a variety of stressors - adding additional stressors might result in a tipping point from which they cannot recover. This effect has not been considered in the environmental impact statement.

Response

The assessment and consideration of key marine biodiversity issues is based on identification of potential hazards associated with the project and a risk assessment as described in Section 2.1.1, and the results of field surveys that identified any unique attributes of particular habitats or biota and regional extent as described in Section 3.5 of Appendix T (Technical working paper: Marine ecology).

The assessment was based on whether the project would potentially result in direct loss of habitat or modification of their physical attributes (eg hydrodynamics) but also indirect effects on biota through loss of prey or physiological changes to biochemical processes in habitats within the study area.

The assessment was based on the overarching key issues identified in the risk analysis, including the following:

- Potential for direct removal of seagrass or subtidal rocky reef habitat
- Excessive turbidity and sedimentation (from dredging) in seagrass or subtidal rocky reef habitat
- Mobilisation of contaminants to seagrass or subtidal rocky reef habitat
- Introduction/spread of marine pests to seagrass or subtidal rocky reef habitat
- Altered hydrodynamics in seagrass or subtidal rocky reef habitat
- Underwater noise impacts to fish and elasmobranchs in seagrass or subtidal rocky reef habitat
- Spill of contaminants in seagrass or subtidal rocky reef habitat
- Direct removal of deepwater soft sediment habitat (including overlying open water habitat)
- Altered hydrodynamics in deepwater soft sediment habitat and overlying open water habitat
- Underwater noise impacts to fish and elasmobranchs in deepwater soft sediment and overlying open water habitat
- Underwater noise impacts to marine reptiles, marine mammals and elasmobranchs (Matter of National Environmental Significance listed elasmobranchs)
- Boat strike to marine mammals and reptiles.

The immersed tube tunnel crossing of Middle Harbour and its construction has been designed to avoid or minimise impacts on marine biodiversity values. Safeguards have been proposed to reduce the extent of impacts during construction and to minimise potential impacts to Type 1 (highly sensitive) key fish habitats and to threatened species. Direct impacts have generally been restricted to small areas around the shorelines of the crossing location. These habitats would be impacted due to the removal of a minor amount (less than 0.01 hectares) of subtidal rocky reef habitat, elevated turbidity and excess sedimentation from dredging and underwater noise from impact piling. Although there would be mortality to biota in these areas, the impacts are considered minor (including from cumulative impacts from multiple hazards) relative to the extent of the habitats or biota in Middle

Harbour, as described in the Executive Summary of Appendix T (Technical working paper: Marine ecology). Impacts would not compromise the functionality, long-term connectivity or viability of habitats, or ecological processes within assemblages of biota beyond the small affected areas. Refer to discussion in Section B12.17.6 above for discussion regarding management of turbidity during dredging.

Most impacts would be temporary and associated with the construction phase. Assemblages in most areas would quickly recover through natural processes of recruitment and immigration of species and reinstatement of habitat after construction is completed. The exception would be habitats permanently affected by the placement of the immersed tube tunnel units.

Environmental management measures will be implemented to minimise impacts to marine biota during construction. Salvage of live fish and other marine organisms (eg large, mobile macroinvertebrates) will occur during cofferdam dewatering and will be carried out by suitably qualified and experienced marine ecologists, as required by environmental management measure B38 (refer to Table D2-1 of this submissions report. All salvaged organisms will be immediately relocated to suitable habitat nearby. Pre-construction surveys of potentially affected marine habitat areas will be carried out in the 24 hour period prior to commencement of works that may impact potential habitat by suitably qualified and experienced marine ecologists to search for White's Seahorses (and other Syngnathids) and relocate them to nearby habitat, as required by revised environmental management measure B5 (refer to Table D2-1 of this submissions report). Prior to the pre-construction survey, consultation with DPI Fisheries will be carried out to obtain a permit under section 37 of the *Fisheries Management Act 1994* will be obtained to authorise potential relocations.

Additionally, and in response to issues raised by the Department of Planning, Industry and the Environment as well as Northern Beaches Council, further assessment of potential effects of the sill created by the immersed tube tunnels has been carried out since the exhibition of the environmental impact statement. Modelling results of additional water quality assessment, specifically focussing on dissolved oxygen concentrations, and further consideration of the potential impacts to marine fauna are discussed in Section 4 (Assessment of potential effects of the immersed tube tunnel sill) of the preferred infrastructure report.

The modelling shows that the area affected by the lower dissolved oxygen would be confined to an area of deeper water (depth greater than 10 metres) in the deep basin located immediately upstream of the immersed tube tunnels, below the depth of any identified sensitive marine fauna habitats. The magnitude, duration, and spatial scale of the effect of the immersed tube tunnel sill to benthic fauna in these areas would not be measurable beyond natural impacts from the occasionally low dissolved oxygen events. The sensitive Type 1 or Type 2 key fish habitat in the vicinity of the immersed tube tunnel, such as seagrass or rocky reef, are located in shallow water close to the shoreline of Middle Harbour and would be unaffected by any changes in dissolved oxygen. The outcomes of the modelling and additional assessment remain consistent with the findings of the environmental impact statement.

Based on the assessment findings, and also considering implementation of the above environmental management measures, the project would not have a significant impact on any threatened species, population, endangered ecological community (including those which are Matters of National Environmental Significance), trigger any key threatening process or substantially impact other aspects of marine biodiversity of value within Middle Harbour.

B12.17.8 Marine site rehabilitation

Issue raised

Page 92

In relation to the Middle Harbour cofferdam construction support sites (BL7 and BL8), the process intended for reinstatement of natural habitats (rocky reef and sediment) is not provided at the level of detail needed to assess the potential for recovery after the work. Further information about substrate types, sources, reconstruction methods should be provided.

Willoughby City Council seeks a condition of approval requiring that Transport for NSW provide Council with more detailed information, including a plan for impact mitigation that demonstrates no detrimental effect on the marine environment (either long term or short term) due to the establishment, operation and/or decommissioning/rehabilitation of the Middle Harbour temporary construction support sites.

Response

A comprehensive assessment of potential impacts to the marine environment is provided in Appendix T (Technical working paper: Marine ecology) and summarised in Section 19.5.5 of the environmental impact statement. The impact assessment concludes that most marine ecology impacts would be temporary and associated with the construction phase. Assemblages in most areas would quickly recover through natural processes of recruitment and immigration of species and reinstatement of habitat after construction is completed. The exception would be habitats permanently affected by the placement of the immersed tube tunnel units.

The removal of a small amount of subtidal rocky reef habitat at Middle Harbour north cofferdam construction support site (BL8) and intertidal rocky shore and sand and mudflat habitat at the Spit West Reserve construction support site (BL9) would occur along the shoreline at the crossing of Middle Harbour. This impact can be mitigated through reinstatement of habitat of a similar nature to the habitat removed.

As such, subtidal rocky reef habitat removed along the shoreline at the Middle Harbour north cofferdam (BL8) and intertidal rocky shore, sand and mudflat habitats removed at the Spit West Reserve construction support site (BL9) will be rehabilitated and restored as close as possible to pre-construction conditions where feasible and reasonable, in accordance with revised environmental management measure B34 (refer to Table D2-1 of this submissions report).

The exact design of reef rehabilitation and mitigation works would be dependent on constraints at the site and would be determined following further design development and construction planning. This could be achieved through the following approaches:

- Re-instatement of the intertidal and subtidal rocky reef using natural reef materials, such as the rock removed during construction, so that it would be as similar as possible to pre-existing habitat
- Design the project elements at the nearshore areas of the crossing so that they provide sufficient structural complexity to that of natural intertidal or subtidal rocky reef habitat (ie an artificial reef environment), with guidance provided by the Department of Environment and Climate Change (DECC) (2009) *Environmentally Friendly Seawalls: A Guide to Improving the Environmental Value of Seawalls and Seawall-lined Foreshores in Estuaries*.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.18 Land use and property

B12.18.1 Lease agreements

Issue raised

Pages 28, 29, 31, 33, 65, 76, 77, 80 and 83

Council requests that the conditions of approval require agreements for the occupancy of lands be submitted and approved, with relevant compensation, for the Flat Rock Drive (BL2), Punch Street (BL3), Dickson Avenue (BL3) and Barton Road (BL5) construction support sites. This should include a specific licence agreement with a map and schedule defining boundaries for potential work sites within the Willoughby local government area.

Response

Where a property is temporarily required for the construction of the project this would be managed through leasing or licencing arrangements. Lease agreements would mainly be required for temporary construction support sites and temporary works sites as identified in Table 20-3 of the environmental impact statement.

The boundaries of land temporarily needed for construction would be discussed with Council during further design development and construction planning and included in lease documentation.

The contents of lease agreements would be agreed in discussions with the landowner, including details regarding compensation where appropriate.

Leased land would be rehabilitated in consultation with the relevant landowners and/or in accordance with the urban design and landscape plan where applicable, as required by environmental management measure V1 (refer to Table D2-1 of this submissions report), and returned as soon as practicable at the completion of construction, in accordance with environmental management measure LP5. It is expected that following construction, temporary construction support sites would generally continue to be used consistent with their existing use. In addition, Transport for NSW will work closely with Council on its preferred final form of the Flat Rock Drive construction support site (BL2) in consultation with the local community, in accordance with new environmental management measure LP8 (refer to Table D2-1 of this submissions report). The site will be rehabilitated in line with the land use zoning. Vegetation and landscaping will be determined in consultation with Willoughby City Council and the community and will be implemented as soon as practicable at the completion of construction.

Specific conditions of approval related to licence agreements will be determined by the Department of Planning, Industry and Environment during their assessment of the project.

B12.18.2 Planning approvals required for E2 Environmental conservation zone

Issue raised

Pages 93 and 94

Council requests further information be provided about the appropriate planning approvals required where land in the Willoughby local government area is to be acquired, leased or otherwise used for the construction and operational phases of the project. In particular, for areas classified as E2 Environmental Conservation zoning (Flat Rock Gully and Clive Park).

Response

The project is appropriately classified as being for the purpose of a 'road' and a 'road infrastructure facility' under State Environmental Planning Policy (SEPP) (Infrastructure) 2007, as outlined in Section 2.1 of the environmental impact statement. Clause 94 of SEPP Infrastructure provides that these types of work are permissible without consent from Council.

Transport for NSW, as the proponent for the project, formed the opinion that the construction and operational impacts of the project would require the preparation of an environmental impact statement, meaning that the project falls within clause 1 of Schedule 3 of the State and Regional Development SEPP, and the project is declared State significant infrastructure. Transport for NSW has also requested that the NSW Minister for Planning and Public Spaces declare the project as critical State significant infrastructure.

As the project is declared State significant infrastructure, several approvals are not required in accordance with section 5.23 of the *Environmental Planning and Assessment Act 1979*. These approvals are outlined in Section 2.2.1 of the environmental impact statement.

Lease agreements would mainly be required for temporary construction support sites and temporary works sites and are discussed in Section B12.18.1 of this submissions report.

B12.18.3 Potential impacts to existing land uses at Flat Rock Gully

Issue raised

Pages 77, 82, 92 and 93

Willoughby City Council notes that Flat Rock Gully provides amenity that is unable to be quantified in value to the community. The area has high use by cyclists, dog walkers, joggers and the section of the community that require accessible tracks (elderly / disabled) and the amenity of the bushland environment contributes to community wellbeing. Council is concerned that the ecological integrity of the natural environment will be affected and is unable to be reinstated.

Willoughby City Council requests a condition of approval requiring a thorough assessment of the existing uses of Flat Rock Gully (including passive recreation use, wildlife corridor and vegetation rehabilitation) and that potential impacts to these uses from construction of the project are appropriately addressed.

Response

A small portion of Flat Rock Reserve would be temporarily leased for use as the Flat Rock Drive construction support site (BL2), as described in Section 21.4.4 of the environmental impact statement. The temporary construction support site would result in the temporary loss of access to and use of land within the construction footprint, temporarily disrupting the use of this land for informal recreation. Public access to areas of the reserve outside the Flat Rock Drive construction support site (BL2) would be maintained during construction. However, it is acknowledged that the amenity of these areas may be diminished during construction and may detract from the enjoyment of people visiting accessible parts of the parks or nearby facilities (discussed further in Section B12.19.4 of this submissions report).

An assessment of existing uses of the area around Flat Rock Drive construction support site (BL2) was completed and provided in Section 20.3.2 of the environmental impact statement and the value the community places on Flat Rock Reserve is acknowledged in Section 21.3.3 of the environmental impact statement. As assessment of potential impacts to terrestrial and aquatic biodiversity at Flat Rock Reserve from the temporary use of the Flat Rock Drive construction support site (BL2) was provided in Chapter 19 (Biodiversity) of the environmental impact statement. Potential impacts to

visual amenity at Flat Rock Reserve from the temporary use of the Flat Rock Drive construction support site (BL2) were assessed in Chapter 22 (Urban design and visual amenity) of the environmental impact statement.

As discussed in Table 20-5 of the environmental impact statement, the temporary use of Flat Rock Drive construction support site (BL2) site would have a negligible impact on the continued use of the wider Flat Rock Reserve area and Flat Rock Gully area for public open space and recreational use, as access to these areas would be maintained at all times during the construction and rehabilitation works, as discussed in Table 20-5 of the environmental impact statement. Upon completion, the site and adjacent areas within Flat Rock Reserve could remain zoned for environmental conservation.

In addition, in response to community feedback further assessment has been carried out to consider alternative locations for the Flat Rock Drive construction support site (BL2) including determining the feasibility of relocating Flat Rock Baseball Diamond. A comparative analysis of the social and environmental impacts of the Flat Rock Drive construction support site (BL2) and an alternative is provided in Section 2.6 of the preferred infrastructure report.

Transport for NSW understands the importance of Flat Rock Reserve to the local community and have identified a number of environmental management measures to mitigate impacts of the works (refer to Table D2-1 of this submissions report), including:

- Further refinement of the area required and layout during further design development and construction planning to avoid direct impacts on PCT 1841, where feasible and reasonable (refer to environmental management measure B1)
- Vegetation removal including the clearing of native vegetation and fauna habitat will be further minimised during further design development and construction planning to the extent reasonably practicable (refer to revised environmental management measure B6)
- Vegetation will be re-established within the construction footprint, where feasible, in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011a) (refer to environmental management measure B13)
- Land subject to temporary use, including areas of public open space, will be rehabilitated and restored as soon as practicable to an appropriate condition, taking into consideration the location, land use characteristics, area and adjacent land uses or in accordance with the urban design and landscape plan where applicable (refer to environmental management measures LP5 and V11)
- Construction support sites will be developed to minimise visual impacts for adjacent receivers to the extent reasonably practicable (refer to revised environmental management measure V2)
- Site hoardings will be in neutral colours and designs, in proximity to open space, to help them blend into surrounding environment (refer to environmental management measure V4)
- Hoardings and temporary noise walls will be erected as early as possible within the site establishment phase to provide visual screening (refer to environmental management measure V7).

In addition, Transport for NSW will rehabilitate the temporary construction support site once the project is completed. Transport for NSW will work closely with Willoughby City Council on its preferred final form of the Flat Rock Drive construction support site (BL2) in consultation with the local community in accordance with new environmental management measure LP8 (refer to Table D2-1 of this submissions report) and as discussed in more detail in Section B12.20.3 of this submissions report. The site will be rehabilitated in line with the land use zoning. Vegetation and landscaping will be determined in consultation with Willoughby City Council and the community and will be implemented as soon as practicable at the completion of construction.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.18.4 Use of council land for Barton Road construction support site (BL5)

Issue raised

Page 94

Transport for NSW's proposal to use land on Barton Road for the Barton Road construction support site (BL5) would interfere with, and delay, Willoughby City Council's intent to develop the land for affordable housing, therefore Council recommend this site not be used. However, if this cannot be avoided, Council requests early and ongoing engagement regarding the temporary use of this site, to ensure it is returned to Council control as soon as possible.

Response

The location and configuration of the temporary construction support sites were informed by the project's construction requirements, as well as environmental investigations and community and stakeholder feedback, as outlined in Section 4.5.7 of the environmental impact statement. Key objectives when selecting these sites were to minimise environmental and community impacts, while suitably locating the sites to facilitate project construction activities.

The Barton Road construction support site (BL5) was selected to support construction of the project as it currently is an undeveloped land parcel, located immediately adjacent to proposed Gore Hill Freeway connection works, making it ideal for equipment laydown facilities, car parking for construction workers and temporary site office buildings associated with the works. The site is also partially owned by Transport for NSW, and has access to Reserve Road and the Gore Hill Freeway via Barton Road and Butchers Lane.

Key features of the Barton Road construction support site (BL5) are described in Section 6.8.2 and Table 6-17 of the environmental impact statement. An indicative layout of the site and an indicative construction program for its use are provided in Figure 6-34 and Table 6-18 of the environmental impact statement respectively.

Where land is temporarily needed for the construction of the project, including land to be leased from Council for the Barton Road construction support site (BL5), it would be rehabilitated in consultation with the landowner and returned as soon as practicable at the completion of construction, in accordance with Section 20.4.1 of the environmental impact statement. This consultation would continue to be carried out with Willoughby City Council throughout further design development and construction planning for the project, as outlined in Section B12.5.3 of this submissions report and Appendix E (Community consultation framework).

B12.18.5 Details of property acquisition

Issue raised

Page 93

Private properties would be acquired for the project in the Artarmon industrial area, and the acquisition, lease or other use of Council land is proposed at various locations in Artarmon and elsewhere. Indicative maps are provided but with little detail. Council requests further detail be provided for all properties in Willoughby local government area intended to be acquired, leased and/or used during both the construction and operational phases of the project. Council also requests that Transport for NSW consult on issues which may affect these properties and engage in early and meaningful consultation with Council to manage these impacts.

Response

The properties expected to be acquired for the project in the Artarmon area are shown in Table 20-2, Figure 20-6 and Figure 20-7 of the environmental impact statement. Properties which are expected to be leased for construction of the project are summarised in Table 20-3 of the environmental impact statement.

Further detail would be provided to Council following further design development, confirming the Council owned properties which the project would require to be acquired or leased. Where the project proposes to acquire a property not owned by Council within the Artarmon area, Transport for NSW would engage directly with the property owner and in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, the *Roads and Maritime Services Land Acquisition Information Guide* (Roads and Maritime Services, 2014), *Fact sheet: Property acquisition of subsurface lands* (Roads and Maritime Services, 2015d) and the land acquisition reforms announced by the NSW Government in 2016, in accordance with environmental management measure LP3 (refer to Table D2-1 of this submissions report).

The project would continue to engage and consult with Council during further design development and construction of the project, as outlined in Appendix E (Community consultation framework) and in accordance with environmental management measure SE3 (refer to Table D2-1 of this submissions report). It is expected that some aspects of the project's construction would require specific communication and/or management strategies due to the nature of the potential impact and/or stakeholder group. Any such strategies would be guided by this framework and managed through the community communication strategy to be development in accordance with Appendix E (Community consultation framework).

B12.19 Socio-economics

B12.19.1 Impacts to equity

Issue raised

Page 95

Council anticipates that impacts to equity would be more acutely experienced by those communities closest to surface works, temporary construction support sites, or occupants of properties above the tunnel alignment. Potential equity impacts would mainly relate to construction noise, dust and vibration, affecting the amenity and liveability of the area, as well as changes in local access and connectivity.

Response

Equity impacts during construction of the project are discussed in Section 21.4.2 of the environmental impact statement. As noted by Council, during construction potential equity impacts would mainly relate to construction noise, dust and vibration affecting the amenity and liveability of the area, as well as changes in local access and connectivity. These impacts would be relatively short-term and localised to discrete locations as construction activities at each temporary construction support site would be comparatively less than the overall construction program. The overall significance of potential impacts on equity during construction is considered moderate, with the sensitivity of affected residents and the magnitude of change considered to be moderate.

Construction impacts would be managed through the implementation of environmental management measures provided in Table D2-1 of this submissions report, including:

- Standard construction air quality mitigation and management measures will be detailed in construction management documentation and implemented during construction. This will include dust suppression and/or management measures, selection of construction equipment, materials and management measures to minimise dust generation, and site inspections to monitor the effectiveness of implemented measures (refer to revised environmental management measure AQ1)
- A construction noise and vibration management plan will be developed for the project which will include relevant criteria and management levels in relation to noise and vibration, additional standard mitigation measures, protocols to manage works required outside standard construction hours, and the approach to managing construction noise impacts (refer to revised environmental management measure CNV1)
- The community will be notified in advance of proposed transport network changes, and maritime restrictions through appropriate media and other appropriate forms of community liaison (refer to environmental management measure CTT7)
- Directional signage, barriers and/or linemarking will be used as required to direct and guide motorists, cyclists and pedestrians past construction sites and on the surrounding network. This will be supplemented by Variable Message Signs to advise all road users of potential delays, traffic diversions, speed restrictions or alternative routes (refer to environmental management measure CTT10)
- Where impacts to private property access are unavoidable during construction, landowners or lease holders/tenants where appropriate will be consulted in advance to develop appropriate alternative access arrangements (refer to environmental management measure LP6).

Refer to Section B12.10 (air quality (including construction dust)), Section B12.8 (construction noise and vibration) and Section B12.6 (construction traffic) of this submissions report above for further discussion as to how these impacts would be managed.

B12.19.2 Equity of access

Issue raised

Page 95

Willoughby City Council seeks a condition of approval requiring that the construction environmental management plan prepared for the project details how access, and equity of access for all levels of mobility will be retained around construction sites and that council and the community are provided with specific details of how access will be managed around the construction support sites.

Response

The construction environmental management framework for the project would include a construction environmental management plan and various sub-plans addressing specific issues, as outlined in Section 28.5 of the environmental impact statement. One of the nominated sub-plans is a traffic and transport management plan which would address traffic, safety and access around the works and temporary construction support sites for all road users, including pedestrians and cyclists. The content and purpose of the traffic and transport management plan would be developed in consultation with relevant stakeholders as determined by the Department Planning, Industry and Environment.

The design of temporary construction support sites, including management of pedestrian access around the site, would be designed to operate safely and efficiently in accordance with relevant Austroads guidelines, Transport for NSW standards and Australian Standards.

Review and approval of detailed traffic management plans would be carried out by relevant stakeholders and subject matter experts. Vehicle movements to and from construction sites will be managed to ensure pedestrian, cyclist and motorist safety and amenity, as required by environmental management measure CTT9 (refer to Table D2-1 of this submissions report). Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence. The community will be notified in advance of proposed transport network changes, and maritime restrictions through appropriate media and other appropriate forms of community liaison, in accordance with environmental management measure CTT7 (refer to Table D2-1 of this submissions report).

During construction, temporary closures or changes to pedestrian and cycle paths would be needed near construction works for the safety of pedestrians and cyclists. Existing connectivity for users of these facilities would be maintained, as noted in Section 21.4.8 of the environmental impact statement. The need for temporary access arrangements (for example, diversion of shared user paths) would be minimised in accordance with revised environmental management measure CTT15 (refer to Table D2-1 of this submissions report). Any detours and adjustments will be designed with consideration of user safety and convenience.

The traffic management plan would also incorporate relevant construction traffic and transport environmental management measures provided in Table D2-1 of this submissions report.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.19.3 Impacts to businesses from construction activities and acquisition

Issue raised

Pages 52, 96 and 97

Construction activity would be a source of noise, vibration and increased on-road traffic activity possibly impacting businesses near construction activities. The acquisition of businesses in the Artarmon industrial area could have an immediate impact on the vitality and viability of the industrial area during the construction phase and post construction, especially those with a high need for servicing and delivery, and the need for quiet environments.

Willoughby City Council seeks several conditions of approval in relation to the management of potential project-related business and economic impacts, including that Transport for NSW investigate and provide detailed analysis of:

- Potential impacts to the operation and livelihood of businesses within the Willoughby local government area and where impacts are identified, describe the nature and extent of those impacts and how they will be managed, including any compensation proposed. This should also include the likely construction and operation phase economic benefits of the project
- The turnover and vacancy rates of business premises in the Artarmon industrial area to ensure the vitality and viability of the area is maintained during the construction phase of the project.

Council also notes that there may be an impact on the use of Middle Harbour for businesses and residents of Willoughby local government area that are boat owners/users. Consultation and advanced notice is requested for potentially impacted businesses and waterway users to minimise financial loss, inconvenience, safety and access impacts due to establishment and use of the Middle Harbour cofferdam construction support sites (BL7 and BL8).

Response

Artarmon industrial area

Potential construction impacts on businesses are outlined in Section 21.4.7 of the environmental impact statement. These impacts would be temporary in nature and there may also be benefits for some businesses due to increased passing trade and business exposure. Potential changes to the business environment within the Artarmon industrial area during construction was considered to have a low sensitivity, magnitude and significance (refer to Table 6-5 of Appendix U (Technical working paper: Socio-economic assessment)). Overall, construction is not expected to affect ongoing centre or business performance in the Artarmon industrial area, as noted in Table 6-2 of Annexure A of Appendix U (Technical working paper: Socio-economic assessment).

The project has been designed and developed to minimise property acquisition and has prioritised the use of NSW Government land where possible. Notwithstanding this, some temporary use and permanent acquisition of properties would be needed. It is expected that 12 private commercial properties would be permanently acquired within the Artarmon industrial area as outlined in Section 20.4.1 of the environmental impact statement. Businesses required to close or relocate due to the project are predominantly commercial, light industrial or speciality services, including a media and production company, swim school and beauty college, and are located in the Artarmon industrial area. These businesses would service a wider area and would likely employ a small number of workers. Due to the nature of these businesses and the fixed supply of alternative industrial zoned land in the surrounding area, these businesses may need to relocate to another trade catchment. This would result in relocation and establishment costs with potential loss in trade and revenue during this time.

Of the businesses affected by property acquisitions, there are limited co-dependencies or synergies between those that would be acquired and those that would remain operational in the surrounding catchment. Therefore, the operation of remaining businesses is not expected to be substantially affected by these changes.

Overall, the number of acquisitions and businesses required to cease operation to facilitate the project is relatively low for an infrastructure project of this scale. Although the impact on individual businesses may be substantial, the compensation process is generally designed to reduce this impact. Refer to the business impact assessment in Annexure A of Appendix U (Technical working paper: Socio-economic assessment) for further details.

Environmental management measures that will be implemented to minimise potential impacts to businesses are specified in Table D2-1 of this submissions report and include:

- Where businesses are affected by property acquisition, or lease cessation, the acquisition and compensation process will be implemented in line with the *Determination of compensation following the acquisition of a business guideline*. Compensation for a business conducted on land that is acquired will be determined in accordance with *the Land Acquisition (Just Terms Compensation) Act 1991* as relevant (environmental management measure BU1)
- Specific consultation will be carried out with businesses potentially impacted during construction. Consultation will aim to identify specific potential construction impacts for individual businesses (environmental management measure BU2)
- Based on consultation with businesses, specific feasible and reasonable measures to maintain business access, visibility and, parking and address other potential impacts as they arise through the construction phase will be identified and implemented. A phone hotline that enables businesses to find out about the project or register any issues will be maintained (environmental management measure BU3).

Other environmental management measures will also help with managing potential impacts, including noise and vibration, and traffic and transport measures, refer to Table D2-1 of this submissions report.

The potential impacts upon businesses, including those in the Artarmon industrial area, during operation of the project are outlined in Section 21.5.6 of the environmental impact statement. The sensitivity, magnitude and significance of potential changes to the business environment within the Artarmon industrial area was considered to be low during operation of the project (refer to Table 6-6 of Appendix U (Technical working paper: Socio-economic assessment)). The operation of the project may result in benefits for businesses within the Artarmon industrial area due to improved business visibility as a result of increased traffic at these locations, as noted in Section 21.5.6 of the environmental impact statement. Additionally, operation of the project would create more efficient and reliable travel times for freight services between the Artarmon industrial area and the greater Northern Beaches region, improving access to customers and suppliers.

Middle Harbour businesses

The environmental impact statement has considered the environmental, social and economic impacts that may result from the project, including impacts to maritime traffic and impacts on businesses, commercial operations and other harbour recreational users.

Engagement with Willoughby City Council, sporting groups and the community will occur as outlined in Appendix E (Community consultation framework) and as discussed further in Section B12.5.3 of this submissions report. This includes engagement with business owners and tenants next to temporary construction support sites and other project facilities, as outlined in Table 6-1 of Appendix E (Community consultation framework). Consultation will be continued with surrounding water based users of Middle Harbour including Mosman Rowing Club and Northbridge Sailing Club to minimise construction impacts, in accordance with revised environmental management measure CTT16 (refer to Table D2-1 of this submissions report). The community will be notified in advance of proposed transport network changes, and maritime restrictions through appropriate media and other appropriate forms of community liaison, in accordance with environmental management measure CTT7 (refer to Table D2-1 of this submissions report). In addition, construction of Middle Harbour north and south cofferdam temporary structures (BL7 and BL8) would include establishment of appropriately controlled marine traffic exclusion zones needed to ensure the safety of both the waterway users and the project's construction workforce. Construction marine traffic activities will be scheduled to avoid times and locations of high recreational marine traffic where feasible and reasonable, in accordance with revised environmental management measure CTT4 (refer to Table D2-1 of this submissions report).

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.19.4 Impacts to enjoyment of Flat Rock Reserve

Issue raised

Page 96

Council is concerned that clearing of trees at Flat Rock Drive construction support site (BL2) would be required and amenity of other areas outside of the site would be diminished during construction and may detract from the enjoyment of people visiting accessible parts of the parks or nearby facilities.

Response

A small portion of Flat Rock Reserve would be temporarily leased for use as the Flat Rock Drive construction support site (BL2), and clearing of trees would be required to establish the site. Clearing of older, more established trees would be avoided where possible.

The socio-economic impact of clearing trees at the Flat Rock Drive construction support site (BL2) is assessed in Table 21-5 of the environmental impact statement. The loss of trees would temporarily impact on the landscape and visual amenity of Flat Rock Reserve until new trees or landscaping or other recreation facilities become established. The clearing of trees in the reserve is also likely to be a concern for the local community. The amenity of other areas outside of the Flat Rock Drive construction support site (BL2) would be diminished during construction and may detract from the enjoyment of people visiting accessible parts of the parks or nearby facilities.

Construction support sites will be developed to minimise visual impacts for adjacent receivers to the extent reasonably practicable, in accordance with environmental management measure V2 (refer to Table D2-1 of this submissions report). Further, existing trees adjacent to the works will be retained and protected where possible to screen construction works in accordance with environmental management measure V9 (refer to Table D2-1 of this submissions report).

Following construction, areas affected by construction and not required for the ongoing operation of the project would be rehabilitated and/or re-purposed, including with replacement trees and landscaping, with potential landscape and visual amenity impacts diminishing as the new trees or landscaping becomes established. Transport for NSW will work closely with council on its preferred final form of the Flat Rock Drive construction support site (BL2) in consultation with the local community, in accordance with new environmental management measure LP8 (refer to Table D2-1 of this submissions report). The site will be rehabilitated in line with the land use zoning. Vegetation and landscaping will be determined in consultation with Willoughby City Council and the community and will be implemented as soon as practicable at the completion of construction.

B12.20 Urban design and visual amenity

B12.20.1 Strategic urban design

Pages 98 and 99

Issue raised

Willoughby City Council is concerned that the urban design of the project does not appear to have been given the level of status required within *Beyond the Pavement* (Transport for NSW, 2020a) and has been largely relegated to the materiality of the screen and facade for proposed project elements. An example of this is the 'Strategic concept design adopted for project motorway facilities' (refer to Section 3.4.6 of Appendix V (Technical working paper: Urban design, landscape character and visual impact)), where the facility is treated with a façade to address 'urban design' quality. This is not the approach advocated by the NSW Government Architect.

Response

The development of the strategic urban design for the project has been informed by the design principles within *Beyond the Pavement* (Transport for NSW, 2020a), including:

2) Contributing to urban structure, urban quality and economy
3) Fitting with built fabric
4) Connecting modes and communities and promoting active transport

5) Fitting with the landform
6) Contributing to green infrastructure and responding to natural systems
7) Connecting with Country and incorporating heritage and cultural contexts into projects
8) Designing an experience in movement
9) Designing self explaining roads that safely respond to their role and context
10) Achieving integrated and minimal maintenance design.

The NSW Government Architect has commented that "*Beyond the Pavement* has through two decades remained relevant, practical and achieved substantial results in the work carried out in the cities and regions of NSW. Good design outcomes and an integrated approach to our transport infrastructure is of vital importance to us all. This new version refreshes the approach and continues the good work."

While the urban design for the project has been guided by *Better Placed* (NSW Government Architect, 2017a), the NSW Government Architect's policy which provides direction for high quality design in an urban environment, it is acknowledged that the objectives in this document are not specific to transport projects and they have been translated into the objectives, requirements and principles in *Beyond the Pavement* which have informed the project's strategic urban design.

Appendix V (Technical working paper: Urban design, landscape character and visual impact) provides an overview of the urban design principles and requirements for each of the project elements. The design principle for motorway facilities, ventilation outlets and the motorway control centre is to 'Minimise the physical footprint and visual impact of these structures while ensuring they are designed as high quality pieces of well integrated architecture.' While screening and the design of the façade have been considered to achieve this principle, the design is also required to locate facilities where they have a strong visual tie with the road corridor, maximise opportunities to return residual land as public open space which is not fenced off, provide walking and cycling connections to the facilities and minimise opportunities for vandalism.

B12.20.2 Design Review Panel

Pages 100 and 101

Issue raised

Council note that as the project is considered State significant infrastructure it will be subject to review and consideration by the State Design Review Panel. Council supports the role that the State Design Review Panel plays in providing independent design advice where critical issues may be raised and addressed to ensure the highest standards of design quality are delivered throughout the planning and design process and delivery.

Council notes that Design Excellence and Design Review in the Willoughby local government area is guided by the *Willoughby Design Excellence Policy*, as well as the *Northern Sydney Regional Organisation of Councils (NSROC) - Design Review Panel Terms of Reference*. Where this project requires a planning proposal or amendment to the Willoughby Local Environmental Plan, Transport for NSW should be aware that the Design Excellence Clause would be applied.

Response

A design review panel has been established for the project to provide independent review and advice throughout design development, and support the current environmental impact statement phase design of the project, as outlined in Section 1.7.1 of Appendix V (Technical working paper: Urban design, landscape character and visual impact). As the urban design is further developed it

would be subject to continued review and endorsement by this review panel, who would ensure that as the design of individual components develop, they are delivered in accordance with the urban design principles and guidelines contained within the environmental impact statement.

The project is appropriately classified as being for the purpose of a 'road' and a 'road infrastructure facility' under State Environmental Planning Policy (SEPP) (Infrastructure) 2007, with Clause 94 providing that these types of work are permissible without consent from Council, as discussed in Section B12.18.2 of this submissions report.

B12.20.3 Post-construction use of Flat Rock Drive construction support site (BL2)

Issue raised

Pages 77, 91, 96, 97, 98 and 100

Noting that all of the vegetation within the footprint of the proposed Flat Rock Drive construction support site (BL2) would be removed, Council is concerned that post-construction, the area may be considered as being suitable for alternative use (such as additional structured/regulated recreation or car parking). Recognising differing community views on the post-construction use of the Flat Rock Drive construction support site (BL2), Willoughby City Council requests that Transport for NSW engage in early and meaningful consultation with Council and the community to agree on post-construction options for this and other temporary construction support sites, including design of urban design and landscape elements.

Willoughby City Council seeks a condition of approval requiring the re-instatement of the capping/topsoil at Flat Rock Reserve construction support site (BL2) prior to use of crushed sandstone as a contoured base for re-establishment of locally indigenous vegetation and other landscape and infrastructure elements, while ensuring soil pH levels are correct for each area.

Response

Where land is temporarily required for the construction of the project, including land to be leased from council for the Flat Rock Drive construction support site (BL2), it would be rehabilitated in consultation with the landowner and returned as soon as practicable at the completion of construction, in accordance with Section 20.4.1 of the environmental impact statement and environmental management measure LP5 (refer to Table D2-1 of this submissions report). This consultation would continue to be carried out with Willoughby City Council throughout further design development and construction planning for the project as outlined in Section B12.5.3 of this submissions report and Appendix E (Community consultation framework). The rehabilitation of the site will take into consideration the location, land use characteristics, area and adjacent land uses or will be in accordance with the urban design and landscape plan where applicable (refer to environmental management measure V1), in accordance with environmental management measure LP5 (refer to Table D2-1 of this submissions report).

Transport for NSW acknowledges Council's concerns and notes that there may be differing community views on the post-construction use of the Flat Rock Drive construction support site (BL2). Therefore a new environmental management measure LP8 has been developed as follows (refer to Table D2-1 of this submissions report) to further describe consultation which would be carried out with Council for the rehabilitation of the Flat Rock Drive construction support site (BL2):

> Transport for NSW will work closely with Willoughby City Council on its preferred final form of the Flat Rock Drive construction support site (BL2) in consultation with the local community. The site will be rehabilitated in line with the land use zoning. Vegetation and landscaping will be determined in consultation with Willoughby City Council and the community and will be implemented as soon as practicable at the completion of construction.

B12.20.4 Place, design and landscape plan

Issue raised

Pages 91, 96, 97 and 98

Willoughby City Council recommends the conditions of approval include the requirement for a place, design and landscape plan to be prepared and implemented to inform the final design of the project and to give effect to outcomes of any design review.

Response

A strategic urban design framework has been prepared for the project with reference to the urban design principles in *Beyond the Pavement* (Transport for NSW, 2020a) (refer to Chapter 22 (Urban design and visual amenity) of the environmental impact statement and Appendix V (Technical working paper: Urban design, landscape character and visual impact)). A design review panel has also been established for the project to provide independent review and advice throughout design development and support the current environmental impact statement phase design of the project (refer to Section B12.20.2 of this submissions report). As the urban design is further developed it would be subject to continued review and endorsement by this review panel, who would ensure that as the design of individual components develop, they are delivered in accordance with the urban design principles and guidelines contained within the environmental impact statement.

The urban design and landscape plan for the project will be updated during further design development and implemented in line with the strategic urban design framework for the project in accordance with environmental management measure V1 (refer to Table D2-1 of this submissions report). The plan will detail built and landscape features to be implemented during construction and rehabilitation of disturbed areas during construction of the project. It will be made available to the public for feedback.

Specific conditions of approval related to the development of a place, design and landscape plan will be determined by the Department of Planning, Industry and Environment during their assessment of the project.

B12.21 Hazards and risks

Issue raised

Page 102

Willoughby City Council suggests that hazards and risks are to be addressed through Transport for NSW's own risk assessment and management plans and the requirement for these plans is included in the conditions of approval for the project.

Response

An environmental risk analysis for the project has been carried out as part of the environmental impact statement and is included in Appendix C (Environmental risk analysis). The risk analysis has identified several 'medium' level residual risks. No potential impacts with a residual risk rating of 'high' were identified for the project. The proposed approach to the management of 'medium' level residual risks is provided in Section 28.4.3 of the environmental impact statement. Where 'medium' level residual risks are considered to still be likely after further design development, additional refined environmental management measures would be developed, where appropriate, to ensure those risks are suitably mitigated.

An appropriate process of continuous improvement would be applied to 'low' level residual risks to address potential impacts during construction and operation as far as is reasonable and feasible.

An environmental management plan framework for the project is discussed in Section D1 of this submissions report and Section 28.5 of the environmental impact statement. A construction environmental management plan would be prepared for the project and would be reviewed and approved by Transport for NSW and the Department of Planning, Industry and Environment, prior to the start of main construction work. It would provide the overarching framework for construction environmental management and would include an environmental risk and opportunities methodology.

Specific conditions of approval are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.22 Resource use and waste management

B12.22.1 Request for a waste minimisation and management plan

Issue raised

Page 105

Willoughby City Council notes that waste avoidance should be the focus for waste management, with landfill disposal the last option. Council seeks a condition of approval that requires the preparation of a waste minimisation and management plan prior to the commencement of works. The waste minimisation and management plan should include strict conditions regarding the transport of contaminated waste and agreed with Council. Council requests a copy of the final waste minimisation and management plan well prior to the commencement of construction.

Response

The resource management hierarchy principles established under the *Waste Avoidance and Recovery Act 2001* of avoid/reduce/reuse/recycle/dispose will be applied during project construction, as required by environmental management measure WM2 (refer to Table D2-1 of this submissions report).

A construction waste management plan will be prepared and implemented during construction as required by environmental management measure SG12 (refer to Table D2-1 of this submissions report). The plan will include but not be limited to procedures for handling and storing potentially contaminated substances.

The construction environmental management plan for the project would likely include the waste management plan as a sub-plan (refer to Section D1 of this submissions report). The plan would include a hierarchy for waste avoidance and resource recovery as well as procedures for storage and handling of potentially contaminated materials, including monitoring and inspection requirements and record keeping.

The management measures for handling, management, transport and disposal of waste, including contaminated materials, are provided in Section 24.6 of the environmental impact statement and as required by environmental management measures WM1 to WM12 (refer to Table D2-1 of this submissions report).

Haulage routes for construction vehicles carrying spoil, including contaminated materials, would be outlined in the construction traffic and transport management sub-plan. The transport of contaminated material would be carried out in a controlled manner, using equipment that is fit for purpose, by experienced and licenced contractor/s.

Specific conditions of approval, including the requirement for consultation with various authorities regarding specific management plans, is a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B12.23 Climate change and greenhouse gas

Issue raised

Page 106

Willoughby City Council recommended that public transport-focused alternatives with lower climate impacts be considered to ensure consistency with Council's overall strategic intentions regarding climate change and improved resilience, in particular as defined in *Our Green City Plan 2028 – Sustainability Action Plan*.

Council note they recently declared a climate emergency. Council is concerned that, based on the climate and sustainability data detailed in the environmental impact statement, the project is not consistent with this declaration. Council believes that the project is entrenching car dependency and would generate significant carbon dioxide emissions and any reduction in emissions due to greater uptake of electric vehicles would take decades to realise.

Response

The Beaches Link and Gore Hill Freeway Connection project forms part of a complementary integrated multi-modal strategy being implemented by the NSW Government to deliver an integrated transport network. There would be an expected reduction in congestion as a result of the project and improvements in fuel efficiency and increases in electric vehicles which are projected to result in improvements to the overall efficiency of emissions, as outlined in Section 26.2.4 of the environmental impact statement.

The project would increase the number of road links across the network, but in doing so would help reduce greenhouse gas emissions by reducing congestion, thereby reducing vehicle stop and start movements and increasing average vehicle speed (increasing vehicle efficiency). Reducing congestion on strategic bus corridors, including the Military Road corridor, would help improve travel time reliability for public transport customers, encouraging a modal shift to public transport, which would also help in reducing greenhouse gas emissions.

The estimated operational emissions for the project would represent about 0.03 and 0.04 per cent of projected NSW emissions in 2027 and 2037 respectively. Notwithstanding, environmental management measure GHG1 (energy efficiency in design) would be implemented to further minimise greenhouse emissions during the operation of the project (refer to Table D2-1 of this submissions report).

Council's *Our Green City Plan 2028 - Sustainability Action Plan* responds to four key community priorities to reduce carbon and greenhouse gas emissions; promote sustainable lifestyles and practices; enhance, protect and respect waterways, bushland, nature, wildlife and ecological systems; and reduce energy, water and resource waste and encourage reuse and recycling. The outcomes of the project are consistent with Council's plan and the community's priorities with:

- An anticipated reduction in greenhouse gas emissions by reducing congestion, thereby reducing vehicle stop and start movements and increasing average vehicle speed
- Reduced congestion on strategic bus corridors which would help improve travel time reliability for public transport customers, encouraging a modal shift to public transport

- The configuration of the surface roads and ramps at the Gore Hill Freeway Connection component are designed to enable high quality bus connectivity between the Beaches Link tunnels and St Leonards, and strategic centres to the north-west via the Lane Cove Tunnel
- The wastewater treatment plant located at the Gore Hill Freeway in the Artarmon industrial area, to treat water collected within the Beaches Link tunnels. It would be designed to minimise the impact on downstream water quality, treating the wastewater to comply with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ, 2000) and the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018)
- The project's ventilation systems would be designed and operated in compliance with strict air quality criteria and any conditions of approval set by the Department of Planning, Industry and Environment
- A Sustainability Management Plan would be developed and implemented to help in achieving 'Design' and 'As Built' ratings of Excellent under the Infrastructure Sustainability Council rating scheme, in accordance with revised environmental management measure SU2 (refer to Table D2-1 of this submission report).

In addition, the NSW Government has demonstrated its commitment to effective action on climate change through the *NSW Climate Change Policy Framework* (OEH, 2016a), which outlines long-term objectives to achieve net-zero emissions by 2050 and to make NSW more resilient to a changing climate. Under this framework the NSW Government developed the *Electric and Hybrid Vehicle Plan* (NSW Government, 2019b), which identifies actions for the next five years focussed on three vehicle availability, charging points and customer information.

In June 2021 the NSW Government also announced its Electric Vehicle Strategy, which aims to drive sales of electric vehicles to more than 50 per cent of new car sales by 2030-31 and transition the entire NSW government passenger fleet to electric vehicles by 2030. Furthermore, the NSW Government is committed to transition to zero emission buses, delivering more sustainable outcomes for the community. Further detail on these initiatives is included in Section C25 and Section C28.11 of this submissions report.

B12.24 Cumulative impacts

B12.24.1 Planning proposal for Walter Street at Willoughby

Issue raised

Pages 107 and 108

Willoughby City Council requests that Transport for NSW provides a brief assessment of the cumulative impacts of the project in relation to the planning proposal for Walter Street at Willoughby, which would involve a significant uplift in residential density.

Response

The Willoughby Local Environmental Plan 2012 was amended and published in March 2021 to rezone land at 1-31 Walter Street and 452-462 Willoughby Road at Willoughby from R3 Medium Density Residential to R4 High Density Residential in line with Planning Proposal PP-2020-535 (Council reference 2020/002). The rezoning is likely to result in a housing yield of about 255 units. All vehicle access would be from Walter Street.

The preparation and exhibition of the environmental impact statement pre-dates publication of the amendment to the local environmental plan.

While the Walter Street developments would result in an increase in vehicles to/from the site during construction, there are no temporary construction support sites near the subject land. Furthermore, Walter Street is a cul-de-sac and does not offer access to the surrounding road network beyond a direct connection to Willoughby Road, a road not proposed for use by construction vehicles as part of the Beaches Link and Gore Hill Freeway Connection project.

If constructed, the site would yield a considerable increase in dwellings and resultant vehicle movements. However, access would be from Walter Street, and not directly to roads associated with the project (either during construction or operation).

Individual development applications are yet to be submitted and approved for the site. Nonetheless, should development of the site start during the Beaches Link and Gore Hill Freeway Connection project construction period, the number and frequency of vehicles is not expected to have a material effect on modelled construction traffic impacts and no material cumulative impacts are expected.

Furthermore, community and stakeholder engagement (refer to Section B12.5.3 of this submissions report and Appendix E (Community communication framework)), in combination with the preparation of a construction traffic management plan (refer to Section B12.6.5 of this submissions report) and the environmental management measures identified in Table D2-1 of this submissions report would address potential cumulative construction traffic issues.

B12.24.2 Management of cumulative impacts

Issue raised

Pages 43, 107 and 108

Willoughby City Council seeks a condition of approval requiring that Transport for NSW engage in early, meaningful and collaborative consultation with Council to ensure that cumulative impacts of the project can be adequately managed in relation to significant other projects underway or planned in the Willoughby local government area including:

- Sydney Metro City & Southwest (Chatswood to Sydenham) – under construction 2017-2024
- Former Channel 9 site (Willoughby) staged residential development – currently under construction 2021
- Willoughby Leisure Centre - alterations and additions to existing pool hall (DA-2021/22) – lodged 25 January 2021, not yet determined
- Planning Proposal for Walter Street at Willoughby (Council reference PP-2020/002, Department of Planning, Industry and Environment reference PP-2020-535) – date of publication 5 February 2021.

Response

Transport for NSW would continue with extensive, meaningful engagement with stakeholders and the community during all phases of the project.

As outlined in Section B12.5.3 of this submissions report and Appendix E (Community consultation framework), a community communication strategy will be developed that will guide engagement with Council on potential cumulative impact mitigation strategies and other matters.

The implementation of environmental management measures for the project would avoid, to the greatest extent possible, cumulative impacts with surrounding development. Multi-party engagement and cooperation will be established prior to construction to coordinate with various projects to manage construction fatigue impacts where possible including Western Harbour Tunnel and Warringah Freeway Upgrade, Sydney Metro City & Southwest, Channel 9 site staged residential

redevelopment and the Willoughby Leisure Centre pool area upgrades in accordance with revised environmental management measure CI2 (refer to Table D2-1 of this submissions report). Refer to Section 26.1 of this submissions report for more information about the potential impacts associated with the proposed upgrade of the Willoughby Leisure Centre by Council.

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B13 – Mosman Council

November 2021

B13 Mosman Council

Contents

B13.1 Support

Issue raised

Page 1

Mosman Council provides in principle support for the Beaches Link and Gore Hill Freeway Connection project.

Response

Mosman Council's support for the project is acknowledged.

B13.2 Military Road/Spit Road corridor improvements

B13.2.1 Project description

Issue raised

Page 2

Mosman Council is concerned that the environmental impact statement does not identify opportunities to improve the 'place' function of the Military Road/Spit Road corridor.

The *Mosman Local Strategic Planning Statement* (Mosman Council, 2020) identifies that the Western Harbour Tunnel and Beaches Link program of works offers the opportunity to revitalise the Military Road/Spit Road corridor, to improve amenity for residents and businesses, reduce traffic congestion and facilitate greater access for cycling, walking and public transport. The *Mosman Local Strategic Planning Statement* includes the planning priorities and actions for Council to reimagine the Military Road/Spit Road corridor, advocate that the project include measures to improve amenity in the corridor and collaborate with councils, Transport for NSW and the community on revitalising the corridor.

Mosman Council would like to take the project as an opportunity to revitalise the Military Road/Spit Road corridor and request that the Military Road/Spit Road corridor improvements be included in the overall project proposal.

Response

The Beaches Link and Gore Hill Freeway Connection project seeks to improve transport functionality, urban amenity and safety in local centres by reducing congestion, through traffic and 'rat runs', including reducing traffic volumes and congestion on the Military Road/Spit Road corridor. Analysis of the modelled forecast traffic demands across Middle Harbour with the project in 2037 indicates that peak period traffic demand on Military Road and Spit Road would decrease as a result of the project by up to 11 per cent and 33 per cent respectively, and daily traffic demand expected to decrease by about 62 per cent (refer to Section B13.2.2 below). The varying percentage changes in traffic demand which are anticipated for the Military Road/Spit Road corridor are due to a variety of factors including:

- Existing traffic demands and volumes differ between Military Road and Spit Road, which consequently influences the percentage change for each road
- Military Road has alternative parallel routes whereas there are no such alternative parallel routes for Spit Road in the immediate vicinity of the Spit Bridge. Therefore reduced traffic demand for the Military Road corridor is also shared with alternative parallel routes such as Ourimbah Road and Kurraba Road

- Reduced 'rat-running' is expected for the alternative parallel routes to Military Road, with through traffic better suited to Military Road and currently 'rat-running traffic' returning to Military Road. While this offsets some of the direct demand reduction benefits to Military Road, it provides further benefits to the alterative parallel routes which traverse primarily residential areas.

By reducing traffic volumes and congestion on the Military Road/Spit Road corridor the project benefits align with the *Mosman Local Strategic Planning Statement* (Mosman Council, 2020), which identifies the planning priority of reimagining the Military Road/Spit Road corridor to improve function, amenity and accessibility in response to the Western Harbour Tunnel and Beaches Link program of works. The project would also support the objectives in the *Military Road Corridor Planning Study – Stage 1* (North Sydney Council, 2021) though the benefit of reduced traffic volumes and congestion along the Military Road/Spit Road corridor, enhancing the connectivity and amenity of Military Road.

The project creates an opportunity to reimagine Military Road and how this movement corridor services the lower North Shore and Northern Beaches. As the project design is further developed it would seek to maintain opportunities for the Military Road/Spit Road corridor identified under the *Mosman Local Strategic Planning Statement* and the *Military Road Corridor Planning Study – Stage 1*.

The project would enable other divisions of Transport for NSW and other agencies (including Council) to explore opportunities for urban renewal, public transport, active transport and changes to transport management on key corridors, including the Military Road/Spit Road corridor. This includes working with local councils and other government stakeholders to develop a place based transport plan for the lower North Shore, which would identify potential transport opportunities to respond to the changing needs of the community, including movement types, and initiatives for mode shift and network operation across all transport modes. Transport for NSW will commence engagement with Mosman Council, North Sydney Council, Willoughby City Council and Lane Cove Council on this plan in the last quarter of 2021.Transport for NSW will also investigate alternative uses for road space, with initiatives aiming to contribute to the development of 'Successful Places', one of the six outcomes for NSW in the *Future Transport Strategy 2056* (NSW Government, 2018).

The project has been designed to take into account concerns raised by key stakeholders, including councils. Communication strategies for the project will be managed consistently across the NSW Government transport portfolio and in accordance with the community consultation framework for the project, as required by environmental management measure CI3 (refer to Table D2-1 of this submissions report). This would include ongoing consultation from all Transport for NSW projects with relevant council stakeholders.

B13.2.2 Operational traffic and transport

Issue raised

Page 2

Mosman Council is concerned that daily traffic volumes along the Military Road corridor may return to current levels by 2027 or sooner if insufficient intervention is made to encourage through traffic to use the Beaches Link and Gore Hill Freeway Connection project.

Response

The Beaches Link and Gore Hill Freeway Connection project is expected to reduce traffic volumes and congestion on existing surface roads including the Military Road/Spit Road corridor, and consequently create an opportunity to reimagine Military Road and how this movement corridor services the lower North Shore and Northern Beaches. Transport for NSW will work with the

community, stakeholders and local councils to understand how the NSW Government's vision for an integrated public transport and road network can best service the community. This includes investigating alternative uses for road space, with initiatives aiming to contribute to the development of 'Successful Places', one of the six outcomes for NSW in the *Future Transport Strategy 2056* (NSW Government, 2018).

The operational traffic assessment for the project shows that the project would result in a large reduction (about 62 per cent in each case) in daily traffic on Spit Road when the project opens in 2027 and after 10 years of operation in 2037. Daily travel demand forecasts based on this operational traffic modelling are provided in Table 9-4 of the environmental impact statement and the forecast for Spit Road is reproduced in Table B13-1.

Table B13-1 Modelled daily traffic demand at Spit Road (both directions)

Scenario	2027	2037
'Do minimum'	74,500	80,000
'Do something'	48,500	52,000
'Do something cumulative'	46,500	49,500

Detailed analysis of the outputs from the modelling including travel times for key routes and intersection performance are provided in Section 9.4 of the environmental impact statement.

The environmental impact statement includes an environmental management measure to review the operational traffic performance of the project following its commencement of operation. Environmental management measure OT1 (refer to Table D2-1 of this submissions report) requires that:

> A review of operational network performance will be carried out 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections. The assessment will be based on updated traffic data at the time and the methodology used will be comparable with that used in Appendix F (Technical working paper: Traffic and transport) of the environmental impact statement. Where required, additional feasible and reasonable mitigation measures will be identified in consultation with the Department of Planning, Industry and Environment and the relevant council to manage any additional traffic performance impacts identified during the review of operational network performance.

Implementation of environmental management measure OT1 will identify daily traffic volumes on Military Road and, in consultation with the Department of Planning, Industry and Environment and the relevant council, confirm whether additional feasible and reasonable mitigation measures are required.

B13.2.3 Funding

Issue raised

Page 2

Mosman Council requests that revitalisation of the Military Road/Spit Road corridor, including both the design and implementation, be funded as part of the Beaches Link and Gore Hill Freeway Connection project.

Response

The Beaches Link and Gore Hill Freeway Connection project creates an opportunity to reimagine Military Road and how this movement corridor services the lower North Shore and Northern Beaches. Transport for NSW will work with the community, stakeholders and local councils to understand how the NSW Government's vision for an integrated public transport and road network can best service the community. This includes investigating alternative uses for road space, with initiatives aiming to contribute to the development of 'Successful Places', one of the six outcomes for NSW in the *Future Transport Strategy 2056* (NSW Government, 2018).

The reimagined Military Road/Spit Road corridor does not form part of the Beaches Link and Gore Hill Freeway Connection project and has not been considered as part of project development activities, the project design assessed in the environmental impact statement (refer to Chapter 5 (Project description) of the environmental impact statement) or the funding envelope for the project.

B13.2.4 Establishment of a working group

Issue raised

Page 2

Mosman Council requests that Transport for NSW establish a working group with Mosman and North Sydney councils with the aim to develop designs for the Military Road/Spit Road corridor and have them built and carried out as part of the Beaches Link and Gore Hill Freeway Connection project.

Response

The Beaches Link and Gore Hill Freeway Connection project creates an opportunity to reimagine Military Road and how this movement corridor services the lower North Shore and Northern Beaches. It would enable other divisions of Transport for NSW and other agencies (including Council) to explore opportunities for urban renewal and changes to transport management on key corridors, including the Military Road/Spit Road corridor. This includes working with local councils and other government stakeholders to develop a place based transport plan for the lower North Shore (refer to Section B13.2.1 for further detail). Transport for NSW will commence engagement with Mosman Council, North Sydney Council, Willoughby City Council and Lane Cove Council on this plan in the last quarter of 2021.

As the Beaches Link and Gore Hill Freeway Connection project design is further developed it would seek to maintain opportunities for the Military Road/Spit Road corridor identified under the *Mosman Local Strategic Planning Statement* (Mosman Council, 2020) and the *Military Road Corridor Planning Study – Stage 1* (North Sydney Council, 2021). Communication strategies for the project will be managed consistently across the NSW Government transport portfolio and in accordance with the community consultation framework for the project, as required by environmental management measure CI3 (refer to Table D2-1 of this submissions report). This would include ongoing consultation from all Transport for NSW projects with relevant council stakeholders.

Transport for NSW will also continue to regularly participate in the Mosman Council Traffic Committee and consider those items raised by Council.

B13.3 Occupation of Spit West Reserve and construction site impacts

Issue raised

Page 3

Mosman Council generally supports the concept of the temporary construction support site at Spit West Reserve (Spit West Reserve construction support site (BL9)) and makes the following observations regarding the occupation and operation of this site:

- Potential road safety and traffic impacts on Spit Road and Military Road due to construction traffic and temporary Spit Bridge openings
- Potential noise impact on local businesses in The Spit area as a result of construction noise
- Potential impact on the operation of Mosman Rowers Club
- The need for cyclists using the Spit West Cycleway to detour around the site
- Potential impact on the nearby saltmarsh
- Potential amenity impact on Spit West Reserve
- Potential impact on organised sport in the area, including summer netball and winter soccer
- Potential impact on Mosman Council's assets in the area including the seawall, footpaths, car park, trees and grassed areas. Mosman Council notes that a number of these assets would require restoration or rehabilitation once the construction work is complete.

While Mosman Council acknowledges that many of the potential impacts listed have already been considered by Transport for NSW in the environmental impact statement, it believes further consultation with Council is necessary to ensure that the proposed works can be carried out with minimal impact to the locality. Mosman Council requests that the potential impacts listed above are clarified and resolved prior to any occupancy of the area. It notes that occupancy of Spit West Reserve would be subject to a formal lease with Council.

Response

Transport for NSW acknowledges Council’s support for the proposed temporary construction support site at Spit West Reserve and that many of the potential impacts are considered in the environmental impact statement.

Following exhibition of the environmental impact statement, the Department of Planning, Industry and Environment requested Transport for NSW prepare a separate preferred infrastructure report on 14 May 2021. The preferred infrastructure report provides further information, describes design changes and assesses the environmental impact of these changes. In response to the request to assesses the construction impacts to recreational users of Spit West Reserve construction support site (BL9), an updated configuration of the temporary construction support is provided in Section 3 (Spit West Reserve temporary construction support site (BL9) reconfiguration) of the preferred infrastructure report. The reconfigured temporary construction support site has been developed in response to feedback received from Mosman Council on recreational use of Spit West Reserve.

The potential impacts of the proposed Spit West Reserve construction support site (BL9) are assessed in the environmental impact statement for each relevant environmental factor, with an updated assessment of key environmental issues for the reconfigured site provided in Section 3 (Spit West Reserve temporary construction support site (BL9) reconfiguration) of the preferred infrastructure report. The assessments identify:

- During construction of the project, Spit Road would be used for heavy vehicle access to the Spit West Reserve construction support site (BL9). Spit Road provides access to a number of recreation and leisure facilities and is the starting point for the Spit to Manly Walk. Increased construction traffic along Spit Road may impact on the perceptions of safety for people accessing social infrastructure at this location. Vessel movements for the project would generally be carried out during standard bridge opening times, with the exception being the transport of the six steel shell immersed tube tunnel units where slightly extended opening periods would be required. These units would be transported through The Spit one at a time at intervals of three to four months. The Spit Bridge may need to be open for about an extra 15 minutes for each opening. The community will be notified in advance of proposed transport network changes, including extended opening times of the Spit Bridge, in accordance with environmental management measure CTT7 (refer to Table D2-1 of this submissions report). Further details of potential construction traffic impacts at the Spit West Reserve construction support site (BL9) are provided in Table 6-23, Figure 6-37 and Section 8.4.3 of the environmental impact statement. Construction traffic impacts for the reconfigured site would remain consistent with the environmental impact statement (refer to Section 3.5.1 of the preferred infrastructure report)
- Five commercial receivers located within The Spit area of Mosman are predicted to experience noise levels during early works above the noise management level by less than 10 dB(A). Where noise management levels are exceeded, there is a requirement to implement feasible and reasonable noise mitigation. Further details of potential construction noise impacts at the Spit West Reserve construction support site (BL9) are provided in Section 10.6.9 of the environmental impact statement. The environmental impact statement used a conservative approach when investigating and assessing potential noise impacts based on worst-case scenarios. For example, the construction noise assessment is based on all equipment being used simultaneously, at its loudest level in the location on site where it would have the highest impact on residents. These scenarios are unlikely to occur as further mitigation measures would be designed and identified during detailed development of the construction method by the contractor/s. Construction noise impacts for the reconfigured site would remain consistent with the environmental impact statement (refer to Section 3.5.2 of the preferred infrastructure report)
- Mosman Rowing Club is located to the south of the Spit West Reserve construction support site (BL9) and there may be a need to make minor modifications to existing rowing routes to ensure an adequate clearance is maintained around the water-based component of the temporary construction support site (including the floating immersed tube tunnel casting facility). A controlled navigation channel would be provided to rowers and other waterway users through the main works for the Middle Harbour crossing between Northbridge and Seaforth Bluff as shown in Figure 8-13 of the environmental impact statement. Mosman Rowing Club made a submission following the exhibition of the environmental impact statement in which they raise concerns about potential conflicts between rowers and water-based movements and activities associated with the project (refer to Section C7.9 of this submissions report) and requested to be consulted regarding the extent of the Spit West Reserve construction support site (BL9) (refer to Table A2-9 of this submissions report). The reconfigured site would move to the north increasing the distance between the proposed temporary construction support site and Mosman Rowing Club. The increased distance between the Spit West Reserve construction support site (BL9) and Mosman Rowing Club would reduce the potential effects of boat wash on rowers either accessing or egressing the Mosman Rowing Club jetty south of the marine traffic control zone (refer to Section 3.5.1 of the preferred infrastructure report). Transport for NSW will continue to consult with Mosman Rowing Club to minimise construction impacts in accordance with revised environmental management measure CTT16 (refer to Table D2-1 of this submissions report). Further details of potential construction impacts to recreational maritime traffic in Middle Harbour are provided in Section 8.4.3 of the environmental impact statement and Annexure A of Appendix F (Technical working paper: Traffic and Transport)
- The existing Figtree Lane shared user path located along the foreshore of Middle Harbour would be temporarily diverted around the Spit West Reserve construction support site (BL9) with

connectivity along the reserve maintained. This diversion would result in an increase in travel, which would be considered a minor impact due to the short detour distance. As part of the reconfigured site layout, the temporary shared user path diversion of Figtree Lane around the site has decreased by 30 metres (refer to Figure 3-1 and Section 3.5.1 of the preferred infrastructure report)

- Saltmarsh in the vicinity of the project is discussed in Section 19.3.6 of the environmental impact statement and Section 3.5.4 of Appendix T (Technical working paper: Marine ecology). The Subtropical and temperate coastal saltmarsh community occurs within and around Middle Harbour but it has not been identified in the project area. A small, artificially created saltmarsh habitat (0.02 hectares) was observed at Spit West Reserve and is shown in Figure 3-14 of Appendix T (Technical working paper: Marine ecology). The reconfigured site layout would move about 6.5 metres closer to the small occurrence of artificially created saltmarsh habitat. However, it is noted that this patch of saltmarsh is currently protected by rock armour and impacts are expected to be consistent with the environmental impact statement (refer to Section 3.5.5 of the preferred infrastructure report)
- The amenity of Spit West Reserve would be temporarily diminished during construction and may detract from the enjoyment of people visiting accessible parts of the reserve or nearby facilities. Ongoing engagement will be carried out with representatives of user groups and managers of social infrastructure located near the temporary construction support site about the timing and duration of construction works and management of potential impacts, in accordance with environmental management measure SE2 (refer to Table D2-1 of this submissions report). Further details of potential amenity impacts at Spit West Reserve during construction of the project are provided in Section 21.4 of the environmental impact statement. Impacts to urban design and visual amenity due to the reconfiguration of the Spit West Reserve construction support site (BL9) would remain consistent with those described in the environmental impact statement. The additional removal of one tree would not materially alter the potential impacts to surrounding receivers nor would the location of the reconfigured site further north in closer proximity to the viewing platform along Figtree Lane, amenities and the playground within Spit West Reserve
- The Spit West Reserve public car park would not be utilised by construction workers, therefore it would remain available for use by recreational users of the reserve in accordance with revised environmental management measure CTT11 (refer to Table D2-1 of this submissions report). Construction workers at the Spit West Reserve construction support site (BL9) would either use public transport or would be transported to the site by shuttle bus (where required) from the Balgowlah Golf Course construction support site (BL10) as outlined in Section 8.4.4 of the environmental impact statement. The reconfiguration of Spit West Reserve construction support site (BL9) has not changed the above approach to managing impacts to public car parks during construction (refer to Section 3.5.1 of the preferred infrastructure report)
- The reconfigured site layout has been refined such that five netball courts could be provided or up to three junior soccer playing fields (around 20 metres by 30 metres) or one larger soccer field. The reconfiguration of Spit West Reserve construction support site (BL9) allows for the continued use of facilities at the reserve by Manly Warringah Football Association, Mosman Netball Club, Mosman Junior Cricket Club, Beauty Point Public School and Mosman Parkrun, minimising impacts to these users (refer to Section 3.5.7 of the preferred infrastructure report). Consultation and notification will be carried out with Mosman Council, sporting groups and clubs, and Beauty Point Public School to facilitate the ongoing use of Spit West Reserve during construction to minimise potential amenity and access impacts (as required by new environmental management measure SE5 (refer to Table D2-1 of this submissions report))
- The impacted portion of Spit West Reserve will be rehabilitated and returned as soon as practicable in consultation with Mosman Council in accordance with environmental management measure LP5 (refer to Table D2-1 of this submissions report). The temporary use of this land would not impact on the use of the site for open space and public recreational use at the

completion of construction. The reconfigured site would impact on 600 square metres less land than the configuration described in the environmental impact statement, requiring less land to be leased from the Council.

Transport for NSW will continue to consult with stakeholders, including Mosman Council, during future development, delivery, and operation phases of the project as outlined in Appendix E (Community consultation framework).

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

B14 – North Sydney Council

November 2021

B14 North Sydney Council

Contents

B14.1 Strategic context and project need

B14.1.1 Alignment to strategic plans and policies

Issue raised

Cover letter (page 2) and page 8

North Sydney Council recommends that Transport for NSW consider the Greater Sydney Commission's *A Metropolis of Three Cities* and *North District Plan* as well as other State government strategies. Council considers that the project would impact the achievement of strategic directions, priorities, actions and specific projects within these plans.

Response

The project has been developed to align with the objectives of a number of strategic plans for transport, freight, and city planning that have been prepared at a national and State level. An overview of relevant strategic plans, policies and strategies and their relationship to the project, including the *Future Transport Strategy 2056* (NSW Government, 2018), *Greater Sydney Region Plan – A Metropolis of Three Cities* (Greater Sydney Region Plan) (Greater Sydney Commission, 2018a) and the *North District Plan* (Greater Sydney Commission, 2018b), is provided in Table 3-2 of the environmental impact assessment.

The project is one part of a complementary integrated multi-modal strategy being implemented by the NSW Government that includes a suite of current and future transport initiatives outlined in *Future Transport Strategy 2056* that would work together to provide additional cross-harbour transport. *Future Transport Strategy 2056* specifically identifies the Western Harbour Tunnel and Beaches Link program of works as 'Committed' transport projects forming part of the vision for the future strategic road network for Greater Sydney that would support key movements by road, including public transport, private vehicles and freight.

The Greater Sydney Region Plan is built on a vision of three cities where most residents live within a 30-minute journey of their jobs, education and health facilities, and services, as outlined in Table 3-2 of the environmental impact statement. Objective 18 of The Greater Sydney Region Plan references the Western Harbour Tunnel and Beaches Link program of works as infrastructure that would further improve accessibility from the Northern Beaches to the Harbour CBD and reduce through traffic in the Harbour CBD ensuring the economic strength and global competitiveness of the Harbour CBD.

The Beaches Link and Gore Hill Freeway Connection project, as part of an integrated multi-modal transport network being implemented by the NSW Government would facilitate the Greater Sydney Region Plan's goal of delivering a 30-minute city by increasing the number of people and places that are able to be reached within 30 minutes.

The changes in the percentage of jobs accessible within 30 minutes in the 2037 AM peak for trips from Chatswood, Brookvale, Dee Why and Manly, for the 'Do minimum' and 'Do something' scenarios (ie with and without implementation of the project respectively), are outlined in Figures 3-11, 3-12, and 3-13 of the environmental impact statement. These figures indicate that the project would result in the employment centres of North Sydney and Chatswood being much more accessible for workers residing in the Northern Beaches region, including Manly and Dee Why. The project offers the opportunity for new express bus service routes, which would also substantially reduce travel times and increase the 30-minute public transport catchments between the Northern Beaches and key strategic centres and interchange locations such as Sydney CBD and North Sydney, St Leonards and Macquarie Park.

The project would also deliver the opportunity to relocate a significant volume of through traffic on surface arterial roads underground. In addition, a direct benefit of moving traffic underground is reduced congestion on the arterial road network which would result in improvements in amenity related to physical safety, air quality and noise levels, aligning to the objectives of *Future Transport Strategy 2056 and* the Greater Sydney Region Plan.

The *North District Plan* addresses issues influencing Greater Sydney to 2056 with one of the overarching priorities for a productive North District including improved access to local jobs, goods and services within 30 minutes. The *North District Plan* includes the Western Harbour Tunnel and Beaches Link program of works as a transport initiative that would provide improved connections and access.

Other relevant plans and policies at a regional and local level are discussed in sections 9.1 and 20.1 of the environmental impact statement.

B14.1.2 Program of works integration

Issue raised

Page 5

North Sydney Council is concerned that the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project are described in the environmental impact statement as integrated projects, however, this integration is limited to a single traffic lane connecting the Beaches Link tunnel and the Western Harbour Tunnel, leaving the remaining two lanes to enter the Sydney CBD. This suggests that providing a link between the Northern Beaches and Sydney's strategic motorway network (WestConnex) is now only a small part of the intended function of the Beaches Link and Gore Hill Freeway Connection project.

Response

The Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project are being delivered as separate projects, but have been developed as an integrated program of works. Delivery of the program of works would provide three different Sydney Harbour crossings, and optimise the way the three harbour crossings would function into the future (ie separating out different traffic functions such as through vs local traffic). As such, some transport customers would be better served by existing crossings and corridors, while others would be served by the new crossings, depending on the customer destination.

The Warringah Freeway Upgrade would integrate the Western Harbour Tunnel and the Beaches Link tunnel, in addition to improving safety, efficiency and wayfinding for customers. The upgraded Warringah Freeway would connect the Beaches Link tunnels to a variety of strategic motorway catchments in addition to the WestConnex network:

- North Sydney and surrounds (via Warringah Freeway)
- Sydney CBD and surrounds (via Sydney Harbour Bridge)
- Eastern suburbs (via Sydney Harbour Tunnel).

The Beaches Link mainline tunnels would also connect to and from the Gore Hill Freeway and surrounds in the Artarmon area. The Beaches Link mainline tunnels would provide three traffic lanes in each direction between the Warringah Freeway at Cammeray and to ramp tunnels under Naremburn, Northbridge and Seaforth. The Beaches Link mainline tunnels would connect to the single-lane stub tunnels constructed beneath Cammeray as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project, providing direct underground connections to and from the future Western Harbour Tunnel and onward to the M4-M5 Link (WestConnex) at Rozelle. This would

create a western bypass of the Sydney CBD that would take pressure off the Sydney Harbour Bridge, Sydney Harbour Tunnel and ANZAC Bridge; while Beaches Link would create an alternative to the Military Road/Spit Road and Warringah Road corridors to relieve traffic pressure on the North Shore.

B14.1.3 Employment and housing targets

Issue raised

Page 8

North Sydney Council is concerned that the project would curtail its ability to deliver the employment and housing targets established for the North Sydney local government area by the Greater Sydney Commission and reflected in council's local strategic planning statement.

Response

The *North District Plan* (Greater Sydney Commission, 2018b) sets a five year (2016 to 2021) housing target of 3000 dwellings for North Sydney.

The *North Sydney Draft Local Housing Strategy* (North Sydney Council, 2019) sets out the strategic direction for housing in the North Sydney local government area. It is a strategy which aligns with the hierarchy of regional and district plans directions, objectives and actions for housing in metropolitan Sydney. It was developed to meet the *North District Plan* five year (2016 to 2021) housing target of 3000 dwellings. In the *North Sydney Draft Local Housing Strategy* (North Sydney Council, 2019), Council proposed to develop a six to 10 year (2022 to 2026) housing target to meet the anticipated demand set by the *North District Plan*. The strategy also forecasts the delivery of 11,879 dwellings in North Sydney local government area between 2016 and 2036. It also identifies capacity for the delivery of a further 2695 dwellings after 2036.

The *North District Plan* contains a target to increase employment in North Sydney CBD to between 76,000 and 81,500 jobs by 2036. This would be an increase of between 15,400 and 21,100 on the estimated 60,400 jobs in North Sydney CBD in 2016. The *North Sydney Economic Development Strategy* (SGS Economics & Planning, 2016) outlines North Sydney Council's vision for economic development. Employment in the North Sydney local government area in 2041 is forecast to grow by 19,370 jobs compared to 2016 levels.

The *North Sydney Local Strategic Planning Statement* (North Sydney Council, 2020a) is a plan to guide future land use planning and development identified in the NSW Government's regional and district plans such as the *North District Plan* (Greater Sydney Commission, 2018b). The *North Sydney Local Strategic Planning Statement* (North Sydney Council, 2020b) brings together and builds upon the planning work found in a range of established Council policies and plans and community views, such as the *North Sydney Draft Local Housing Strategy* (North Sydney Council, 2019) and *North Sydney Economic Development Strategy* (SGS Economics & Planning, 2016), to set a framework as to how the North Sydney local government area would evolve over the next 20 years.

The project is consistent with the broader NSW Government strategic planning direction for North Sydney and surrounding locality, as discussed in Table 3-2 of the environmental impact statement, in addition to the North Sydney Council's local strategic documents. The project has been developed to enable the desired growth while at the same time minimising the predicted congestion increases in the Eastern City and North Districts.

As demonstrated in the assessment of 'Do minimum' (without project) scenario, predicted population growth in the future is expected to increase travel demand and congestion across the

road network, including within North Sydney, with associated adverse impacts on local streetscapes and liveability and on North Sydney Council's key local strategic projects. The project would generally improve network performance for roads surrounding North Sydney compared to the 'Do minimum' scenario, as discussed in Section 9.4.2 of the environmental impact statement. This improvement would potentially provide benefits in enabling North Sydney Council's existing key strategic projects and also to support future strategic projects.

The key benefits of the project for North Sydney include:

- Reducing pressure on congested road corridors, leading to faster and more reliable road transport journeys to, from and around the Northern Beaches and North Shore
- Improving public transport journey times, travel time reliability and connectivity between the Northern Beaches and strategic centres, enabling new express bus service routes
- Improving access for local businesses to Greater Sydney, making it easier and safer to move goods and provide services
- Improving access for businesses within Greater Sydney, making it easier and safer to connect with customers in the Northern Beaches
- Improving the amenity of local streets and local town centres by freeing up local streets for local traffic.

These project benefits would support future employment and housing development in the North Sydney local government area.

The project would improve accessibility to employment, with residents of the Northern Beaches and lower North Shore experiencing improved access to jobs in other parts of Greater Sydney, in particular to jobs in the Harbour CBD and North Sydney CBD, once the project is operational. The project would result in the employment centres of North Sydney and Chatswood being much more accessible for workers residing in the Northern Beaches region, including Manly and Dee Why, as shown by the forecast 30-minute catchments by road for strategic centres in the vicinity of the project (refer to Figures 3-11 to 3-13 of the environmental impact statement).

Given the contribution of the Harbour CBD to NSW's gross state product, supporting the future growth and productivity of the Eastern Economic Corridor by enabling greater business-to-business connections would deliver substantial benefits for North Sydney, NSW and the national economy.

B14.1.4 Military Road

Issue raised

Cover letter (page 2), page 1 and page 8

North Sydney Council notes that the project would result in a reduction in traffic on Military Road. Council seeks the inclusion of a Military Road 'local traffic benefits program' as part of the delivery of the project, to capitalise on traffic reductions on this road by creating a more engaging and pedestrian focussed environment at Neutral Bay and Cremorne centres. As such Council recommended that a condition requiring a local traffic benefits program be prepared and finalised before construction commences such that these savings can realistically be delivered.

Response

The Beaches Link and Gore Hill Freeway Connection project seeks to improve transport functionality, urban amenity and safety in local centres by reducing congestion, through traffic and 'rat runs', including reducing traffic volumes and congestion on the Military Road/Spit Road corridor. The project would support the objectives in the *Military Road Corridor Planning Study - Stage 1*

(North Sydney Council, 2021) through a reduction in traffic volumes and congestion along the Military Road/Spit Road corridor, enhancing the connectivity and amenity of Military Road. This also aligns with the *Mosman Local Strategic Planning Statement* (Mosman Council, 2020), which identifies the planning priority of reimagining the Military Road/Spit Road corridor to improve function, amenity and accessibility in response to the Western Harbour Tunnel and Beaches Link program of works.

The project creates an opportunity to reimagine Military Road and how this movement corridor services the lower North Shore and Northern Beaches. As the project design is further developed it would seek to maintain opportunities for the Military Road/Spit Road corridor identified under the *Military Road Corridor Planning Study - Stage 1* (North Sydney Council, 2021) and the *Mosman Local Strategic Planning Statement* (Mosman Council, 2020).

The project would enable other divisions of Transport for NSW and other agencies (including Council) to explore opportunities for urban renewal, public transport, active transport and changes to transport management on key corridors, including the Military Road/Spit Road corridor. This includes working with local Councils and other government stakeholders to develop a place based transport plan for the lower North Shore, which would identify potential transport opportunities to respond to the changing needs of the community, including movement types, and initiatives for mode shift and network operation across all transport modes. Transport for NSW will commence engagement with North Sydney Council, Mosman Council, Willoughby City Council and Lane Cove Council on this plan in the last quarter of 2021. Transport for NSW will also investigate alternative uses for road space, with initiatives aiming to contribute to the development of 'Successful Places', one of the six outcomes for NSW in the *Future Transport Strategy 2056* (NSW Government, 2018).

Communication strategies for the project will be managed consistently across the NSW Government transport portfolio and in accordance with the community consultation framework for the project, as required by environmental management measure CI3 (refer to Table D2-1 of this submissions report). This would include ongoing consultation from all Transport for NSW projects with relevant council stakeholders.

The reimagined Military Road/Spit Road corridor does not form part of the Beaches Link and Gore Hill Freeway Connection project and has not been considered as part of project development activities, the project design assessed in the environmental impact statement (refer to Chapter 5 (Project description) of the environmental impact statement or the funding envelope for the project.

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during their assessment of the project.

B14.2 Project development and alternatives

Issue raised

Cover letter (page 1)

North Sydney Council is concerned about the lack of alternative transport options including public transport.

Response

In conjunction with other road, rail, bus and light rail projects, the Western Harbour Tunnel and Beaches Link program of works has been developed to meet the current and future multi-modal transport needs of Sydney. Alternative transport modes, including bus, rail, ferry and active transport are outlined in Chapter 4 (Project development and alternatives) of the environmental impact statement. While many of these modes and upgrades are complementary to the project as

part of a broader integrated, multi-modal transport network, none of the proposed initiatives negate the need to provide additional cross-harbour motorway capacity identified in the *NSW Long Term Transport Master Plan* (NSW Government, 2012a) and *Future Transport Strategy 2056* (NSW Government, 2018). For example, public transport is well suited to provide people with access to central locations, such as the Sydney and North Sydney business districts. Those trips, however, only represent a portion of overall trips on the road network. A large proportion of private and commercial trips have dispersed origins and destinations, and/or varying purposes which are not well served by public transport alone.

As such, an integrated transport network is required to service the needs of a very diverse range of origins, destinations and journey purposes. The array of journey patterns and trip purposes within Sydney, and the dispersed nature of origin and destination points for an individual journey mean that roads remain a critical element in the integrated transport network.

The Beaches Link component of the project has been designed to be a key piece of the public transport network of the Northern Beaches, allowing for the future provision of express bus connections with North Sydney, the Sydney CBD, Macquarie Park, St Leonards and other key centres across Greater Sydney like the Northern Beaches Hospital Medical Precinct via the motorway network. Accordingly, the Beaches Link tunnels have been designed to allow use by buses, including double decker bus services. The tunnel portals at the Warringah Freeway have also been designed to integrate with a new southbound bus lane on the Warringah Freeway (delivered as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project), and provide the opportunity for efficient access and interchange with the new Victoria Cross Metro Station at North Sydney.

The Northern Beaches B-Line began operation in 2017 and provides frequent and more reliable services between the Northern Beaches and Sydney CBD. The project would support the continued operation of the B-Line program along with other existing and proposed bus services by improving travel times and reliability on key routes connecting the Northern Beaches to key centres including Spit Road/Military Road and Warringah Road/Eastern Valley Way. By reducing network congestion, improving network resilience and increasing reliability in peak periods, the project would make buses a more attractive transport option, supporting and encouraging a mode shift to public transport.

B14.3 Stakeholder and community engagement

B14.3.1 Consultation with North Sydney Council

Issue raised

Cover letter (page 1)

North Sydney Council notes that, in July 2018, the NSW Government released the Western Harbour Tunnel and Beaches Link project updates. A Western Harbour Tunnel and Beaches Link project updates report was received by council on 29 October 2018. In line with resolutions linked to this report, council made a significant submission to the Western Harbour Tunnel and Beaches Link consultation, requesting clarification of issues identified in the report as well as the following requests:

- That the NSW Government release a strategic/final business case for Western Harbour Tunnel and Beaches Link program of works
- That more information regarding the design, construction and operational impacts of Western Harbour Tunnel and Beaches Link program of works on North Sydney be provided

- That the Western Harbour Tunnel and Beaches Link program of works exhaust stacks be filtered
- That clarification of the impacts of the Western Harbour Tunnel and Beaches Link program of works on existing and future open space, sports facilities and water treatment infrastructure at Cammeray Golf Course be provided.

Response

The NSW Government released both the Western Harbour Tunnel Project Update and Beaches Link Project Update in July 2018. The release of these project updates was timed to coincide with the release of reference designs for each respective project and community and stakeholder engagement from 26 July 2018 to 9 November 2018 that sought feedback on the reference designs.

Transport for NSW acknowledges the receipt of North Sydney Council's submission in response to the July 2018 project updates. Transport for NSW has held several meetings with North Sydney Council relevant to the Beaches Link and Gore Hill Freeway Connection project since the release of the project updates, including:

- 30 July 2018 – Post announcement project briefing
- 27 August 2018 – Meeting called through North Shore Electorate office about an update on the Western Harbour Tunnel and Beaches Link program of works
- 28 August 2018 – Project briefing to North Sydney Councillors
- 15 November 2018 – Further meeting between project personnel and North Sydney Council
- 28 November 2018 – Urban Design Strategy Meeting with North Sydney Council
- 29 November 2019 – Program of works update
- 17 February 2020 – Storage dam relocation meeting
- 6 March 2020 – Business Buzz (presentation to North Sydney businesses on the benefits of the project and managing impacts in the North Sydney area)
- 12 November 2020 – Project team briefed North Sydney Council on the environmental impact statement and key impacts to the local government area
- Regular meetings for the North Sydney Integrated Transport Program (NSITP/North Sydney Program).

Responses to the issues raised in North Sydney Council's 2018 submission are as follows or can be found in the locations outlined below. Also refer to Section B14 of the Western Harbour Tunnel and Warringah Freeway Upgrade submissions report (Transport for NSW, 2020i), which addresses North Sydney Council's submission for the Western Harbour Tunnel and Warringah Freeway Upgrade project.

<u>Business case</u>

The Western Harbour Tunnel and Beaches Link program of works has followed the Infrastructure NSW process. Through this process the program of works has demonstrated its economic merit and successfully passed, for this development stage of the project, the Infrastructure NSW Assurance Review Process. In addition to independent review of the design, constructability, environmental impacts, and traffic and transport benefits, this assurance review process included a review of the economic merit of the program of works. As part of this governance and rigorous review process, the Beaches Link and Gore Hill Freeway Connection project has undergone extensive scrutiny throughout its development.

The analysis for the business case for the Western Harbour Tunnel and Beaches Link program of works was augmented by extensive stakeholder and community consultation, additional site

investigations and design development during 2017 and 2018. This resulted in design and construction improvements to reduce stakeholder impacts and improve project outcomes where feasible.

An overview of the development process and options considered as part of this process is provided in Chapter 4 (Project development and alternatives) of the environmental impact statement. An overview of the strategic context and project need is provided in Chapter 3 (Strategic context and project need) of the environmental impact statement.

Separate business cases were prepared for the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project. The business case carried out for the project contains confidential and market-sensitive information such as forecast construction costs, which if made public, could jeopardise the integrity of the procurement process for the project and risk achieving value for money for the people of NSW.

Consistent with NSW Government policy, a summary of the business case for the project will be released by Infrastructure NSW at an appropriate time once an investment decision has been made. It is noted that Infrastructure NSW has released a summary of the Final Business Case for the Western Harbour Tunnel and Warringah Freeway Upgrade project, which is available online: www.infrastructure.nsw.gov.au/media/2528/western-harbour-tunnel_bc-summary-may-2020.pdf.

Project design

Refer to Chapter 5 (Project description) of the environmental impact statement. Also refer to other sections within this Section B14 for details on specific construction or operational impacts raised by Council.

Ventilation outlets and filtration

The NSW Chief Scientist and Engineer has recently released a series of reports in relation to trends in motor vehicle emissions, the design of road tunnel ventilation systems, road tunnel outlet emissions and options for treating road tunnel emissions. The reports variously found that emissions from well-designed road tunnels cause a negligible change to surrounding air quality at locations close to the ventilation outlets, and as such, while treatment systems for particulates may be technically feasible, there is little to no health benefit for surrounding communities and outlet dispersion may achieve the same outcomes at a reduced cost. Further information is available at www.chiefscientist.nsw.gov.au and nswroads.work/airquality.

The Beaches Link tunnel and associated ventilation systems would be built and operated in compliance with any conditions of approval set by the Department of Planning, Industry and Environment, should the project be approved. Further, the monitoring of ventilation outlet emissions during operation would be regulated under an environment protection licence prescribed under the *Protection of the Environment Operations Act 1997.*

Refer to Chapter 12 (Air quality) of the environmental impact statement and Section B14.7.3 below for further details.

Impacts to social infrastructure and open space at Cammeray Golf Course

Temporary and permanent impacts to social infrastructure and open space at Cammeray Golf Course are discussed in Section B14.11 below. Also refer to Chapter 20 (Land use and property) and Chapter 21 (Socio-economics) of the environmental impact statement.

The existing storage dam at Cammeray Golf Course would be directly impacted by the proposed Western Harbour Tunnel and Warringah Freeway Upgrade project, prior to the Cammeray Golf

Course construction support site (BL1) being used by the Beaches Link and Gore Hill Freeway Connection project.

In accordance with condition E209 of the Western Harbour Tunnel and Warringah Freeway Upgrade project's conditions of approval, Transport for NSW will provide a replacement stormwater harvesting dam within the boundaries of the golf course prior to decommissioning of the existing dam. If the new stormwater harvesting dam is not operational prior to dewatering of the existing dam, Transport for NSW will pay for all water usage costs associated with the use of the stormwater harvesting dam incurred by Council or the golf club until the replacement dam is operational. Transport for NSW is continuing to engage with North Sydney Council on this issue.

For further details refer to Chapter 5 (Project description) and Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement, in addition to Section B14.6.1 below.

B14.3.2 Adequacy of community consultation

Issue raised

Cover letter (page 1)

North Sydney Council is concerned about the adequacy of community consultation for the project.

Response

Transport for NSW completed an extensive community engagement program for the project, ahead of the environmental impact statement exhibition, as summarised in Section A2.2 of this submissions report and further detailed in Chapter 7 (Stakeholder and community engagement) of the environmental impact statement. This included two rounds of formal public consultation prior to the release of the environmental impact statement, carried out for the Western Harbour Tunnel and Beaches Link program of works:

- April and June 2017 following the announcement of the proposed design (concept design)
- July and December 2018 following the publishing of further development of the design (reference design).

This involved proactive consultation with the community, State and local government agencies, utility service providers, special interest groups and relevant industry stakeholders. Community engagement activities during these periods included:

- General program information and feedback channels (including the program website, email address, and 1800 number; letterbox drops; online community engagement map; program updates to email subscribers; feedback forms; and ministerial enquiries)
- Hosted events (community feedback sessions and pop-up information displays)
- Resident and stakeholder meetings, and door knocks
- Notifications of investigation work
- Newspaper advertisements, media releases, and Facebook posts.

During the public exhibition period for the environmental impact statement, Transport for NSW also carried out a comprehensive community consultation and engagement program to notify local communities and stakeholders that the environmental impact statement was on exhibition, provide accessible information, encourage submissions, and increase transparency of the project including benefits and possible impacts. The program utilised communication channels and tools that were appropriate to the COVID-19 restrictions that were in place at the time of the public exhibition.

The community consultation and engagement program during the exhibition period used a diverse range of communication methods and platforms to achieve a significant reach and provide local communities and stakeholders information relevant to them, including:

- Written communications and project collateral including the Beaches Link and Gore Hill Freeway Connection community guide to the environmental impact statement, fact sheets on key temporary construction support sites and key topics, frequently asked questions (FAQs) document and electronic project information packs
- Digital engagement through the project's interactive online portal, including an interactive map, virtual information room, project overview and 3D animation videos
- Virtual community information sessions, of which recordings were also provided via the project's interactive online portal (the recorded sessions were viewed over 3700 times during the exhibition period)
- Virtual meetings and briefings with key stakeholders and community groups
- Stakeholder phone calls and responses to enquiries and questions via the 1800 number and project email address
- Door knocks in impacted areas (before this was discontinued due to COVID-19 health advice in relation to outbreak of the Avalon, Northern Beaches cluster in December 2020).

Refer to Section A2.3 of this submissions report for further details of the community engagement activities conducted during the public exhibition of the environmental impact statement, and Section A2.4 of this submissions report for details on engagement which has occurred after the environmental impact statement exhibition.

Consultation on the project would continue throughout the remainder of the planning process and into the construction period, with a view to further minimising project impacts wherever possible, as outlined in Section A2.5 of this submissions report.

B14.3.3 Exhibition period

Issue raised

Cover letter (page 1)

North Sydney Council requests that the submissions period be extended by one month.

Response

Under the *Environmental Planning and Assessment Act 1979*, the statutory duration for the public exhibition period for an environmental impact statement is a minimum of 30 (calendar) days. The Secretary of the Department of Planning, Industry and Environment is responsible for determining the timing and duration of public exhibition periods for an environmental impact statement.

The environmental impact statement for the Beaches Link and Gore Hill Freeway Connection was placed on public exhibition on 9 December 2020 and ended on 1 March 2021, resulting in a total exhibition period of 61 days, noting that the period between 20 December 2020 and 10 January 2021 (inclusive) was not included within the 61 days. The duration of the exhibition period was in line with the public exhibition periods for both the WestConnex M4-M5 Link and Western Harbour Tunnel and Warringah Freeway Upgrade projects.

Community consultation carried out during the public exhibition period for the environmental impact statement is detailed in Section A2.3 of this submissions report.

B14.3.4 Funding of staff positions

Issue raised

Page 10

North Sydney Council requests funding for additional Council staff positions to manage the wide range and complex nature of current and future interagency liaison, design and permit review, legal processes and community engagement.

Response

In recognition of the complex nature and number of overlapping Transport for NSW State Significant Infrastructure projects within the North Sydney local government area, Transport for NSW has engaged with Council regarding funding arrangements and will contribute funds for two Council staff to interface with Transport for NSW project teams.

B14.4 Construction traffic and transport

Issue raised

Page 8

North Sydney Council is concerned that the project would extend the use of the Cammeray Golf Course construction support site (BL1) by two years (to seven years total, when also considering use of the site by the Western Harbour Tunnel and Warringah Freeway Upgrade project), which would cause significant flow-on impacts on other arterial and local roads in the North Sydney local government area.

Response

Council's concern regarding the duration of works at Cammeray Golf Course construction support site (BL1) due to its use by both the project and the Western Harbour Tunnel and Warringah Freeway Upgrade project is acknowledged.

The proposed Cammeray Golf Course construction support site (BL1) would be located in an area of the golf course that would also be used as a temporary construction support site for the Western Harbour Tunnel and Warringah Freeway Upgrade project as discussed in Section B14.11.1 below. The use of this site as a temporary construction support site by both projects provides several environmental benefits including more efficient use/reuse of materials, a smaller overall disturbance footprint and less site rehabilitation than if separate locations were used. It also reduces the cost and setup time for the project contractors.

The potential cumulative peak traffic impacts associated with the expected peak in construction for the Western Harbour Tunnel and Beaches Link program of works in 2024 are identified in Section 5.7 of Appendix F (Technical working paper: Traffic and transport). Traffic modelling indicates that when compared to forecast 2024 peak period base conditions, short-term cumulative peak construction activities in the Warringah Freeway and surrounds have the potential to:

- Increase traffic demand by about one per cent
- Create less than one additional stop per trip
- Reduce average trip speeds by about four per cent
- Impact corridor travel times by less than one minute for most routes.

Cumulative construction activities are therefore only expected to have minor and manageable impacts on network performance in the Warringah Freeway and surrounding area.

The Warringah Freeway Upgrade component of the Western Harbour Tunnel and Warringah Freeway Upgrade project would provide the structural works for the cut and cover and trough structures for the Beaches Link ramps to and from the Warringah Freeway, as discussed in Section 6.4.3 of the environmental impact statement. The structural works would largely comprise the construction of the 'roof' and supporting piles for these structures. This would allow maximum use of the road corridor by the Warringah Freeway Upgrade contractor and minimise disruption.

It is also noted that apart from the motorway facilities, cut and cover structures, trough structures and tunnelling works in Cammeray, the construction footprint shown on the Warringah Freeway would consist of low impact activities such as traffic control and management, line marking and staged surface roadworks tie in works, and utility and cable works required to connect to the Western Harbour Tunnel and Warringah Freeway Upgrade project and other local roads (as outlined in Section 6.8.1 of the environmental impact statement).

Considered and tailored multi-party engagement and cooperation will be established prior to construction to ensure all contributors to (cumulative) impacts are working together to minimise adverse impacts or enhance benefits of multiple projects occurring concurrently or consecutively, in accordance with environmental management measure CI1 (refer to Table D2-1 of this submissions report). Haulage routes and road occupancy will be coordinated with other major transport projects via Greater Sydney Operations.

Other environmental management measures which will be implemented to manage and minimise construction traffic and transport impacts on the road network (refer to Table D2-1 of this submissions report) include:

- Ongoing consultation, as relevant to the location, will be carried out with Greater Sydney Operations, the Port Authority of NSW, local councils, emergency services and bus operators to minimise traffic and transport impacts during construction (refer to environmental management measure CTT6)
- Construction road traffic will be managed to minimise impacts of movements during peak periods (refer to environmental management measure CTT8)
- Truck marshalling areas will be identified and used where required, to minimise potential queueing, to ensure associated road user safety and minimise traffic and access disruptions in the vicinity of temporary construction support sites and access points to construction sites (refer to revised environmental management measure CTT13).

B14.5 Operational traffic and transport

B14.5.1 Operational traffic impacts in North Sydney CBD

Issue raised

Pages 1, 4 and 8

North Sydney Council notes that the project would result in significant additional traffic using the Pacific Highway (southbound), Berry Street and proposed Warringah Freeway access lanes to enter the northbound portal of the Beaches Link on the Warringah Freeway. As a result, Council is concerned that the project would negatively impact the North Sydney road network and particularly the Pacific Highway, Miller Street and Berry Street. Council requests that the impact of the project on traffic volumes in North Sydney CBD be minimised.

Response

The detailed transport modelling process which has been adopted by Transport for NSW for the purpose of the assessment does not indicate that the project would result in significant additional traffic on the roads listed by Council. Transport for NSW's assessment also indicates that the project would not create material adverse traffic performance impacts on the North Sydney road network when considered in the context of typical customer journeys across the transport network.

As an example, the traffic forecasting which informs the environmental impact statement indicates that daily traffic demand on Berry Street would increase by around 10 per cent or less as a result of the Western Harbour Tunnel and Beaches Link program of works. Detailed microsimulation modelling which has been further refined and updated for the preferred infrastructure report (refer to Section 6 (Assessment of road intersection operational performance) of the preferred infrastructure report) indicates that intersection performance along the Pacific Highway, Berry Street and Miller Street would not materially change as a result of the Beaches Link project nor broader Western Harbour Tunnel and Beaches Link program of works.

Further refinements and changes to network operations within the North Sydney CBD may occur as part of the North Sydney Integrated Transport Program works (North Sydney Program/NSITP). The North Sydney Program is a staged program of road based network and place improvements developed by Transport for NSW in close partnership with North Sydney Council, Greater Sydney Commission and Government Architect NSW. Further details of the objectives and status of the North Sydney Program are discussed in Section B14.5.2 below.

Notwithstanding, further assessment was requested by the Department of Planning, Industry and Environment for particular locations where the environmental impact statement indicated potential localised intersection traffic performance impacts (refer to Section 6 (Assessment of road intersection operational performance) of the preferred infrastructure report), including Miller Street through the North Sydney CBD. As noted above, the refined operational traffic modelling for the 2037 'Do something' and 2037 'Do something cumulative' scenarios in the morning and evening peaks generally result in an improvement to overall road network performance compared to the 2037 'Do minimum' scenario, and the performance of intersections in focus would be maintained or improved with the project, with a few exceptions where minor residual impacts to isolated intersection delay are reported.

Transport for NSW would continue to investigate further opportunities to provide additional benefits or mitigate any residual impacts within the North Sydney CBD and surrounds through the Western Harbour Tunnel and Beaches Link program of works and/or other relevant processes such as the North Sydney Program. Given the context of this complex, constrained, urban area, additional mitigations would focus on multi-modal strategies to reduce private vehicle demand rather than seek to deliver further road capacity upgrades.

A review of operational network performance will be carried out after 12 months, and again after five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections, in accordance with environmental management measure OT1 (refer to Table D2-1 of this submissions report). The assessment will be based on updated traffic data at the time and the methodology used will be comparable with that used in Appendix F (Technical working paper: Traffic and transport). Where required, additional feasible and reasonable mitigation measures will be identified in consultation with Department of Planning, Industry and Environment and the relevant council to manage any additional traffic performance impacts identified during the review of operational network performance.

Where required, Transport for NSW will investigate local area traffic management measures to minimise the impact of the project on the surrounding local road network, in accordance with

environmental management measure OT2 (refer to Table D2-1 of this submissions report). Such measures will be determined in consultation with relevant councils and implemented where feasible and reasonable.

B14.5.2 Local planning

Issue raised

Cover letter (page 2), pages 1, 7 and 8

North Sydney Council is concerned that operational impacts of the project on traffic would impact amenity and urban safety in North Sydney CBD. Council notes that the environmental impact statement for the project shows four lanes of eastbound traffic on Berry Street, which is not consistent with Transport for NSW's North Sydney Integrated Transport Plan, which has as a key objective reducing the arterial traffic function of Berry Street.

Condition of approval E162 of the Western Harbour Tunnel and Warringah Freeway Upgrade project requires that the project not preclude the delivery of the objectives of the North Sydney Integrated Transport Plan. North Sydney Council seeks a condition of approval consistent with condition E162 of the Western Harbour Tunnel and Warringah Freeway Upgrade project approval.

Council considers that the Beaches Link and Gore Hill Freeway Connection project will impact upon initiatives such as the North Sydney Integrated Transport Plan and also Council's North Sydney CBD Transport Masterplan, the North Sydney Public Domain Strategy, Ward Street Masterplan, Military Road Planning Study and Civic Precinct Planning Study.

Response

As noted in the previous response, the transport modelling and assessment carried out by Transport for NSW does not show that the project would result in significant additional traffic or performance issues in the North Sydney CBD.

The scope of works proposed on Berry Street as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project includes a pedestrian ‘scramble’ crossing at the intersection of Miller Street and Berry Street to improve pedestrian movement safety and capacity, and the removal of the existing kerb build outs on the southern side of Berry Street. The removal of the kerb build outs and refinement of existing peak period clearway provisions on the southern side of Berry Street would enable traffic performance to be maintained in combination with the proposed pedestrian movement improvements. It is noted that outside of peak traffic periods (ie for the majority of time during weekdays and throughout weekends) the existing operation of Berry Street – two traffic lanes and two parking lanes – would be unaltered by the Western Harbour Tunnel and Beaches Link program of works.

As noted in the previous response, the capacity and configuration works proposed in North Sydney CBD as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project are considered to provide an equitable outcome from the perspective of maintaining a balanced and integrated transport network through North Sydney. Overall, the environmental impact statement (and additional assessment presented in Section 6 (Assessment of road intersection operational performance) of the preferred infrastructure report assessment demonstrates that traffic conditions in the North Sydney CBD would not be materially adversely impacted by the Western Harbour Tunnel and Beaches Link program of works. In addition, proposed changes to infrastructure and operations in the North Sydney CBD are relatively minor, and would not impact the existing function of the transport network. However, further refinements and changes to network operations within the North Sydney CBD may occur as part of the North Sydney Integrated Transport Program (North Sydney Program/NSITP) works.

The North Sydney Program is an ongoing multi-agency collaboration between Transport for NSW, North Sydney Council, Greater Sydney Commission and the Government Architect of NSW, to guide future integrated transport planning and investment in the North Sydney CBD and interconnected areas. Led by Transport for NSW since 2018, it aims to deliver a shared place-based vision for the North Sydney CBD, with validation of the vision for North Sydney currently underway.

The North Sydney Program considers strategic public transport connections to the North Sydney CBD, land use and public domain objectives, improved pedestrian amenity and safety, road network changes, improved access for cyclists to and through the CBD, convenient interchanges between bus and rail services, management of kerbside access to support business activity across the day, and place outcomes within the CBD. As such, a focus of the North Sydney Program is to ensure major projects, such as the Western Harbour Tunnel and Beaches Link program of works, integrate with the North Sydney CBD in a manner that supports the globally connected 'Harbour CBD' and enables delivery of befitting place-based outcomes.

Recent media releases confirm Transport for NSW's commitment to the North Sydney Program, with a particular focus on changes to the existing form and functions of Berry Street and Miller Street (www.mysydney.nsw.gov.au/Working_Together_to_Shape_North_Sydney's_Future). The North Sydney Program has the shared objective of pushing regional traffic to the edges of the CBD to create a safe and comfortable place for pedestrians. This would change the way people move to, from, and within the North Sydney CBD, including to and from motorway connections such as Beaches Link and the Western Harbour Tunnel. Beaches Link – and the accompanying Warringah Freeway Upgrade and Western Harbour Tunnel projects – would contribute to the shared vision of the North Sydney Program, enabling growth by improving the regional transport network and creating the opportunity for sustainable transport options such as new express bus services to and from North Sydney CBD.

The Western Harbour Tunnel and Beaches Link program of works is expected to transfer a significant volume of through traffic currently on surface roads underground. Further, and in addition to transferring surface traffic underground, reduced congestion on the motorway and arterial road network would provide flow-on benefits to the adjoining local road network. Reduced congestion on the arterial and local road networks including reduced rat-running would result in improvements in amenity related to physical safety, air quality and noise levels and facilitate improved pedestrian access and activity consistent with the North Sydney Program. Any changes to the project as a result of the North Sydney Program would be considered during further design development. Further investigations and assessments may be carried out as part of this process, including additional traffic and transport modelling.

It is also noted that Transport for NSW is also working with local council and other government stakeholders to develop a place based transport plan for the lower North Shore, which would identify potential transport opportunities to respond to the changing needs of the community, including movement types, and initiatives for mode shift and network operation across all transport modes. The development of the plan would consider the transport needs for the area based on transport and land use changes within the area, including their purpose, connections between centres and modal priority, eg light vehicle, freight, buses and cyclists, and changes to the transport network as a result of major infrastructure projects currently proposed and being delivered in the area. Transport for NSW is commencing engagement with North Sydney Council, Willoughby City Council, Mosman Council and Lane Cove Council in the last quarter of 2021.

In summary, Transport for NSW will continue to work closely with North Sydney Council and key stakeholders through agreed governance structures to investigate options to improve movement and place outcomes within North Sydney, further leveraging the strategic benefits of the Western

Harbour Tunnel and Beaches Link program of works. Community consultation would also be carried out. Issues raised by the community would be considered in any final decision to refine the project.

The relationship between the project and local government strategic plans is identified in Table 3-3 of the environmental impact statement. It includes discussion of the relationship between the project and the North Sydney Program and also the *Military Road Corridor Planning Study* – Stage 1 (North Sydney Council, 2021). It notes that the project would support the objectives outlined in the Military Road Corridor Planning Study through reducing traffic volumes and congestion along the Military Road/Spit Road corridor, enhancing the connectivity and amenity of Military Road.

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during their assessment of the project. Notwithstanding, Transport for NSW will comply with Western Harbour Tunnel and Warringah Freeway Upgrade project condition of approval E162, and in principle does not have any objection to a similar condition of approval for the Beaches Link and Gore Hill Freeway Connection project.

B14.5.3 Induced demand

Issue raised

Page 10

North Sydney Council notes that the project facilitates ease of journeys made by private vehicles, which would induce demand for private vehicle trips and lead to increased traffic movements and an increase in the associated environmental impacts.

Response

A new or substantially upgraded road can induce changes in trip patterns, which then appear as induced traffic demand. Traffic growth on new or upgraded roads is generally a result of the following influences (as discussed in Appendix F (Technical working paper: Traffic and transport)):

- Regional increase in number of trips due to population growth and increased economic activity
- Trips attracted from competing routes or modes as a result of improved travel times on the new or upgraded road
- Induced demand (new trips) as a result of improved travel times between homes and destinations, such as workplaces, shopping centres and education facilities, which cause changes to region-wide trip patterns.

The Sydney Motorway Planning Model (SMPM) (traffic forecasting model used for the assessment) includes the changes in traffic associated with all three of the above sources of traffic, which means that all areas of the environmental impact statement assessment consider and present project impacts inclusive of induced demand, including operational travel benefits.

The improved road travel times provided by the project would benefit public transport. The Beaches Link tunnel has been designed to be a key element of the future public transport network by allowing for the provision of new express bus connections between North Sydney and the Northern Beaches and other strategic centres. The tunnel portals at the Warringah Freeway have been designed to integrate with a new southbound bus lane on the Warringah Freeway (delivered as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project) and provide the opportunity for efficient access and interchange with the new Victoria Cross Metro Station at North Sydney, delivered as part of the Sydney Metro City & Southwest project. Further details of how the project would benefit public transport are provided in Section 5.2.8 of the environmental impact statement.

It should also be noted that the project is one of a suite of transport projects in the Sydney metropolitan area that include a number of major public transport projects, including the Sydney Metro City & Southwest project. This integrated transport approach is designed to ensure an adequate level of investment in both existing and future public transport. Similar to the effects of road projects enabling and accommodating growth which results in traffic demand, the delivery of these public transport improvements would encourage and accommodate growth of bus and rail demand, creating a balanced, multi-modal transport system suitable for the diverse range of transport purposes, origins, and destinations.

B14.5.4 Modelling adequacy

Issue raised

Page 10

North Sydney Council recommends that the modelling contained in the environmental impact statement be reviewed to include current population growth and distribution forecast, the Sydney Metro West and Sydney Metro Western Sydney Airport projects as well as consider current traffic network capacity constraints.

Response

The transport modelling for the Beaches Link and Gore Hill Freeway Connection project has been completed in accordance with appropriate standards and guidelines, and developed, reviewed, and endorsed by internal Transport for NSW and independent subject matter experts.

A multi-tiered transport modelling approach was adopted to carry out a comprehensive assessment of the current and future performance of the road network, as outlined in Section 3.3 of Appendix F (Technical working paper: Traffic and transport). The multi-modal Sydney Strategic Travel Model (STM) and the road traffic assignment Sydney Motorway Planning Model (SMPM) were used for strategic demand forecasting for the assessment. Downstream of these modelling activities, VISSIM microsimulation modelling was used to reflect and assess detailed network capacity constraints and resultant performance implications.

The key inputs and assumptions used in the traffic modelling were the latest available at the time of assessment. They include recently completed and approved future infrastructure projects, and are discussed in Section 3.3.2 of Appendix F (Technical working paper: Traffic and transport). Base and future population and employment data for the Sydney metropolitan area was sourced from Transport for NSW Transport Performance and Analytics (TPA), which are available at five-year intervals from the most recent Census year. Given the strategic nature of the traffic modelling carried out, the relatively minor refinements to the most current population and employment forecasts are unlikely to have a material effect on the assessment outcomes, and this has been demonstrated by sensitivity tests.

The environmental impact statement for Sydney Metro West was on public exhibition between April and June 2020, with the project planned to link Parramatta and Sydney CBDs and serve Sydney Olympic Park and The Bays Precinct along the route. At the time the traffic and transport assessment was carried out, Sydney Metro West was at the early stages of development and therefore not included in the future strategic modelling. While Sydney Metro West is aimed at transporting passengers between Parramatta and Sydney CBD, the Beaches Link and Gore Hill Freeway Connection project would service buses, freight, commercial and many other individual journey needs with diverse origins and destinations to and from the Northern Beaches. Considering that the project and the Sydney Metro West project serve very different transport functions, and

origins and destinations, it is unlikely that inclusion of the Sydney Metro West project would have a material influence on the modelling. This has been demonstrated by sensitivity testing.

The environmental impact statement for the Sydney Metro Western Sydney Airport project was on public exhibition from 21 October 2020 until 2 December 2020, with the project planned to include six new metro stations from St Marys through to the new airport and the Western Sydney Aerotropolis. At the time the traffic and transport assessment was carried out for the Beaches Link and Gore Hill Freeway Connection project, Sydney Metro Western Sydney Airport was at the early stages of development and therefore not included in the future strategic modelling. However, noting that it is further geographically removed from the project than the Sydney Metro West project and with a less competitive transport purpose, the inclusion of the Sydney Metro Western Sydney Airport project would likely have an immaterial effect on the traffic modelling.

B14.6 Hydrodynamics and water quality

B14.6.1 Stormwater harvesting scheme

Issue raised

Cover letter (page 1)

North Sydney Council is concerned about the loss of water treatment infrastructure at Cammeray Golf Course due to the project.

Response

The existing storage dam at Cammeray Golf Course would be directly impacted by the proposed Western Harbour Tunnel and Warringah Freeway Upgrade project, prior to the Cammeray Golf Course construction support site (BL1) being used by the Beaches Link and Gore Hill Freeway Connection project.

In accordance with condition E209 of the Western Harbour Tunnel and Warringah Freeway Upgrade project's conditions of approval, Transport for NSW will provide a replacement stormwater harvesting dam within the boundaries of the golf course prior to decommissioning of the existing dam. If the new stormwater harvesting dam is not operational prior to dewatering of the existing dam, Transport for NSW will pay for all water usage costs associated with the use of the stormwater harvesting dam incurred by Council or the golf club until the replacement dam is operational. For further information, also refer to Section A3.3.3 of the Western Harbour Tunnel and Warringah Freeway Upgrade submissions report.

B14.6.2 Marine water quality

Issue raised

Cover letter (page 1) and page 10

North Sydney Council is concerned about the use of the immersed tube tunnel construction method to cross Middle Harbour, noting that the Sydney Metro City & Southwest project deemed that tunnel boring (under the harbour floor) was the most environmentally sensitive construction method, over the immersed tube tunnel methodology. In particular, Council is concerned about the impact of the project on waterways, in particular sediment disturbance as a result of dredging the harbour floor, on water quality and marine biodiversity.

Response

The Sydney Metro City & Southwest project is subject to a separate planning approval which was received in 2017. The project and the Sydney Metro City & Southwest project are each challenged with managing different constraints and the selected construction methods presented in each environmental impact statement were chosen accordingly.

A number of different Middle Harbour crossing options and tunnelling method alternatives were considered as identified in Chapter 4 (Project development and alternatives) of the environmental impact statement. This analysis was carried out by a multidisciplinary team including design, construction, transport planning, and environmental specialists to ensure a comprehensive analysis. The immersed tube option was chosen as it would provide the best solution when considered against a number of criteria specific to design, constructability, traffic performance, environmental and social impacts.

The immersed tube tunnel method has been applied to over 150 major road and rail tunnels around the world, including the existing Sydney Harbour Tunnel, to overcome similar combinations of geology, topography and cross-sectional challenges. The advantages of the immersed tube tunnel method (as described in Table 4-4 of the environmental impact statement) include:

- Provides the shallowest possible tunnel alignment at the Middle Harbour crossing enabling the best possible gradient and associated performance outcomes (eg safety, vehicle speeds, journey experience, long-term emissions)
- Minimises tunneling risks by reducing exposure to tunneling through poor geology and reducing the time workers need to spend in high risk tunneling environments
- Lower construction and operational costs when compared to alternative methodologies
- Minimises the size of waterside sites when compared to those required to launch, support, and retrieve large diameter tunnel boring machines
- Substantially reduces haulage on land when compared to tunnel boring machine solutions for the project's required cross section
- Takes advantage of marine logistics to minimise heavy haulage on roads
- The preferred alignment avoids interfaces with substantial sensitive marine ecology at the sand bar at the entrance to Middle Harbour (immersed tube tunnel proposed for the purple corridor alternative).

A further benefit of the immersed tube tunnel is that it would be aligned partially above the bed of Middle Harbour, requiring only a partial trench and therefore requiring about 75 per cent less dredging than an equivalent fully trenched immersed tube tunnel.

The dredging methodology has been designed to minimise impacts on the marine environment depending on the material being dredged, as described in Table 6-4 of the environmental impact statement. This would involve using a backhoe dredge with a closed environmental clamshell bucket for removal of the surface layer of material with elevated levels of contaminants to avoid the spread of material into the water column. These buckets have been specifically designed for dredging material with elevated levels of contaminants.

Three types of silt curtain would also be used during dredging operations to provide several layers of protection:

- Two deep draft silt curtains (one on each side of the crossing) designed with a draft of 10-12 metres placed around the dredging activity

- Shallow draft silt curtains (sometimes referred to as ‘moon pools’) about two to three metres deep immediately at the dredge excavation point, attached to the backhoe dredge
- Shallow silt curtains around ecologically sensitive areas (eg nearby seagrass and rocky reef habitat) to provide additional protection.

Refer to environmental management measure WQ16 (see Table D2-1 of this submissions report) for further information. For a diagrammatic representation of the silt curtains, also refer to Figure C16-1 in Section C16.2.5 of this submissions report.

The use of the proposed silts curtains combined with the environmental clamshell bucket, together with other environmental control measures such as no overflow from transport barges and restricted working hours (thereby minimising the rate of sediment disturbance) is considered an effective dredging methodology. This methodology, in conjunction with the behaviour of sediment-bound contaminants and limited sediment mobilisation, means it is unlikely that water quality would be significantly impacted by contaminants mobilised from dredging and marine construction activities.

Monitoring during dredging activities will be carried out to validate the effectiveness of mitigation measures implemented to manage potential impacts on the water quality and sensitive marine vegetation and habitats of Middle Harbour, in accordance with revised environmental management measure WQ12 (refer to Table D2-1 of this submissions report). The use of real-time turbidity monitoring at both potential impact and background locations, as well as adoption of a tiered (trigger level) management approach for sensitive sites to manage any potential impacts, will be included in a dredge monitoring program. The dredge monitoring program will be developed in consultation with an appropriately qualified and experienced specialist, DPI Fisheries and the NSW EPA prior to its implementation.

Prior to the commencement of construction, the dredging contractor would develop a dredge management plan which would document all of the potential risks associated with the dredging works and describe in detail the measures that would be established to mitigate these potential impacts. Refer to Section D1 of this submissions report for further discussion about the dredge management plan and the overall construction environmental management plan.

B14.7 Air quality

B14.7.1 Operational air quality modelling (assumed emissions reduction)

Issue raised

Page 9

North Sydney Council is concerned that the operational air quality modelling assumes that background air quality growth would continue on its current trajectory under a ‘Do minimum’ scenario (which assumes the project is not operational). Modelled emission increases for the project under the ‘Do something’ and ‘Do something cumulative’ scenarios are then represented as a portion or measure above the projected air quality under a ‘Do minimum’ scenario. However, the project modelling also takes some account of projected emissions reductions likely to occur over time, thus presenting the project in a more environmentally favourable light.

Response

The impacts of the project on air quality are assessed in Appendix H (Technical working paper: Air quality), with the results presented in two main ways to assist in assessing the extent of impacts from the project:

- The total pollutant concentration from all sources (background, surface roads, portals and ventilation outlets)
- The change in the pollutant concentration due to the project.

Total pollutant concentrations were predicted for several different scenarios, including:

- 'Do minimum' (without project) scenario (eg Figure I-41 in Annexure I of Appendix H (Technical working paper: Air quality))
- 'Do something' (with project) scenario (eg Figure I-42 in Annexure I of Appendix H (Technical working paper: Air quality))
- 'Do something cumulative' (with program of works) scenario (eg Figure I-44 in Annexure I of Appendix H (Technical working paper: Air quality)).

The total pollutant concentrations are the air quality levels predicted to be experienced by the community in the above scenarios, and all results include expected improvements in vehicle emissions due to cleaner fuels and vehicles. To assist in assessing impacts, these results have been compared to air quality criteria, including national standards, however they cannot be used to assess how the project is predicted to change air quality.

The change in pollutant concentration looks at the difference between the 'Do minimum' (without project) scenario and a 'Do something' scenario (or 'Do something cumulative' scenario) for a given year. For example, the results presented in Figure I-23 in Annexure I of Appendix H (Technical working paper: Air quality) show the change in annual mean $PM_{2.5}$ due to the project in 2027. These results were obtained by subtracting Figure I-41 ('Do minimum') from Figure I-42 ('Do something') (both figures from Annexure I of Appendix H (Technical working paper: Air quality)). This concept is illustrated for a single receiver in Figure 6-4 of Appendix H (Technical working paper: Air quality).

The change in pollutant concentration results represent the change in air quality resulting from the traffic changes due to the project. Where traffic is predicted to increase due to the project, pollutant concentrations are predicted to increase. Conversely, where traffic is predicted to decrease due to the project, pollutant concentrations are predicted to decrease. These results are independent of the predicted improvements in vehicle emissions across the broader network.

Figure 8-7 of Appendix H (Technical working paper: Air quality) shows the emissions levels assumed for each scenario/year used in the modelling and demonstrates that the emissions levels are similar between the 'Do minimum', 'Do something' and 'Do something cumulative' scenarios, for each of the modelled years. As these results show total pollutant concentrations, improvements in petrol and diesel engine vehicles in future years eg from fuel or engine standards, are included equally in the 'Do minimum', 'Do something' and 'Do something cumulative' scenarios. However, factors such as continued transition to alternatively fuelled low (or zero) emission vehicles have not been considered in either the vehicle emissions or in adjustments to the background air quality in future years.

B14.7.2 Operational air quality modelling (nitrogen dioxide standard)

Issue raised

Page 9

The proposed revision to the nitrogen dioxide (NO_2) standard in the National Environmental Protection (Ambient Air Quality) Measure should be applied to the project.

Response

The NO_2 standards in the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM), that are used in the air quality assessment, are based on the understanding of the health effects at the time it was introduced (1998). The 2011 AAQ NEPM review concluded there was sufficient evidence to support the review of the NO_2 standards (and others). The latest review published in 2019 recommends an initial move to annual average and 1-hour NO_2 standards of 185 µg/m^3 and 39 µg/m^3 respectively, and to 164 µg/m^3 and 31 µg/m^3 respectively by 2025.

Figure B14-1 and Figure B14-2 below are taken from Annexure D of Appendix H (Technical working paper: Air quality) and show the general downward trend in annual average NO_2 in Sydney, to levels below the proposed 2025 standard of 31 µg/m^3. Maximum 1-hour measurements remain steady but are generally below the proposed 2025 standard of 164 µg/m^3. Given the small contributions that the ventilation outlets make to the total ambient air quality at ground level, the project is unlikely to change these trends.

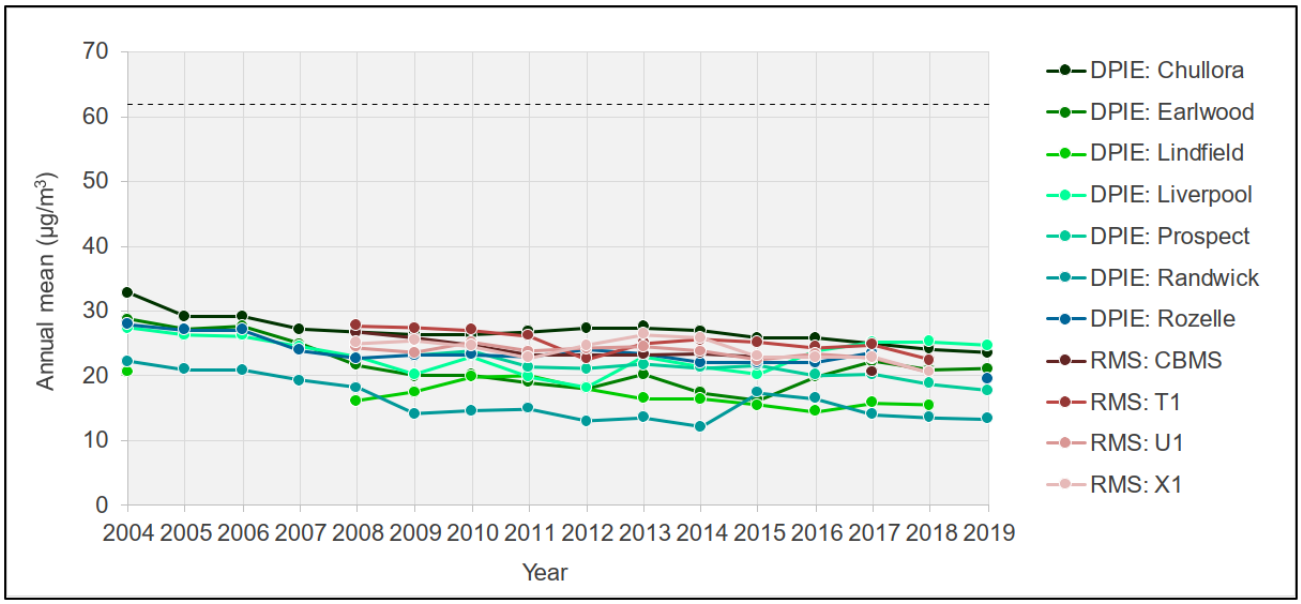


Figure B14-1 Trend in annual mean NO_2 concentration (Source: Figure D-8, Annexure D of Appendix H (Technical working paper: Air quality))

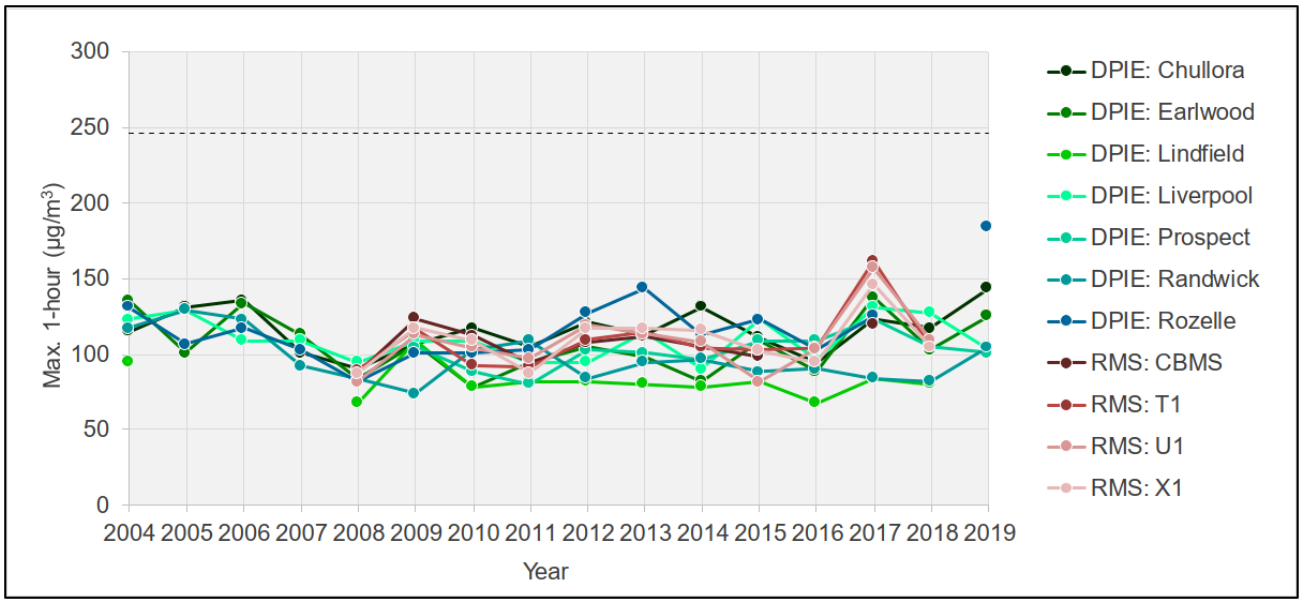


Figure B14-2 Trend in maximum one-hour mean NO_2 concentration (Source: Figure D-9, Annexure D of Appendix H (Technical working paper: Air quality))

There were very few sensitive receivers that showed exceedances of either the annual average or 1-hour proposed NO_2 standards, and those that did were as a result of emissions from surface roads and not the ventilation outlets. The example shown in Figure B14-3 below is taken from Figure 8-27 in Appendix H (Technical working paper: Air quality). It shows that almost all of the residential, workplace and recreational receivers remain below 31 µg/m^3 for the 'Do something cumulative 2037' scenario. For the very few that are predicted to exceed, this exceedance is marginal only, and only then due to the contributions from surface roads (pink line). It is also likely that there is an element of double counting of surface roads as these would also be contained to some extent in the background levels (blue line).

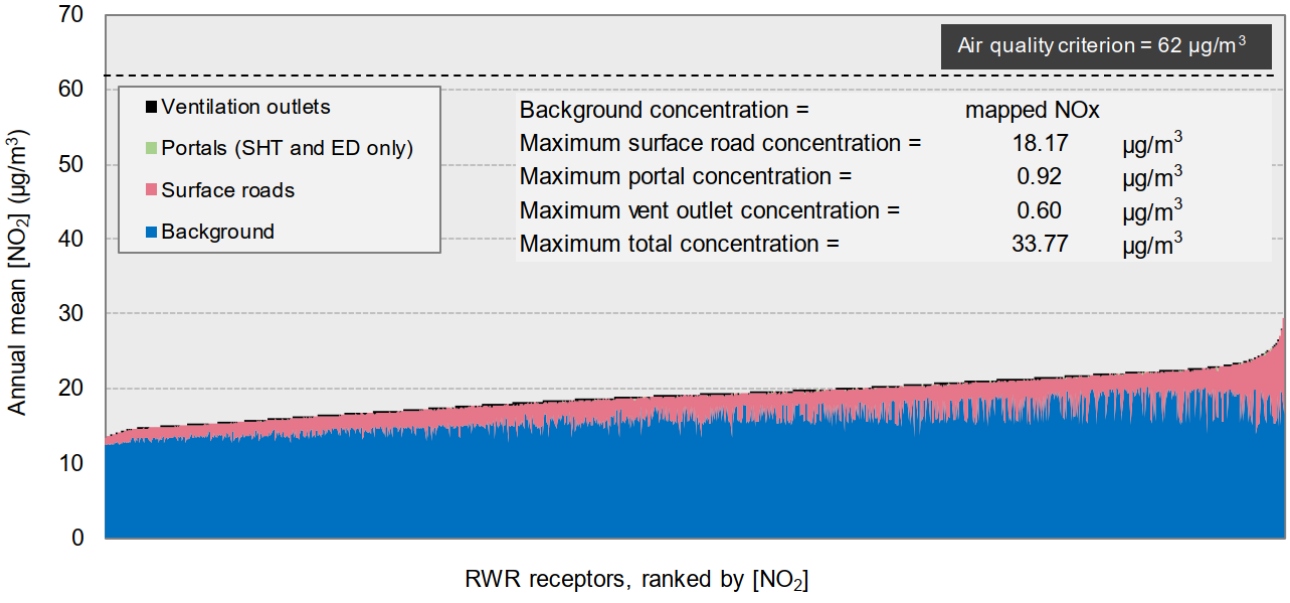


Figure B14-3 Source contributions to annual mean NO_2 concentration at residential, workplace and recreational receivers (Source: Figure 8-27, Appendix H (Technical working paper: Air quality))

B14.7.3 Ventilation outlets

Issue raised

Cover letter (page 1) and page 9

North Sydney Council is concerned that no filtration system is proposed for the project's ventilation outlets. Council notes that the assessment in the environmental impact statement concludes that appropriate design of ventilation outlets would achieve the same outcomes as installing air filtration systems; however, Council believes that a precautionary approach should be adopted and a filtration system installed to minimise the project's air quality impact and risks to human health and the environment to the greatest extent practicable.

North Sydney Council also expressed that the locations of the proposed ventilation outlets is a key concern for the community, and has been repeatedly articulated at various forums.

Response

Ventilation outlet filtration

The independent NSW Chief Scientist and Engineer has recently released a series of reports in relation to road tunnel air quality. The reports found that emissions from well-designed road tunnels cause a negligible change to surrounding air quality, and as such, there is little to no health benefit for surrounding communities in installing filtration and air-treatment systems in such tunnels. Further information is available at www.chiefscientist.nsw.gov.au and nswroads.work/airquality.

The inclusion of filtration would result in no material benefit to air quality or community health in the surrounding community when compared to the current project ventilation system and outlet design, as discussed in Section 12.7.2 of the environmental impact statement. Any predicted changes in the concentration of pollutants would be largely driven by changes in the surface road traffic.

Modelling carried out demonstrates that the ventilation system would be effective in ensuring compliance with the in-tunnel air quality criteria.

Ventilation outlet locations

The ventilation alternatives considered, including ventilation outlet locations, are discussed in Section 4.5.6 of the environmental impact statement. Vehicles travelling through the tunnels create a piston effect which draws air in the direction of travel. As a result, the most efficient location for a ventilation outlet is near the tunnel exit portal locations (that is, near the exit portals of the tunnel in Cammeray, Artarmon, Balgowlah and Killarney Heights). This minimises the length of tunnel where the air flow must be forced by jet fans within the tunnels against traffic flow back to the ventilation point. The reduced use of tunnel ventilation fans also increases the performance of the tunnels and reduces operational power consumption, thereby reducing the operational costs of the project and enhancing sustainability outcomes.

The ventilation outlet locations at Gore Hill Freeway at Artarmon, Burnt Bridge Creek Deviation at Balgowlah and Wakehurst Parkway at Killarney Heights were driven by the locations of the tunnel portals and the motorway facilities. For the ventilation outlet at Cammeray, the Warringah Freeway corridor was identified as the preferred location for the ventilation outlet. This location provides the following key advantages:

- It would minimise the total project footprint, noting alternatives would require additional property acquisition external to the existing road corridor

- It would be immediately above the tunnel, with associated efficiencies.

Additionally, it would be more appropriate to locate the ventilation outlet within an area of compatible land use such as a major road corridor, where it would not significantly alter the landscape character.

An overview of the key features of the project, including the location of the ventilation outlets, is provided in Figure 5-1 to Figure 5-9 of the environmental impact statement.

B14.8 Human health

Issue raised

Cover letter (page 1)

North Sydney Council is concerned about the impact of the project on the health and wellbeing of residents.

Response

Construction

An assessment of the potential human health impacts to communities who live or work within the vicinity of the proposed temporary construction support sites is provided in Section 13.4 of the environmental impact statement. The human health impact assessment considers community receivers, which are locations in the local community where more sensitive members of the population, such as infants and young children, the elderly or those with existing health conditions or illnesses, may spend a greater proportion of time. Community receiver locations include hospitals, child care facilities, schools and aged care homes/facilities.

Potential impacts to human health during construction were assessed in relation to:

- Air quality impacts (sections 13.4.1 and 12.5 of the environmental impact statement)
- Noise and vibration impacts (sections 13.4.2 and 10.6 of the environmental impact statement)
- Social impacts (section 13.4.3 and 21.4 of the environmental impact statement).

Potential impacts will be managed in accordance with the environmental management measures outlined in Table D2-1 of this submissions report. This includes:

- Construction noise management measures (environmental management measures CNV1-CNV15)
- Dust management measures (environmental management measures AQ1 and AQ3)
- Contamination management measures (environmental management measures SG8, SG10-SG13 and SG20)
- Property acquisition and relocation services (environmental management measure LP3)
- Social impact management measures (environmental management measures SE1-SE3)
- Visual amenity measures (environmental management measures V2-V13)
- Construction fatigue measures (environmental management measures CI1-CI4).

Operation

An assessment of the potential human health impacts during operation of the project is provided in Section 13.5 of the environmental impact statement. The human health impact assessment considers community receivers, which are locations in the local community where more sensitive

members of the population, such as infants and young children, the elderly or those with existing health conditions or illnesses, may spend a significant period of time. Community receiver locations include hospitals, child care facilities, schools and aged care homes/facilities.

Potential impacts to human health during operation were assessed in relation to:

- Air quality impacts outside the tunnels
- Air quality impacts inside the tunnels
- Noise and vibration impacts
- Social impacts.

Some of the key findings of the assessment are:

- There would be no significant changes in the incidence of health impacts associated with exposure to NO_2 in the community as a result of the project
- Concentrations of total particulate matter ($PM_{2.5}$ and PM_{10}) in the local community would essentially remain unchanged in most cases with the operation of the project. The potential incidence of health impacts associated with exposure to particulate matter is anticipated to remain unchanged as a result of the project
- No health impacts due to exposures to CO are anticipated in the local area surrounding the project as a result of the project
- No significant health impacts are anticipated within the tunnel due to exposures to vehicle emissions under any plausible traffic and tunnel operational scenarios
- For most receivers assessed, the project would result in either reduced or relatively minor changes in traffic noise levels. In areas where there is a reduction in traffic noise there would be associated health benefits in these communities.

B14.9 Aboriginal cultural heritage

Issue raised

Cover letter (page 1)

North Sydney Council is concerned about the impact of the project on Aboriginal heritage.

Response

The potential impact of the project on Aboriginal heritage is assessed in Chapter 15 (Aboriginal cultural heritage) of the environmental impact statement.

Recorded Aboriginal heritage sites within the project area are identified in Table 15-2 of the environmental impact statement. No recorded Aboriginal heritage sites were identified in the North Sydney local government area.

Measures to avoid, minimise or manage Aboriginal cultural heritage impacts as a result of the project are detailed in Table D2-1 of this submissions report.

B14.10 Biodiversity

B14.10.1 Impacts to terrestrial flora

Issue raised

Cover letter (page 1)

Council is concerned about the impact of the project on flora.

Response

The potential impact of the project on flora is assessed in Chapter 19 (Biodiversity) of the environmental impact statement and Appendix S (Technical working paper: Biodiversity development assessment report). Potential impacts to biodiversity will be managed in accordance with the environmental management measures outlined in Table D2-1 of this submissions report.

In terms of impacts around the North Sydney area, it is noted that the construction footprint of the project overlaps with the construction footprint of the Western Harbour Tunnel and Warringah Freeway Upgrade project at Warringah Freeway/Cammeray Golf Course construction support site (BL1). This overlap area was previously assessed as part of the environmental impact statement prepared for the Western Harbour Tunnel and Warringah Freeway Upgrade project. Further, apart from the motorway facilities, cut and cover structures, trough structures and tunnelling works in Cammeray, the construction footprint shown on the Warringah Freeway would only consist of low impact activities such as traffic control and management, line marking and staged surface roadworks tie in works, and utility and cable works required to connect to the Western Harbour Tunnel and Warringah Freeway Upgrade project and other local roads.

Where mature amenity trees (other than trees offset under the NSW Biodiversity Offsets Scheme, established under Part 6 of the *Biodiversity Conservation Act 2016*) are removed as a result of construction, they will be replaced at a ratio of 2:1 (ie net gain of trees), in accordance with revised environmental management measure V13 (refer to Table D2-1 of this submissions report). The replacement trees will consist of local native provenance species from the vegetation community that once occurred in the locality (rather than plant exotic or non-local native trees) where available and subject to the urban design and landscape plan. Where replacement trees cannot be accommodated within the operational footprint of the project, consultation will be carried out with adjacent government land owners and the relevant local council (where appropriate) to determine if they can accommodate the replacement tree(s).

B14.10.2 Impacts to terrestrial fauna

Issue raised

Cover letter (page 1) and page 10

Council is concerned about the impact of the project on fauna, including impacts on foraging habitat as well as known roosting sites of threatened species.

Response

The potential impact of the project on fauna is assessed in Chapter 19 (Biodiversity) of the environmental impact statement and Appendix S (Technical working paper: Biodiversity development assessment report). Potential impacts to biodiversity will be managed in accordance with the environmental management measures outlined in Table D2-1 of this submissions report.

Vegetated habitats that would be removed are primarily located next to the Wakehurst Parkway, within the Flat Rock Drive construction support site (BL2), Balgowlah Golf Course construction

support site (BL10), Wakehurst Parkway south construction support site (BL12) and Wakehurst Parkway east construction support site (BL13). The project's potential impact on foraging habitats is discussed in Section 19.5.2 of the environmental impact statement. The removal of flowering and fruiting trees, shrubs and ground layer vegetation, and rocky habitat would result in the loss of potential foraging and sheltering habitat to a number of threatened fauna species known or considered likely to occur in the construction footprint. However, these impacts would be negligible since the habitat to be removed does not comprise a significant proportion of habitat available to species in the surrounding terrestrial biodiversity locality or wider bioregion.

The project's potential impact on roosting sites is also discussed in Section 19.5.2 of the environmental impact statement. Direct impacts to human-made structures and the built environment would be limited to the alteration of existing bridges and culverts at the surface works in Artarmon, surface road works at Balgowlah, and road realignment and upgrade works at Wakehurst Parkway, which offer limited and marginal potential roosting habitat for some threatened bat species (including the Large Bent-winged Bat, Little Bent-winged Bat, and Southern Myotis). These works would be temporary and are unlikely to adversely impact such species.

In terms of impacts around the North Sydney area, as noted above in Section B14.10.1, the construction footprint of the project overlaps with the construction footprint of the Western Harbour Tunnel and Warringah Freeway Upgrade project at Warringah Freeway/Cammeray Golf Course construction support site (BL1). This overlap area was previously assessed as part of the environmental impact statement prepared for the Western Harbour Tunnel and Warringah Freeway Upgrade project.

Further details on the occurrence of threatened fauna species in the project area and the availability and potential impact of the project on roosting sites and foraging habitat is provided in Table 19-7 of the environmental impact statement.

B14.10.3 Maritime environment

Issue raised

Cover letter (page 1)

Council is concerned about the impact of the project on the marine/maritime environment.

Response

An assessment of the potential impact of the project on the marine environment during construction is provided in the following sections of the environmental impact statement:

- Section 17.4.1 – potential construction impacts to the hydrodynamic environment of Middle Harbour
- Section 17.4.2 – potential construction impacts to marine water quality
- Section 17.5.1 – potential operational impacts to the hydrodynamic environment of Middle Harbour
- Section 19.5.5 – potential impacts to marine biodiversity.

The dredging methodology has been designed to minimise impacts on the marine environment depending on the material being dredged. This would involve use of a backhoe dredge with a closed environmental clamshell bucket, supported by three types of silt curtains (refer to Section B14.6.2 above for further details). The proposed methodology is considered to be an effective dredging methodology which, in conjunction with the behaviour of sediment-bound contaminants and the

limited sediment mobilisation, means it is unlikely that water quality would be significantly impacted by contaminants mobilised from dredging and marine construction activities.

Overall, the impacts on the marine/maritime environment, including key fish habitats, during construction and operation of the project are not considered to be significant and will be adequately managed by the environmental management measures included in Table D2-1 of this submissions report, in particular environmental management measures B28 to B38.

B14.11 Land use and property

B14.11.1 Loss of open space

Issue raised

Cover letter (page 1 and page 2) and Page 7

North Sydney Council is concerned about the construction and post-construction impacts of the project on existing and future open space and sporting facilities at Cammeray Park, including permanent loss of land at Cammeray Golf Course. Council is also concerned regarding loss of trees and canopy.

Council seeks assurance that there would be no net loss of open space as a result of the project, and that any net increase in usable open space be provided within the North Sydney local government area. Council seeks a condition of approval consistent with condition E157 of the Western Harbour Tunnel and Warringah Freeway Upgrade project approval, which requires a net increase in usable open space. Council considers that it is critical for open space impacts to be identified early and future state agreed as a priority. Council also requests the development of an overarching strategy for negotiation of financial and open space loss amelioration and compensation.

Response

Impacts at Cammeray Golf Course

An assessment of the open space impacts due to the Beaches Link and Gore Hill Freeway Connection project during construction and operation is provided in Table 20-5 and Table 20-6 respectively of the environmental impact statement. Within North Sydney local government area, the project would only impact open space at Cammeray Golf Course. The adjoining Cammeray Park sports ground, tennis club, croquet club and skate park would not be directly impacted and would be able to remain in use during construction and operation.

Impacts to land within Cammeray Golf Course would initially result from the establishment of infrastructure required to support construction and operation of the Western Harbour Tunnel and Warringah Freeway Upgrade project. Part of the site would be later adjusted to support the establishment of the Cammeray Golf Course construction support site (BL1). Part of Cammeray Golf Course would be acquired for permanent operational facilities for both the project and the Western Harbour Tunnel and Warringah Freeway Upgrade project (outlined in Table 20-5 of the environmental impact statement). This would reduce the amount of land available for public recreational use. The location of operational infrastructure has been developed in consideration of existing land uses and future development to minimise permanent impacts.

The project would not impact on the feasibility of Cammeray Golf Course to operate as a nine hole golf course or for public recreation and open space purposes, either during construction or operation. However, construction and the longer-term operation of project support infrastructure at Cammeray would require reconfiguration of the golf course including changes to some holes on the

golf course. In accordance with condition E101 of the Western Harbour Tunnel and Warringah Freeway Upgrade project's conditions of approval, the design and establishment of an altered Cammeray Golf Course must provide an equivalent standard golf course or the provision of works to offset the loss in standards. This must be undertaken in consultation with and at no cost to Cammeray Golf Club. Transport for NSW is continuing to consult with Cammeray Golf Club, Department of Planning, Industry and Environment (Crown Lands) and North Sydney Council (the trustee).

After construction of the Beaches Link and Gore Hill Freeway Connection project has been completed, areas of the golf course not required for permanent project infrastructure will be rehabilitated and returned in consultation with relevant stakeholders, including replacement trees and landscaping (refer to environmental management measure LP5 in Table D2-1 of this submissions report).

The majority of open space used for construction of the project would not be required to operate the project. Where feasible and reasonable, the extent of permanent impact on public open space areas will be minimised during further design development, in accordance with environmental management measure SE1 (refer to Table D2-1 of this submissions report).

Where mature amenity trees (other than trees offset under the NSW Biodiversity Offsets Scheme, established under Part 6 of the *Biodiversity Conservation Act 2016*) are removed as a result construction, they will be replaced at a ratio of 2:1 (ie net gain of trees), in accordance with revised environmental management measure V13 (refer to Table D2-1 of this submissions report). The replacement trees will consist of local native provenance species from the vegetation community that once occurred in the locality (rather than plant exotic or non-local native trees) where available and subject to the urban design and landscape plan. Where replacement trees cannot be accommodated within the operational footprint of the project, consultation will be carried out with adjacent government land owners and the relevant local council (where appropriate) to determine if they can accommodate the replacement tree(s).

Open space strategy

Conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during their assessment of the project. Notwithstanding, land subject to temporary use, including areas of public open space, will be rehabilitated as soon as practicable to an appropriate condition, taking into consideration the location, land use characteristics, area and adjacent land uses, as required by environmental management measure LP5 (refer to Table D2-1 of this submissions report). Rehabilitation will be carried out in consultation with the relevant landowner, the local council and community (where appropriate).

An urban design and landscape plan will be prepared during further design development and implemented in line with the strategic urban design framework for the project (environmental management measure V1, refer to Table D2-1 of this submissions report). The urban design and landscape plan will detail built and landscape features to be implemented during construction and rehabilitation of disturbed areas during construction of the project. The urban design and landscape plan will be made available to the public for feedback.

Transport for NSW is also working with North Sydney Council to develop an Interface Agreement for the Western Harbour Tunnel and Warringah Freeway Upgrade project, which would be extended to include the Beaches Link and Gore Hill Freeway Connection project. This agreement would provide more details regarding obligations between both parties, including with respect to all impacted areas of open space. The agreement will recognise the need for Transport for NSW to rehabilitate areas of the golf course not required for permanent project infrastructure in consultation with relevant stakeholders, including replacement trees and landscaping.

B14.11.2 Motorway facilities at Cammeray

Issue raised

Cover letter (page 2), page 1 and page 7

North Sydney Council considers that the motorway facilities buildings at Cammeray Golf Course do not need to be on the surface as proposed and can be built underground to minimise the visual impact and maximise retention of usable open space for the North Sydney and regional community. Council notes that loss of open space and visual impacts are permanent, and notes that there are precedents for undergrounding motorway facilities.

Response

During design development, the option to locate the Western Harbour Tunnel and Beaches Link motorway facilities underground at Cammeray Golf Course was considered. It found that lowering and recessing the motorway facilities for both tunnels at Cammeray would result in a number of impacts, including:

- Increased construction noise and vibration impacts associated with:
  - The excavation of large quantities of rock beneath Cammeray Park
  - Crushing and screening spoil removed from tunnelling to use as fill in embankments
- Increase in the construction footprint of about 10,000 square metres within Cammeray Golf Course (and associated vegetation and open space impacts)
- Additional heavy vehicle movements required in the Cammeray area for spoil transport and deliveries, increasing construction traffic volumes and construction traffic noise
- Increased project costs.

The above major construction and cost impacts associated with this option ultimately resulted in this option not being pursued. Further, while the alternate design would provide a superior urban design outcome by reducing permanent visual impacts, it would provide negligible additional open space that was accessible by the community or usable by Cammeray Golf Course. This is because the land immediately above the underground motorway facility buildings would be required for various associated project infrastructure, along with maintenance access for the tunnel and underground facilities.

B14.12 Socio-economics

Issue raised

Cover letter (page 1)

Council is concerned about the impact of the project on schools and school children.

Response

<u>Construction</u>

Sensitive social infrastructure, such as schools, located near surface construction works and temporary construction support sites in the vicinity of the project have been identified, potential impacts assessed and management measures summarised in Chapter 21 (Socio-economics) of the environmental impact statement. Ongoing engagement will be carried out with schools about the timing and duration of construction works and management of potential impacts in accordance with

environmental management measure SE2 (refer to Table D2-1 of this submissions report). Where possible additional mitigation measures would be implemented to further reduce impacts.

During construction, the main priority is to maintain the safety of the public in and around the construction work sites and the immediate areas adjacent to the sites. Vehicle movements to and from construction sites will be managed to ensure pedestrian, cyclist and road user safety in accordance with environmental management measure CTT9 (refer to Table D2-1 of this submissions report). Directional signage, barriers and/or linemarking will be used as required to direct and guide motorists, cyclists and pedestrians past construction sites and on the surrounding network in accordance with environmental management measure CTT10 (refer to Table D2-1 of this submissions report). This will be supplemented by Variable Message Signs to advise all road users of potential delays, traffic diversions, speed restrictions or alternative routes.

Potential noise impacts to schools will be managed in accordance with the noise and vibration environmental management measures outlined in Table D2-1 of this submissions report, in particular:

- A construction noise and vibration management plan will be developed and implemented for the duration of construction (revised environmental management measure CNV1)
- Detailed location and activity specific construction noise and vibration impact statements will be prepared and implemented (environmental management measure CNV2)
- Construction noise and vibration impacts will be monitored periodically throughout all stages of construction (revised environmental management measure CNV5)
- Construction traffic will not utilise local roads beyond those required for direct access to construction sites where possible (revised environmental management measure CNV6).

Operation

Potential operational impacts of the project on sensitive social infrastructure, such as schools, are discussed in Chapter 21 (Socio-economics) of the environmental impact statement. The environmental impact statement noted that operation of motorway facilities and ventilation outlets at the Warringah Freeway may influence people's perceptions of air quality in surrounding areas. Concerns about potential impacts on the health of students in schools near ventilation outlets were raised during consultation for the project, including concern for users of ANZAC Park Public School at Cammeray.

The design of the ventilation systems, including ventilation outlet locations, has been carefully developed to make sure they operate efficiently and there would be minimal changes to local air quality. The air quality assessment has demonstrated that the emissions from the ventilation outlets of the project have a negligible impact on existing ambient pollutant concentrations and would pose a very low risk to human health. Operation of these facilities would be carried out in accordance with strict guidelines and would be monitored closely by the relevant authorities. Further discussion on the ventilation outlets is provided above in Section B14.7.3 above.

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