NSW GOVERNMENT

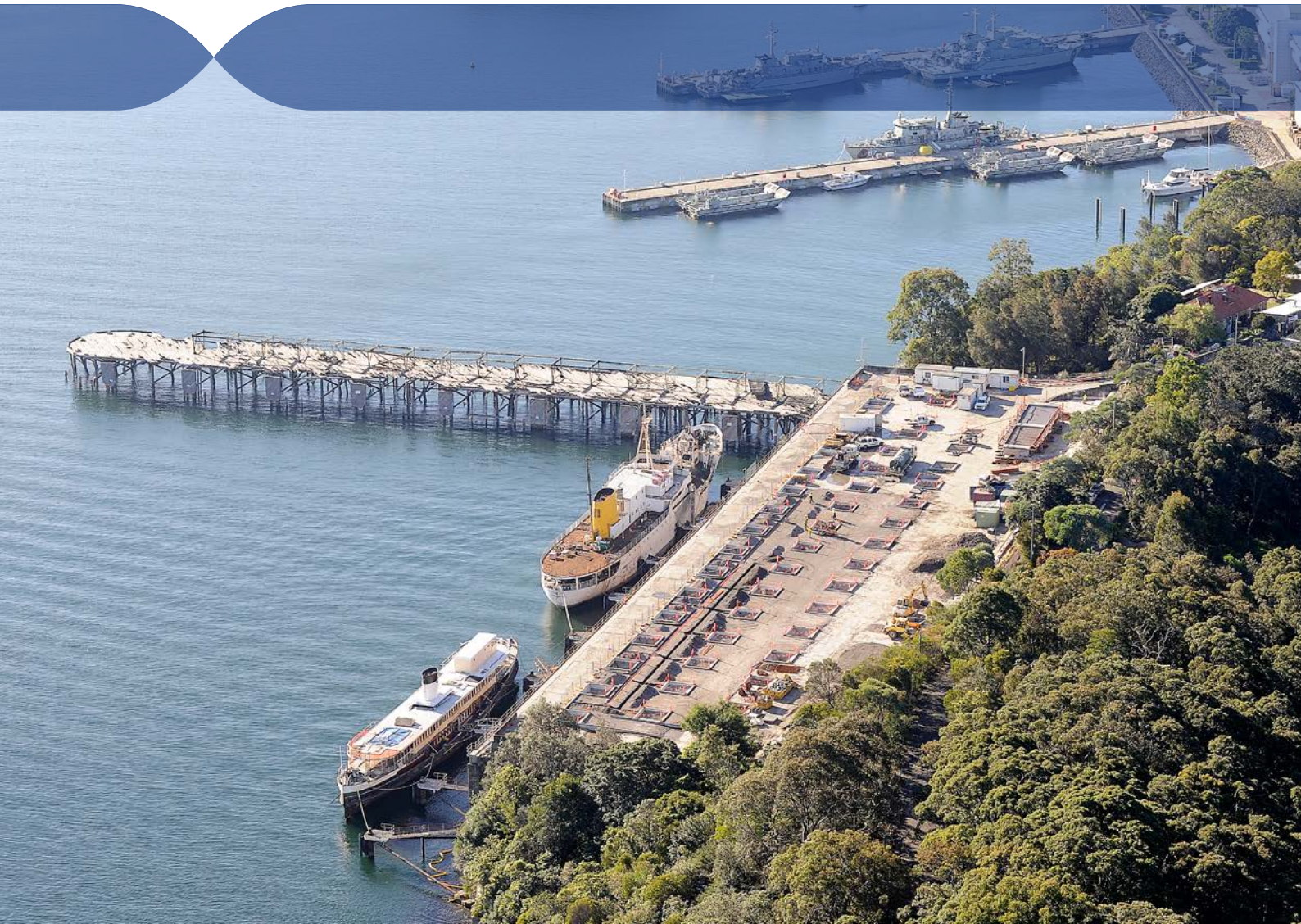
Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

Part B

Response to key stakeholder submissions

September 2020



B Response to key stakeholder submissions

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SEPTEMBER 2020

B1 NSW Environment Protection Authority

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B1.1 Noise and vibration

B1.1.1 General

Issue raised

The NSW Environment Protection Authority notes that Appendix G (Technical working paper: Noise and vibration) has adequately considered the noise and vibration risks associated with the project and is satisfied with the methodology used to determine noise and vibration impacts for construction and operation.

Response

This comment is acknowledged.

B1.1.2 Construction noise

Issue raised

As part of the State Significant Infrastructure approval, the NSW Environment Protection Authority supports the development of a robust community engagement plan so that the community is advised what construction activities will take place, where, when and for how long. Where construction activities are proposed outside of standard construction hours, the community should be engaged to identify feasible and reasonable mitigation, including periods of respite, guided by the *Interim Construction Noise Guidelines* (DECC, 2009), with details included in an out of hours work Protocol.

Response

An out of hours work protocol will be developed for the construction of the project as required by environmental management measure CNV3 (refer to Table D2-1 of this submissions report). The protocol would include details on the type of works required outside standard construction hours, as well as the justification for carrying out these works, methods for assessment, appropriate management and mitigation measures, and complaints handling process.

Meetings would be held with stakeholders near construction support sites and worksites regarding construction activities and out of hours works with the objective of better understanding community issues and improve outcomes where reasonable and feasible, as outlined 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. Out of hours work would be in accordance with any requirements of the project's conditions of approval.

B1.1.3 Operational noise

Issue raised

While the assessment has included significant detail on the reasonable and feasible mitigation options available to receivers that will experience adverse noise impacts from operation of the project, major design details that influence the overall noise levels at these receivers have been deferred to detailed design.

For operational mitigation, design factors such as road surface material, barrier construction, extension and height, and at-property treatment are yet to be determined in full. The community is not yet fully aware of how changes to the noise levels and traffic in the area will be managed once the project is operational.

Response

As is normally the case for complex major infrastructure projects progressing through an environmental planning and assessment process, the design and construction approach presented in the environmental impact statement is at the planning stage and is subject to further refinement and development. The detailed 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 accordance with relevant guidelines to confirm the specific mitigation measures that will be implemented in accordance with environmental management measure ONV1 (refer to Table D2-1 of this submissions report).

Predicted changes to operational road traffic noise levels would generally correlate to forecasted changes to surface road traffic volumes as a result of the project as indicated in Table 7-1 of Appendix G (Technical working paper: Noise and vibration).

Issue raised

The NSW Environment Protection Authority recommends 17 conditions of approval regarding noise and vibration for the Department of Planning, Industry and Environment to consider if the project is approved.

Response

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

B1.2 Water quality

B1.2.1 Wastewater discharges

Issue raised

The environmental impact statement does not adequately address the relevant Secretary's environmental assessment requirements, which is required in order to consider section 45 of the *Protection of the Environment Operations Act 1997* (POEO Act) matters. The environmental impact statement proposes that intercepted groundwater and wastewater would be collected, treated and discharged to waterways. However, it does not characterise the expected discharge quality or adequately assess the potential impact of those discharges on the receiving waterways.

The NSW Environment Protection Authority recommends the following:

- Clarification regarding the quality of the proposed discharges in terms of the concentrations of all pollutants present at non-trivial levels. If the levels of all pollutants in discharges meet the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) (ANZG, 2018) - guideline values for slightly to moderately disturbed ecosystems, then the discharges are unlikely to pose a risk to the receiving waterways and no further assessment is required. Otherwise, the submissions report should provide the information detailed below
- A water quality impact assessment to determine the impact of each of the proposed discharges to waterways. The assessment should, at a minimum:
    - Demonstrate how construction and operation of the project (including mitigating effects of proposed stormwater and wastewater management) will, to the extent that the project can influence, ensure that:
    - Where the NSW Water Quality Objectives for receiving waters are currently being met they will continue to be protected

- Where the NSW Water Quality Objectives are not currently being met, activities will work toward their achievement over time
- Identify and estimate the quality and quantity of discharges at Willoughby Creek and Sydney Harbour, including all pollutants that may be introduced into the water cycle by source and discharge point
- Where possible, discharge quality should be determined based on existing monitoring data that is available from the project site or similar sites
- Confirmation should be provided as to whether pollutant levels of discharges would not exceed the ANZG (2018) guideline values
- Assess the potential impact of discharges on the environmental values of the receiving waterway
- Using a dilution assessment to demonstrate how the relevant ANZG (2018) guideline values for slightly to moderately disturbed ecosystems would be met at the edge of the initial mixing zone of the discharge
- Including average or typical through to worst-case scenarios
- Where relevant, identify practical measures to mitigate identified impacts.

Response

Transport for NSW has amended the proposed criteria for discharges from the wastewater treatment plant during the operational phase. During operation, the project wastewater treatment plant at Rozelle will be required to meet the guideline values for the relevant physical and chemical stressors set out in of *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 and the ANZG (2018) 99 per cent species protection levels for toxicants known to bioaccumulate (refer to environmental management measure WQ9 in Table D2-1 of this submissions report). These proposed discharge criteria are aligned with the guideline values for slightly to moderately disturbed ecosystems from *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ, 2000) and are therefore unlikely to pose a risk to the receiving waterways, as noted by the NSW Environment Protection Authority in the submission. As such, no further assessment of operational discharge is required.

During construction, in the absence of a suitable reference site needed to develop an appropriate site specific trigger values for use as discharge criteria, it is proposed the ANZG (2018) 90 per cent species protection level be adopted as the project construction wastewater treatment plant discharge criteria, with the exception of those toxicants known to bioaccumulate, which will be treated to meet the 95 percent species protection level.

Project wastewater treatment plants would discharge into moderate to highly disturbed waterways with significant tidal exchange that would provide dilution and mixing. Discharge concentrations would therefore be transient and by meeting the proposed discharge criteria it would be unlikely to result in ecological impacts to downstream water quality. As such, a discharge impact assessment is not justified. Environmental management measure WQ3 (refer to Table D2-1 of this submissions report) has been updated to reflect the project's revised strategy on construction wastewater treatment plant discharge.

B1.2.2 Guidelines for Protection of Aquatic Ecosystems

Issue raised

The following errors were identified in the guideline values listed in Table 2-1 of Appendix O (Technical working paper: Surface water quality and hydrology):

- The guideline value for electrical conductivity for NSW coastal rivers is 300 µS/cm and should be adopted for freshwater streams in the project area (see Lowland rivers

explanatory note under Table 3.3.3 of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality volume 1* (ANZECC, 2000))

- The ANZG (2018) interim working level for arsenic (III) in marine waters (2.3 µ/L) should be adopted for total arsenic in estuarine waterways
- ANZECC (2000) does not recommend guideline values for total suspended solids.

The NSW Environment Protection Authority recommends the following:

1. The project should adopt the appropriate *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* guideline values for slightly to moderately disturbed ecosystems

Appendix O (Technical working paper: Surface water quality and hydrology) also states that site-specific physical and chemical stressor guideline values would be derived based on baseline water quality. The NSW Environment Protection Authority advises that development of these guideline values should be consistent with *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, including being based on the 80th percentile of 24 months of data from an appropriate slightly disturbed reference site.

Response

The proposed guideline values for protection of aquatic ecosystems as reported in Appendix O (Technical working paper: Surface water and hydrology) will be modified as per the recommendation provided by the NSW Environment Protection Authority. Changes will be as follows:

- Replacing the electrical conductivity guideline of 125-2200 µS/cm for lowland rivers with the guideline range of 200-300 µS/cm that is more typical of conductivity in NSW coastal rivers in accordance with ANZECC/ARMCANZ (2000)
- Adopting the marine Environmental Concern Level (ECL) of 2.3 ug/L for Arsenic (III) as the guideline value for estuarine receiving environment in the absence of a high reliability trigger value (ANZG 2018)
- Removal of total suspended solids guideline of 50 mg/L which is not recommended by ANZECC/ARMCANZ (2000) or ANZG (2018).

Appendix O (Technical working paper: Surface water and hydrology) recommended the development of site-specific trigger values from a local reference data set for physical and chemical stressors that would be used for designing temporary construction wastewater treatment plants and the discharge criteria. However, as a suitable reference site was not identified within the subject area, site-specific trigger values will not be developed and the ANZECC/ARMCANZ (2000) guidelines for slightly to moderately disturbed lowland river, and estuarine ecosystems will be applied.

It is proposed the ANZG (2018) 90 per cent species protection levels for toxicants be adopted for the project construction wastewater treatment plants discharge criteria, with the exception of those toxicants known to bioaccumulate, which will be treated to meet the ANZG (2018) 95 per cent species protection level.

B1.2.3 Stormwater discharges

Issue raised

The environmental impact statement indicates that a sediment basin may be used at Cammeray Golf Course during construction and states that the contractor would make the final decision at the detailed design stage. The NSW Environment Protection Authority advises that if sediment basin discharges are proposed, a discharge impact assessment commensurate with the potential risk and consistent with the national Water Quality Guidelines will be required to inform licensing consistent with section 45 of the POEO Act.

Response

If sediment basin discharges are proposed, a discharge 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*.

B1.3 Groundwater

B1.3.1 Adequacy of baseline data

Issue raised

The NSW Environment Protection Authority is concerned about the adequacy of the baseline data used to characterise the quantity and quality of available groundwater in the project area due to the short sampling duration. The submission states that Appendix N (Technical working paper: Groundwater) does not satisfactorily address the Secretary's environmental assessment requirement 5, under 9. Water-Hydrology which states:

> *"The Proponent must identify any requirements for baseline monitoring of hydrological attributes."*

Groundwater quality measurements are limited to sporadic sampling events in 2017 and 2018 with results showing variability in some water quality parameters – particularly from Bore B131A which has analyte concentration magnitudes higher than the other bores within the network.

Response

Baseline groundwater level data used in Appendix N (Technical working paper: Groundwater) was considered adequate for the purposes of the environmental impact statement. Data was obtained from the groundwater monitoring network installed for the project, as well as water levels from the Department of Planning, Industry and Environment (Water) Pinneena database, and water levels obtained from other nearby projects, including the Sydney Metro City & Southwest (Chatswood to Sydenham) project and the M4-M5 Link project. The assessment also considered water quality information from previous tunnelling projects in the Sydney area using information provided by Transport for NSW for the Sydney Metro City & Southwest (Chatswood to Sydenham) project.

Appendix N (Technical working paper: Groundwater) included data from groundwater monitoring rounds one to seven carried out by AECOM and Golder Douglas Partners for the project. Monitoring has been carried out at nine monitoring piezometers. Details of monitoring sites are shown in Table 5-10 of Appendix N (Technical working paper: Groundwater). The majority of bores recorded complete results including B131A. Results for metals at two bores, B104A and B208, were considered unreliable due to high pH.

Data from Golder Douglas Partners monitoring rounds seven and eight were made available following completion of the groundwater model for the environmental impact statement. The water quality results from the more recent Golder Douglas Partners monitoring rounds seven and eight do not differ significantly from the results of previous monitoring rounds. The additional data are presented in Appendix E of this submissions report.

Monitoring to date has indicated that samples from boreholes located in Birchgrove, Balmain and Rozelle exceeded the Australian and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines for freshwater and marine ecosystems (95 per cent species protection level). Prior to any discharge to waterways, groundwater inflows during construction would be treated to meet the revised discharge criteria referred to above.

Commitments to further groundwater monitoring are reflected in environmental management measures SG19 (refer to Table D2-1 of this submissions report). Groundwater monitoring requirements for each area of potential impact are detailed in Table 2.1 of Appendix E of this submissions report

As previously mentioned, bore B131A has concentration magnitudes higher than the other bores within the network. It is proposed to continue groundwater quality monitoring in this bore up to the commencement of construction where its viability for ongoing monitoring will be reassessed based on assessment of the groundwater quality trends within the bore.

B1.3.2 Groundwater monitoring data

Issue raised

Appendix N (Technical working paper: Groundwater) does not satisfactorily address Secretary's environmental assessment requirement 1j, under 10. Water-Quality which states:

> *"The Proponent must identify proposed monitoring locations, monitoring frequency and indicators of surface and groundwater quality"*

Table 5-10 and Figure 4-2 in Appendix N (Technical working paper: Groundwater) identify eight groundwater monitoring bores near the proposed infrastructure alignment have been used to sample groundwater quality since November 2017. However, these results differ from those shown in Appendix D of Appendix N (Technical working paper: Groundwater), which provides the full analytical results (monthly samples) in that:

- Monitoring has not been done at regular intervals
- Maximum of six sampling rounds were conducted since the bores were constructed in November 2017.

The NSW Environment Protection Authority also requests that all historic monthly data collected to date (sampling after April 2018 up until 2020) should be made available, updated and reported on.

Response

Proposed monitoring locations, monitoring frequency and indicators of groundwater quality are provided in Sections 2.2.1 and 2.2.2 of Appendix E of this submissions report, showing the additional monitoring location at piezometer B209, and reflecting the fact that water quality sampling has been carried out at piezometers B112P, B150P and B208.

As noted in response to issue B1.3.2, a total of eight groundwater monitoring rounds have been carried out by AECOM and Golder Douglas Partners for the project. The suite of groundwater analytes monitored and the data collected are presented in Table 5-11 and Appendix D of Appendix N (Technical working paper: Groundwater) of the environmental impact statement, respectively. An updated version of the analytes list and groundwater monitoring results are presented in Appendix E of this submissions report.

B1.3.3 Continuation of monthly baseline groundwater monitoring

Issue raised

The NSW Environment Protection Authority requests that the proponent continues monthly baseline groundwater monitoring up to the commencement of construction. This information would need to be assessed in conjunction with data gathered to date and to inform the final design and construction progress.

Response

Environmental management measure SG19 (refer to Table D2-1 of this submissions report) commits to continue with the existing groundwater monitoring program. The associated monitoring proposed for each area of potential impact and for groundwater, in general, are listed in Table 2.1 of Appendix E of this submission report. Monitoring data would inform detailed design and construction planning and would be provided to the NSW Environment Protection Authority if requested.

B1.3.4 Recommended conditions of approval (Groundwater)

Issue raised

The NSW Environment Protection Authority recommends two conditions of approval regarding groundwater for the Department of Planning, Industry and Environment to consider if the project is approved.

Response

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

B1.4 Contaminated land

B1.4.1 Adequacy and accuracy

Issue raised

No site investigations have been conducted for contamination and therefore risks to ecological and human health have not been adequately identified. A detailed site assessment is required to investigate the nature and extent of contamination within the project footprint and to meet the requirements of the Secretary's environmental assessment requirements. Site investigations are required to determine appropriate remedial measures.

The NSW Environment Protection Authority recommends that the proponent is required to engage a NSW Environment Protection Authority-accredited Site Auditor for the duration of construction to ensure that any work required in relation to soil or groundwater contamination is appropriately managed, and that Interim Audit Advice from the engaged site auditor is submitted as part of the response to submissions.

Response

Site investigations will be carried out on sites with moderate to very high potential contamination risk in accordance with the environmental management measure SG6 (refer to Table D2-1 of this submissions report). 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.

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 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.

Contamination testing has been carried out during groundwater monitoring in 2017/2018 and has been documented in the Stage 1 contamination investigation report. This testing has assisted in describing the existing contamination profiles of particular areas of the project footprint. Clarification is provided in Section A4 of this submissions report regarding the use of contamination factual reports as part of the Stage 1 assessment. Contamination investigations have also been carried out as part of geotechnical investigations conducted in 2017/2018. Additional contamination investigation is currently underway to support the development of a Phase 2 contamination assessment to be completed by the construction contractor prior to the commencement of construction.

B1.4.2 Recommended conditions of approval (Contaminated land)

Issue raised

The NSW Environment Protection Authority recommends five conditions of approval regarding contaminated land for the Department of Planning, Industry and Environment to consider if the project is approved.

Response

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

B1.5 Waste management

B1.5.1 Handling, transportation and disposal

Issue raised

Chapter 24 (Resource use and waste management) of the environmental impact statement does not describe waste tracking and auditing protocols, and does not define appropriate waste disposal facilities.

Waste that is generated by the project will need to be segregated, uniquely identified, classified using the NSW Environment Protection Authority *Waste Classification Guidelines*, and tracked to its destination.

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 Contractors for the waste
- Tracking the transport of waste from the area of waste generation to disposal
- Reviewing the receiving waste facility's Environment Protection Licence
- Storing and reviewing waste disposal dockets.

The NSW Environment Protection Authority notes that waste must only be delivered to facilities that can lawfully accept the waste.

Response

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. 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*. Wastes will be appropriately transported, stored and handled according to their waste classification and in a manner than prevents pollution of the surrounding environment.

B1.5.2 Recommended conditions of approval (resource and waste management)

Issue raised

The NSW Environment Protection Authority recommends three conditions of approval regarding waste management for the Department of Planning, Industry and Environment to consider if the project is approved.

Response

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

B1.6 Air quality

B1.6.1 General

Issue raised

The NSW Environment Protection Authority notes that Appendix H (Technical Working Paper: Air quality) adequately addresses all requirements of the Secretary's environmental assessment requirements, and has been conducted in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Environment Protection Authority, 2016).

Response

The NSW Environment Protection Authority comment that Appendix H (Technical working paper: Air quality) adequately addresses relevant requirements is acknowledged.

B1.6.2 Assessment methodology – meteorological data

Issue raised

The NSW Environment Protection Authority request that justification be provided regarding the choice of meteorological data and weightings used in the meteorological modelling. The NSW Environment Protection Authority recommend that the Graz Mesoscale Model (GRAMM) should be validated using other meteorological stations (where possible) not included in the modelling, eg Bureau of Meteorology Wedding Cake West and Department of Planning, Industry and Environment Lindfield station. If the revised model validation does not demonstrate acceptable agreement, GRAMM modelling should be revised to more accurately simulate the meteorology.

Response

The process of determining suitable meteorological data to be included in the modelling is described in considerable detail in Annexure F of Appendix H (Technical Working Paper: Air Quality). The analysis and evaluation process was thorough and the final outcomes of the assessment justified, which is discussed in more detail below. On this basis, it is considered no further analysis is warranted.

Of all the sites originally considered, by virtue of being located within the GRAMM domain, these were reduced to a final four. The process of which to exclude and which to retain is also described in detail in Annexure F of Appendix H (Technical Working Paper: Air quality).

When assessing the dispersion of pollutants from vehicles, wind speed and direction are among the most important meteorological parameters to consider. These parameters were therefore the first considered when identifying which meteorological stations best represented the modelling domain.

Figure F-1 of Appendix H (Technical Working Paper: Air quality) presents the variation of annual average wind speed interpolated across the GRAMM domain. It illustrates that four Bureau of Meteorology weather stations (Sydney Airport, Manly, Wedding Cake West and Fort Denison) drive the higher average wind speeds at around 4.5 metres per second in the eastern part of the GRAMM

domain. Annual average wind speeds near the Department of Planning, Industry and Environment Lindfield station in the north eastern part of the GRAL domain are substantially lower at around one metre per second. The majority of the project corridor shows wind speeds within the two metres per second to 3.5 metres per second range. The Department of Planning, Industry and Environment's Randwick station, has wind speeds between 2.5 metres per second and 3.5 metres per second, and is therefore much more representative of winds speeds within the general project corridor. Wind direction was also considered, and the wind rose analysis is shown in Annexure F of Appendix H (Technical working paper: Air Quality).

Based on the analysis, the majority of meteorological stations were not considered representative and therefore removed from further analysis. Reasons included such things as proximity to vastly different land-use, too far in-land, instrument siting issues or distance from the GRAL domain. Data were not generally excluded for a single one of these attributes, but a number of them combined. Bureau of Meteorology's Wedding Cake West station characterised as an exposed location and recorded the highest average wind speed of all the sites across the domain. This is clearly seen in Figure F-1 of Appendix H (Technical working paper: Air Quality) which shows it is not representative of the project corridor. These high wind speeds were also likely to lead to an underestimate of pollutant concentrations and so was not considered a conservative option. It would also result in an over representation of coastal sites, which are considered by including Bureau of Meteorology's Manly station and Bureau of Meteorology's Fort Denison station. Five stations were remaining to be considered; the Department of Planning, Industry and Environment's Lindfield, Rozelle and Randwick stations, and the Bureau of Meteorology's Fort Denison and Manly stations.

The average monthly wind speeds for each of these five sites, as well as Bureau of Meteorology's Wedding Cake West, is shown in Figure F-2 of Appendix H (Technical Working Paper: Air Quality). Bureau of Meteorology's Wedding Cake West station is substantiality higher than the remaining sites. Figure F-2 of Appendix H (Technical Working Paper: Air Quality) also shows that Department of Planning, Industry and Environment's Lindfield station is substantially lower, a potential anomaly. The remaining four sites provided a reasonable spread of speeds across the domain, predominantly within the range of wind speeds representative of the project corridor.

The remaining five sites were then further evaluated using a matrix to identify their 'weighting' within the GRAMM model. That is, the amount of influence they would have on the final GRAMM output to be used in the GRAL dispersion model. The weighting factors takes into account four main aspects; wind speed, wind direction, siting factors and representativeness of the project corridor.

An evaluation matrix was developed and each aspect scored based on user judgment and considerations described in Annexure F of Appendix G (Technical working paper: Air quality). While not within the GRAL domain, the Department of Planning, Industry and Environment's Randwick station scored highly in the evaluation process and therefore received a higher weighting in terms of influencing the data in GRAMM. Likewise, the Department of Planning, Industry and Environment's Lindfield station scored poorly on almost all aspects and was subsequently excluded from further GRAMM analysis. The remaining three sites scored relatively low on one or two aspects and were therefore included but given a low weighting so they had minimal influence across the domain. The Department of Planning, Industry and Environment's Rozelle station also scored poorly on wind direction as shown in Annexure F of Appendix H (Technical working paper: Air quality) and so was given a lower weighting.

The following summarises the locations of each station:

- The Department of Planning, Industry and Environment's Rozelle station:
    - This station has known siting issues being located in close proximity to trees. The wind speed and direction is likely affected at this site and this is reflected in Figure F-1 and Figure F-2 of Appendix H (Technical working paper: Air quality) as well as through the wind rose analysis which shows dissimilar wind patterns when compared to other sites in the general area

  - This station is located within the GRAL domain and close to the project corridor and important sensitive receivers and should therefore be considered in the GRAMM modelling
  - Rozelle was included in the GRAMM modelling but was given lower wind direction weighting factors than for the other sites
- The Department of Planning, Industry and Environment's Randwick station:
  - This station is located outside of the GRAL domain but is well sited and wind speeds/directions are consistent throughout the past years. Figure F-1 of Appendix H (Technical working paper: Air quality) illustrates that the station is located slightly inland but may also see some coastal effects, much like the project corridor area. This station was given a high weighting
- The Department of Planning, Industry and Environment's Lindfield station:
  - The location of this station is sheltered by trees. The siting is likely to affect the wind speed measurements made at this site and this is reflected in both Figure F-1 and Figure F-2 of Appendix H (Technical working paper: Air quality).
  - The station is considered as representing more of an inland location compared to the project corridor area
  - Low scores were given for all aspects and for these reasons the decision was made to exclude it from the GRAMM modelling
- The Bureau of Meteorology's Manly (North Head) station:
  - This station is located just outside of the GRAL domain and is very coastal. The location is reflected in the average wind speeds. The dominant wind directions are similar to those recorded at the Randwick and Fort Denison stations
  - Similar to the Fort Denison station, due to its more coastal location, this station represents a large portion of the eastern side of the GRAL domain but may not be representative of the main project corridor area
  - This station was included in the modelling but with a lower overall weighting and a lower wind direction weighting
- The Bureau of Meteorology's Fort Denison station:
  - This station is located in the middle of a water body closer to the coastal area of the GRAL domain. Figure F-1 and Figure F-2 of Appendix H (Technical working paper: Air quality) reflect the higher wind speeds recorded at this site. Wind directions are similar to the Randwick and Manly stations
  - Due to its more coastal location, this station represents a large portion of the eastern side of the GRAL domain but may not be representative of the main project corridor area
  - This station was included in the modelling but with a lower overall weighting and a lower wind direction weighting.

Table B1-1 below summarises the criteria used for the evaluation.

Table B1-1 Criteria for weighting meteorological stations in GRAMM

Site	Wind speed consideration	Wind direction consideration	Site factors	Representativeness of project corridor	Suggested MtO 'weighting factor'	Suggested MtO 'direction factor'
Rozelle	**	*	*	**	0.2	0.05
Randwick	***	***	**	***	1	1
Lindfield	*	**	*	*	Exclude	Exclude
Manly	**	**	**	*	0.2	0.2
Fort Denison	**	**	**	*	0.2	0.2

Factor	Definition
Wind speed consideration	Scores the appropriateness of the recorded wind speed
Wind direction consideration	Scores the appropriateness of the recorded wind direction
Site factors	Scores the appropriateness of station siting
Representativeness of project corridor	Scores the representativeness of location/data for the project corridor

Scoring system	
*	1 (low weighting)
**	2
***	3 (high weighing)

An extensive data analysis was carried out and presented for the air quality assessment in Appendix H (Technical working paper: Air quality) which investigated meteorological data from nearly 20 sites across the GRAMM domain. The data from each site was evaluated on a number of aspects, and the final five sites were further evaluated to apply the relevant weightings within the model. This resulted in the elimination of Lindfield as it scored poorly in the final evaluation.

B1.6.3 Assessment methodology – ventilation flow rates

Issue raised

The NSW Environment Protection Authority request additional supporting justification to robustly demonstrate that minimum discharge flowrate adequately simulates expected reasonable worst case impacts for the regulatory worst-case scenario. The NSW Environment Protection Authority does not consider that using the minimum discharge flowrate (velocity) necessarily constitutes regulatory worst case and therefore requires additional supporting justification.

In the absence of transparent and robust justification for using minimum flowrate, for the regulatory worst-case scenario, the NSW Environment Protection Authority recommends the proponent provides additional regulatory worst-case predictions using the maximum ventilation flowrate for the expected traffic case (Table G-8 of Appendix H (Technical working paper: Air quality)), including:

- Total impact (ventilation outlet, surface road and background) at sensitive receivers for all pollutants except air toxics

- Predicted impact (ventilation outlet and surface road) at sensitive receivers of speciated air toxics
- Contour maps for the ventilation outlet alone for all pollutants and all averaging periods.

Response

The environmental impact statement modelled various expected traffic scenarios, as outlined in section 5.4.3 of Appendix H (Technical working paper: Air quality). Regulatory worst case scenarios were also modelled.

The objective of the regulatory worst case scenarios was to present the maximum theoretical increase in ambient air quality due to the ventilation outlets operating continuously at the proposed emissions limits. The scenarios assessed emissions from the ventilation outlets only, with emissions continuously at the proposed emissions limits for all 8760 hours of the year. This is equivalent to both the project and the Beaches Link tunnels operating under breakdown scenarios continuously for a full-year. The regulatory worst case represents a theoretical upper bound that would never occur for periods longer that a few hours.

The assumptions underpinning the regulatory worst case scenarios were very conservative, and resulted in contributions from project ventilation outlets that were much higher than those that could occur under any foreseeable operational conditions in the project tunnels.

The minimum air flow and exit velocity from the expected traffic scenario were chosen for use in the regulatory worst case assessment as described in Appendix H (Technical Working Paper: Air quality). This followed on from the work carried out for the M4 East air quality assessment, which showed that the predicted concentrations were not sensitive to the air flow assumption (WDA, 2015). To represent conditions for poorer dispersion in the M4-M5 Link regulatory worst case analysis, a relatively low flow rate was used for each ventilation outlet. As flow rate is directly proportional to the exit velocity (assuming the outlet diameter does not change) and therefore also mass emission rate (assuming the outlet concentration remains constant), this results in lower outlet emissions.

To address the issue raised by the NSW Environment Protection Authority in their submission, the highest flow rate for each ventilation outlet for the 2037-Do something cumulative scenario was determined and applied to the regulatory worst case modelling. The modelling results are presented in this submissions report, as detailed below. The results show the small number of exceedances are caused by elevated background levels rather than the flow rate and emissions from the outlets.

Table B1-2 presents the minimum and maximum air flow and exit velocities for each ventilation outlet.

Table B1-2 Expected traffic 2037-Do something cumulative scenario minimum and maximum air flow and exit velocities for each ventilation outlet

Outlet	Name	Minimum (from Table G 166 of Appendix H (Technical Working Paper: Air quality)		Maximum (as modelled for this submissions report)	
		Air flow (m3/s)	Exit velocity (m/s)	Air flow (m3/s)	Exit velocity (m/s)
A	Lane Cove Tunnel	335	5.6	470	7.8
B	Cross City Tunnel	222	7.5	222	7.5
C	M4-M5 Link/Iron Cove Link	810	4.6	1000	5.7
D	M4-M5 Link/Iron Cove Link	550	4.9	700	6.2

Outlet	Name	Minimum (from Table G 166 of Appendix H (Technical Working Paper: Air quality)		Maximum (as modelled for this submissions report)	
		Air flow (m3/s)	Exit velocity (m/s)	Air flow (m3/s)	Exit velocity (m/s)
E	Iron Cove Link	280	7.3	470	12.2
F	Western Harbour Tunnel: Rozelle	780	5.1	1080	7.0
G	Western Harbour Tunnel: Warringah Freeway	760	7.0	960	8.9
H	Beaches Link: Warringah Freeway	490	5.7	760	8.8
I	Beaches Link: Gore Hill Freeway	300	8.3	370	10.3
J	Beaches Link: Wakehurst Parkway	370	8.2	480	10.7
K	Beaches Link: Burnt Bridge Creek Deviation	470	9.8	570	11.9

This analysis is two-fold, considering both what the maximum outlet contribution is and also what the maximum total concentration is, for the minimum and maximum flow rates. In all cases, the highest outlet contributions do not coincide with the highest totals.

The results for PM_{10}, $PM_{2.5}$ and NO_X in the regulatory worst case scenario (regulatory worst case - 2037-Do something cumulative only) for modelling with the minimum exit velocity and maximum exit velocity are given in Table B1-3 below.

Table B1-3 provides the maximum contribution of ventilation outlets at any of the regulatory worst case receivers in this scenario.

The analysis was carried out for 1-hour, 24-hour and annual average periods as the impact is different for each different period. As shown in Table B1-3, the largest differences occur for the shorter 1-hour averaging period. The changes likely for air toxics are predicted to be similar to those shown for 1-hour oxides of nitrogen (NO_X), so the results for NO_X have only been presented. Even if concentrations for air toxics were doubled (as for NO_X), this would not alter the outcomes of the assessment.

Table B1-3 Results of regulatory worst case assessment (regulatory worst case receivers) for maximum ventilation outlet contribution – comparing results for minimum and maximum exit velocities for PM and NO_X

Pollutant and period	Units	Maximum ventilation outlet contribution at any sensitive receiver for regulatory worst case 2037 Do something cumulative	
		With minimum exit velocity (from Appendix H (Technical working paper: Air quality) (m/s)	With maximum exit velocity (as modelled for this submissions report) (m/s)
PM_{10} (annual)	$\mu g/m^3$	0.44	0.47

Pollutant and period	Units	Maximum ventilation outlet contribution at any sensitive receiver for regulatory worst case 2037 Do something cumulative	
		With minimum exit velocity (from Appendix H (Technical working paper: Air quality) (m/s)	With maximum exit velocity (as modelled for this submissions report) (m/s)
PM_{10} (24-hour)	µg/m^3	3.12	3.49
$PM_{2.5}$ (annual)[(a)]	µg/m^3	0.44	0.47
$PM_{2.5}$ (24-hour) [(a)]	µg/m^3	3.12	3.49
NO_X (annual)	µg/m^3	16.5	17.9
NO_X (1-hour)	µg/m^3	285	599

[(a)]The same emission rates were used for PM_{10} and $PM_{2.5}$

When considering the maximum ventilation outlet contribution, the results show that for all pollutants and averaging periods the results are higher for the maximum exit velocity model runs. However, for 24-hour and annual averages these increases are small and concentrations are still well below the impact assessment criterion.

For the shorter 1-hour averaging periods the relative increases are much larger, at the most impacted sensitive receiver. As discussed below, this does not lead to any additional exceedances.

The results for particulate matter, comparing maximum ventilation outlet concentrations and maximum total concentrations for the different flow rate scenarios, are provided in Table B1-4.

In summary, exceedances of assessment criteria are due to elevated background concentrations and not the ventilation outlets. These exceedances are not related to the flow rate from the outlets.

Table B1-4 Results of regulatory worst case assessment (regulatory worse case receivers) for total concentrations minimum and maximum flow rates for particulate matter

Minimum or Maximum exit velocity	Maximum outlet contribution or maximum total concentration	Receiver ID (Residential, workplace, recreational (RWR))	Incremental (ventilation outlet) contribution (µg/m^3)	Background (including surface roads) (µg/m^3)	Total concentration (µg/m^3)
Annual average PM_{10}					
Minimum air flow	Max outlet	RWR-25739	0.9	17.9	18.8
	Max total	RWR-33323	0.4	23.3	23.8
Maximum air flow	Max outlet	RWR-25674	1.0	18.1	19.1
	Max total	RWR-33323	0.5	23.3	23.8
Maximum 24-hour average PM_{10}					
Minimum air flow	Max outlet	RWR-32659	7.0	48.6	**55.6**
	Max total	RWR-33323	3.1	**67.7**	**70.8**

Minimum or Maximum exit velocity	Maximum outlet contribution or maximum total concentration	Receiver ID (Residential, workplace, recreational (RWR))	Incremental (ventilation outlet) contribution ($\mu g/m^3$)	Background (including surface roads) ($\mu g/m^3$)	Total concentration ($\mu g/m^3$)
Maximum air flow	Max outlet	RWR-26885	9.4	49.0	**58.4**
	Max total	RWR-33323	3.5	**67.7**	**71.1**
Annual average $PM_{2.5}$					
Minimum air flow	Max outlet	RWR-25739	0.9	**8.5**	**9.4**
	Max total	RWR-33323	0.4	**11.8**	**12.3**
Maximum air flow	Max outlet	RWR-25764	1.0	**8.4**	**9.4**
	Max total	RWR-33323	0.5	**11.8**	**12.3**
Maximum 24-hour average $PM_{2.5}$					
Minimum air flow	Max outlet	RWR-32659	7.0	22.4	**29.4**
	Max total	RWR-33323	3.1	**33.4**	**36.5**
Maximum air flow	Max outlet	RWR-26885	9.4	22.4	**31.8**
	Max total	RWR-33323	3.5	**33.4**	**36.9**

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

Bold = exceedance of the NSW Environment Protection Authority impact assessment criterion

The results show that for the selected sensitive receivers there are no exceedances of the annual average PM_{10} NSW Environment Protection Authority impact assessment criterion when the outlet contribution is at its highest. In other words, exceedances are caused by elevated background levels rather than the emissions from the outlets.

For the selected sensitive receivers for 24-hour average PM_{10}, there are exceedances of the NSW Environment Protection Authority impact assessment criterion. For the maximum total concentration, in both cases (minimum and maximum flow rates), the background concentration is already exceeding the assessment criterion without the outlet contribution. When considering the maximum outlet contribution, the outlets are contributing between 13 and 16 per cent of the total concentrations. The background concentrations for these sensitive receivers are high, but not exceeding the criterion.

For the selected sensitive receivers for annual average $PM_{2.5}$, there are exceedances of the NSW Environment Protection Authority impact assessment criterion. For the maximum total concentration and maximum ventilation outlet contribution, the background concentration is already exceeding the assessment criterion without the ventilation outlet contribution. At its maximum, the ventilation outlets contribute 10 per cent or less of the total concentrations.

For 24-hour average $PM_{2.5}$ there are exceedances of the assessment criterion, but these occur in both cases and are not dependent on the flow from the outlet, but rather the elevated background levels. For the maximum total concentration, in both cases (minimum and the maximum flow), the background concentration is already exceeding the assessment criterion. When considering the maximum ventilation outlet contribution, the outlets contribute between 24 and 30 per cent of the

total concentrations. The background concentrations for these sensitive receivers are not exceeding the criterion but are 90 per cent of the criterion of 25 µg/m^3.

The results for maximum 1-hour NO_X/NO_2 for the regulatory worst case, comparing maximum ventilation outlet concentrations and maximum total concentrations for the minimum and maximum flow rates are provided in Table B1-5. The exceedances occur for both minimum and maximum flow rate conditions and are due to elevated background concentrations and not emissions from the ventilation outlets.

Table B1-5 Results of regulatory worst case assessment (regulatory worse case receivers) for total concentrations minimum and maximum flow rates for maximum 1-hour NO_X/NO_2

Minimum or Maximum exit velocity	Maximum outlet contribution or total concentration	Receiver ID	Incremental (ventilation outlet) contribution (NO_X) (µg/m^3)	Background (including surface roads) (NO_X) (µg/m^3)	Total concentration (NO_2) (µg/m^3)
Maximum 1-hour average NO_2					
Minimum air flow	Max outlet	RWR-26063	285	947	216
	Max total	RWR-08074	40	2719	**441**
Maximum air flow	Max outlet	RWR-03807	599	743	220
	Max total	RWR-08074	69	2719	**446**

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

For the selected sensitive receivers for the maximum 1-hour NO_2 there are multiple exceedances of the NSW Environment Protection Authority impact assessment criterion. For the maximum total concentration, in both cases (minimum and the maximum flow rates), the background concentration is already exceeding the assessment criterion without the ventilation outlet contribution. When considering the maximum ventilation outlet contribution, the outlets are contributing between 23 and 45 per cent of the total concentrations. The results for the annual mean NO_2 for the regulatory worst case, comparing maximum ventilation outlet concentrations and maximum total concentrations for the minimum and maximum flow rates are provided in Table B1-6. The results show that for the selected sensitive receivers there are no exceedances of the annual average NO_2 NSW Environment Protection Authority impact assessment criterion. Table B1-6 to Figure B1-8 present contour plots of the predicted ventilation outlet contributions.

Table B1-6 Results of regulatory worst case assessment (regulatory worse case receivers) for total concentrations minimum and maximum flow rates for annual average NO_2

Minimum or Maximum exit velocity	Maximum outlet contribution or total concentration	Receiver ID	Incremental (ventilation outlet) contribution (µg/m^3)	Background (including surface roads) (µg/m^3)	Total concentration (µg/m^3)
Annual average NO_2					
Minimum air flow	Max outlet	RWR-25769	4.0	21.9	25.9
	Max total	RWR-33639	0.8	33.8	34.6

Minimum or Maximum exit velocity	Maximum outlet contribution or total concentration	Receiver ID	Incremental (ventilation outlet) contribution ($\mu g/m^3$)	Background (including surface roads) ($\mu g/m^3$)	Total concentration ($\mu g/m^3$)
Maximum air flow	Max outlet	RWR-14693	5.0	17.8	22.8
	Max total	RWR-33639	1.0	33.8	34.8

Background = surface road and non-surface road contributions
Total concentration = incremental ventilation outlet contribution + background

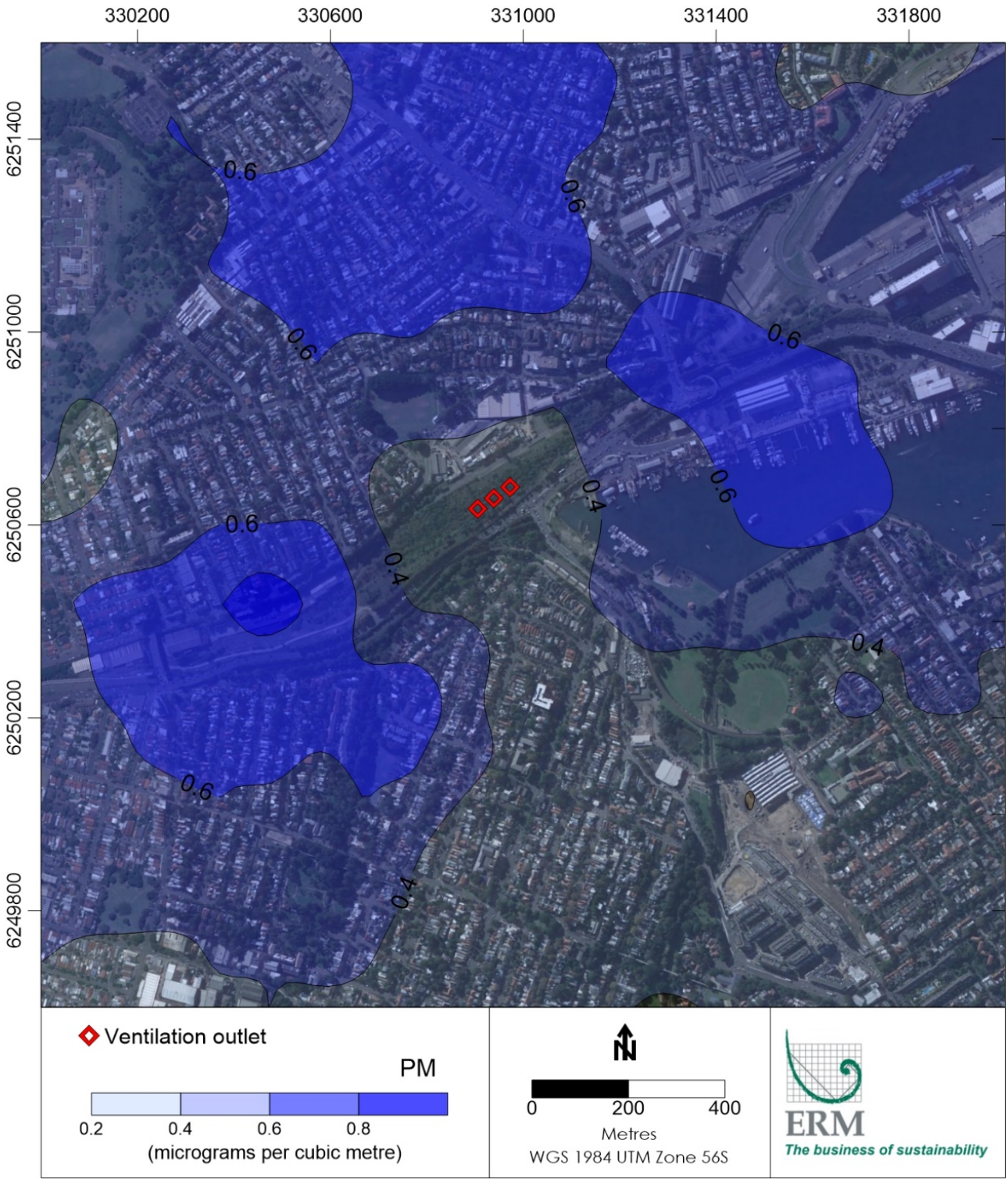

Figure B1-1 Contour plot of ventilation outlet contributions of annual average PM at ground level for Rozelle Interchange in regulatory worse case 2037-Do something cumulative scenario (PM_{10} impact assessment criterion: 25 µg/m^3; $PM_{2.5}$ impact assessment criterion: 8 µg/m^3)

Figure B1-2 Contour plot of ventilation outlet contributions of annual average particulate matter at ground level for Warringah Freeway in regulatory worse case 2037-Do something cumulative scenario (PM_{10} impact assessment criterion: 25 µg/m^3; $PM_{2.5}$ impact assessment criterion: 8 µg/m^3)

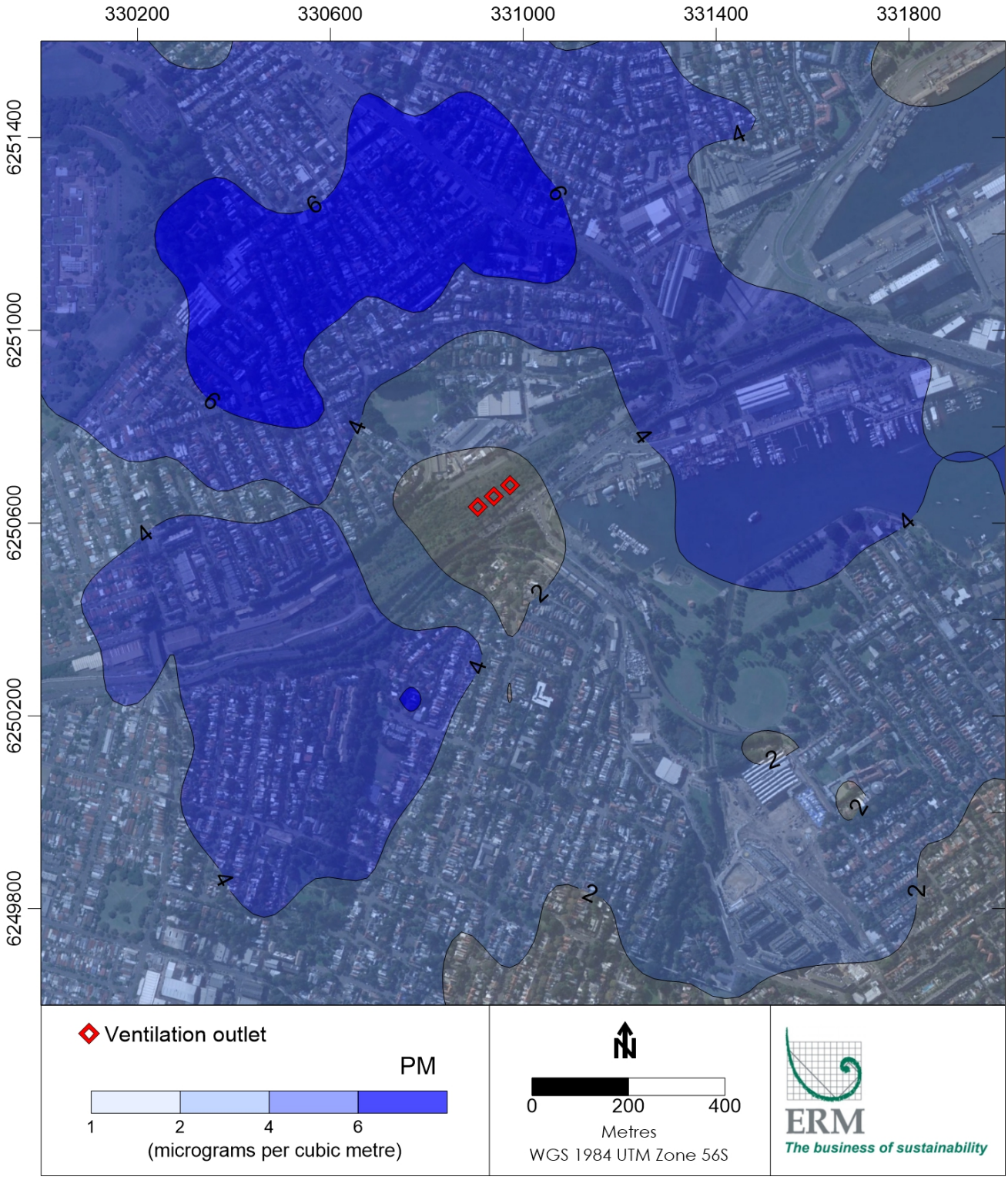

Figure B1-3 Contour plot of ventilation outlet contributions of maximum 24-hour average particulate matter at ground level for Rozelle Interchange in regulatory worse case 2037-Do something cumulative scenario (PM_{10} impact assessment criterion: 50 µg/m^3; $PM_{2.5}$ impact assessment criterion: 25 µg/m^3)

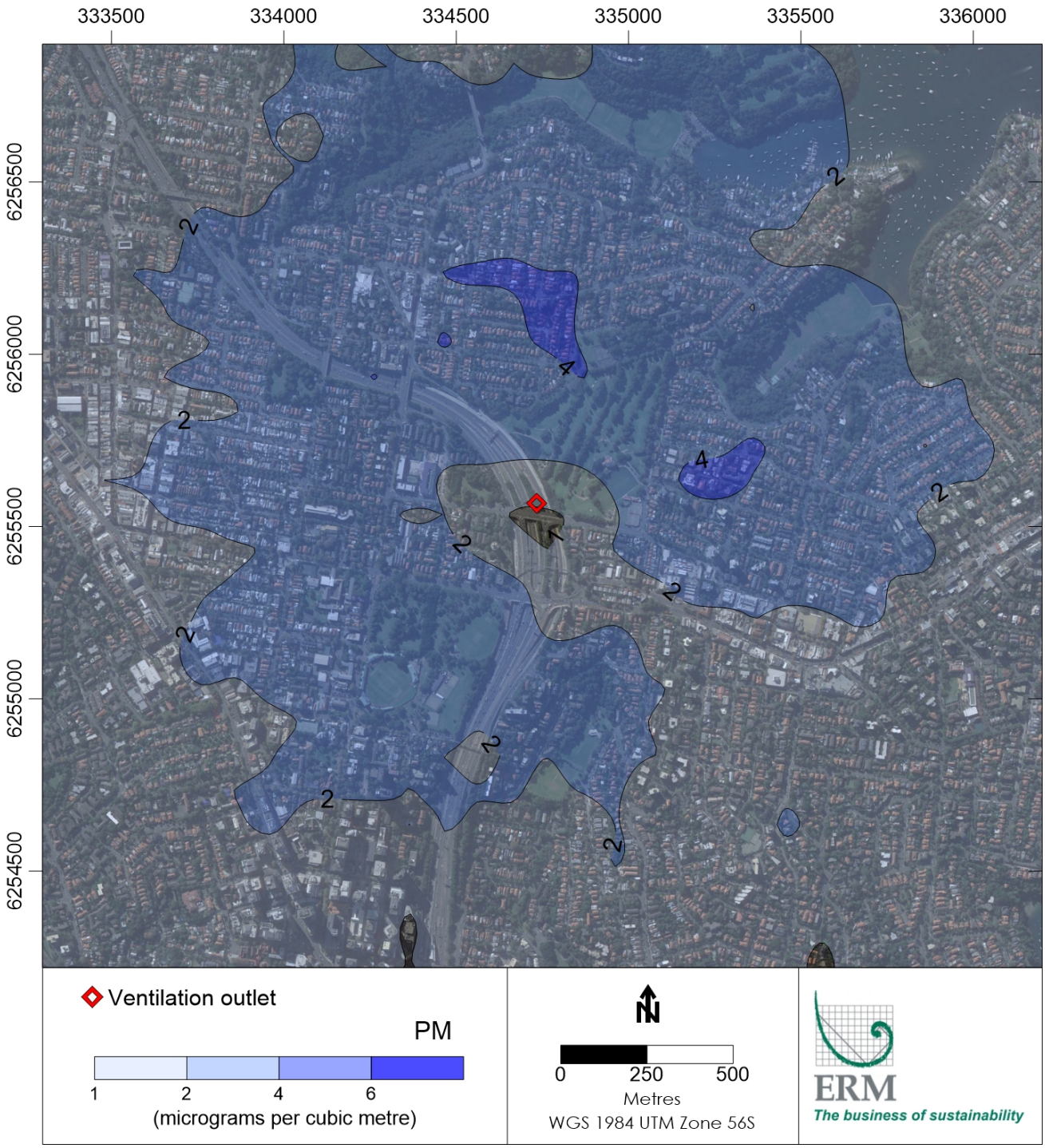

Figure B1-4 Contour plot of ventilation outlet contributions of maximum 24-hour average particulate matter at ground level for Warringah Freeway in regulatory worse case 2037-Do something cumulative scenario (PM_{10} impact assessment criterion: 50 µg/m^3; $PM_{2.5}$ impact assessment criterion: 25 µg/m^3)

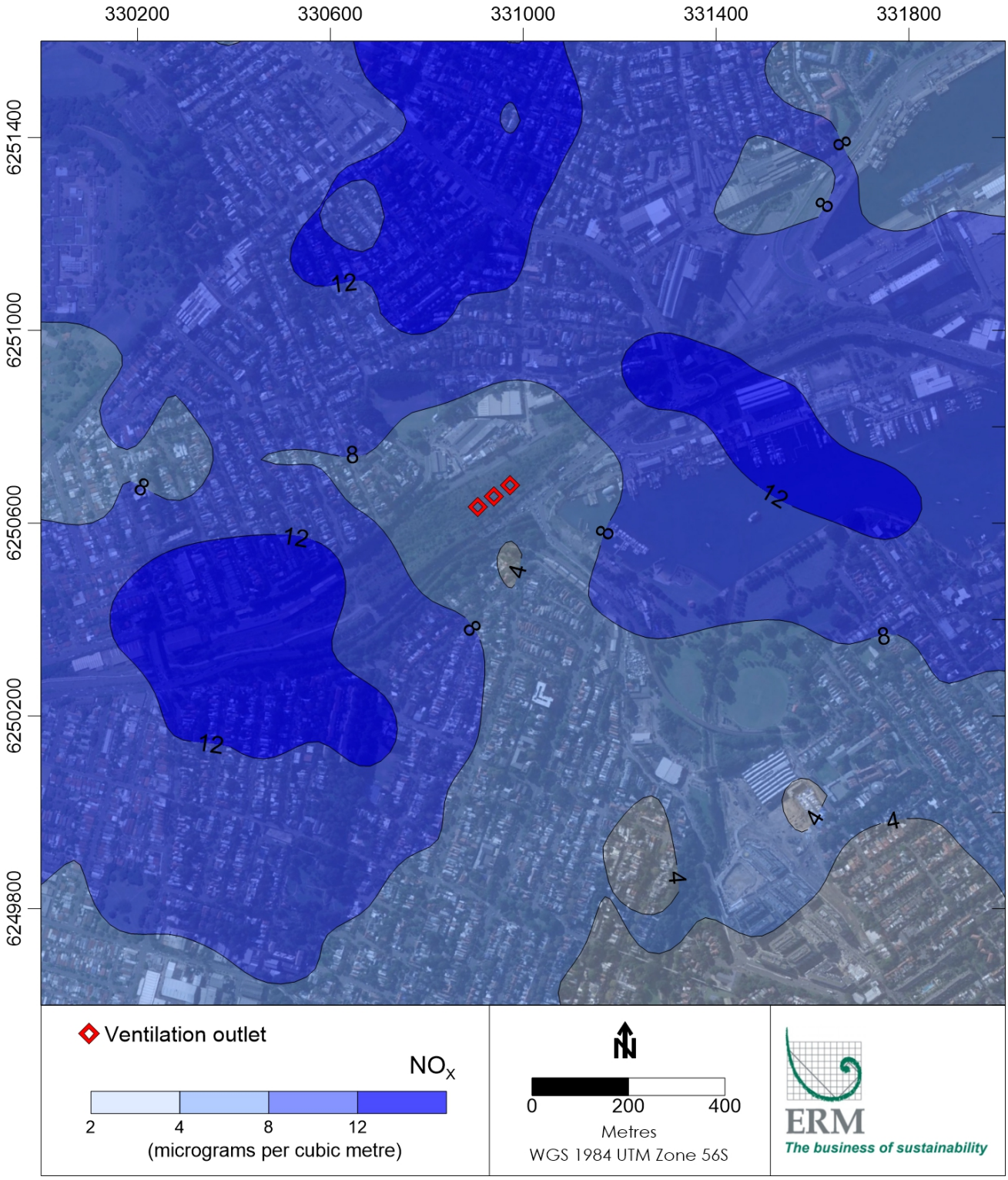

Figure B1-5 Contour plot of ventilation outlet contributions of annual mean NO_X at ground level for Rozelle Interchange in regulatory worse case 2037-Do something cumulative scenario

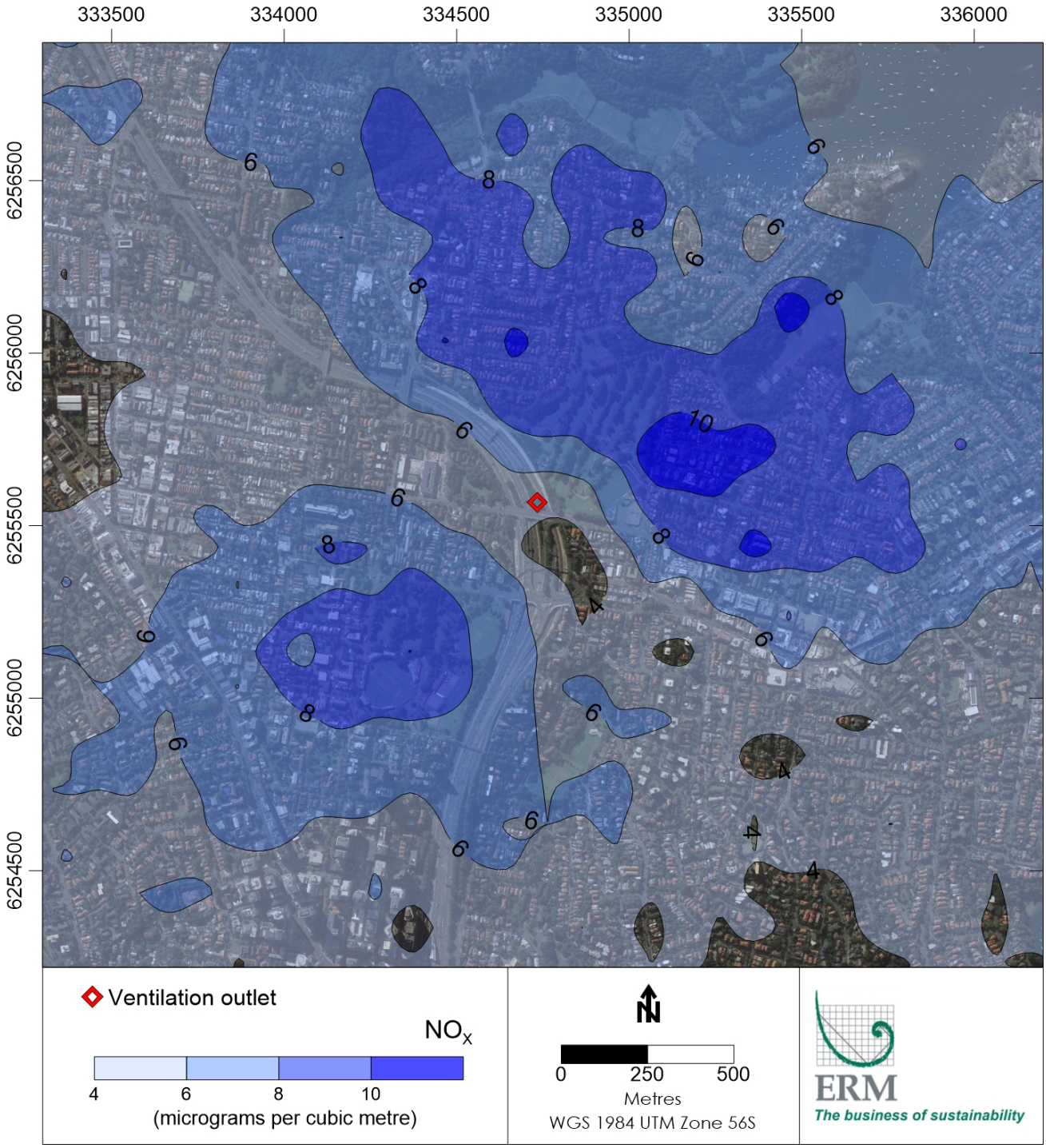

Figure B1-6 Contour plot of ventilation outlet contributions of annual mean NO_X at ground level for Warringah Freeway in regulatory worse case 2037-Do something cumulative scenario

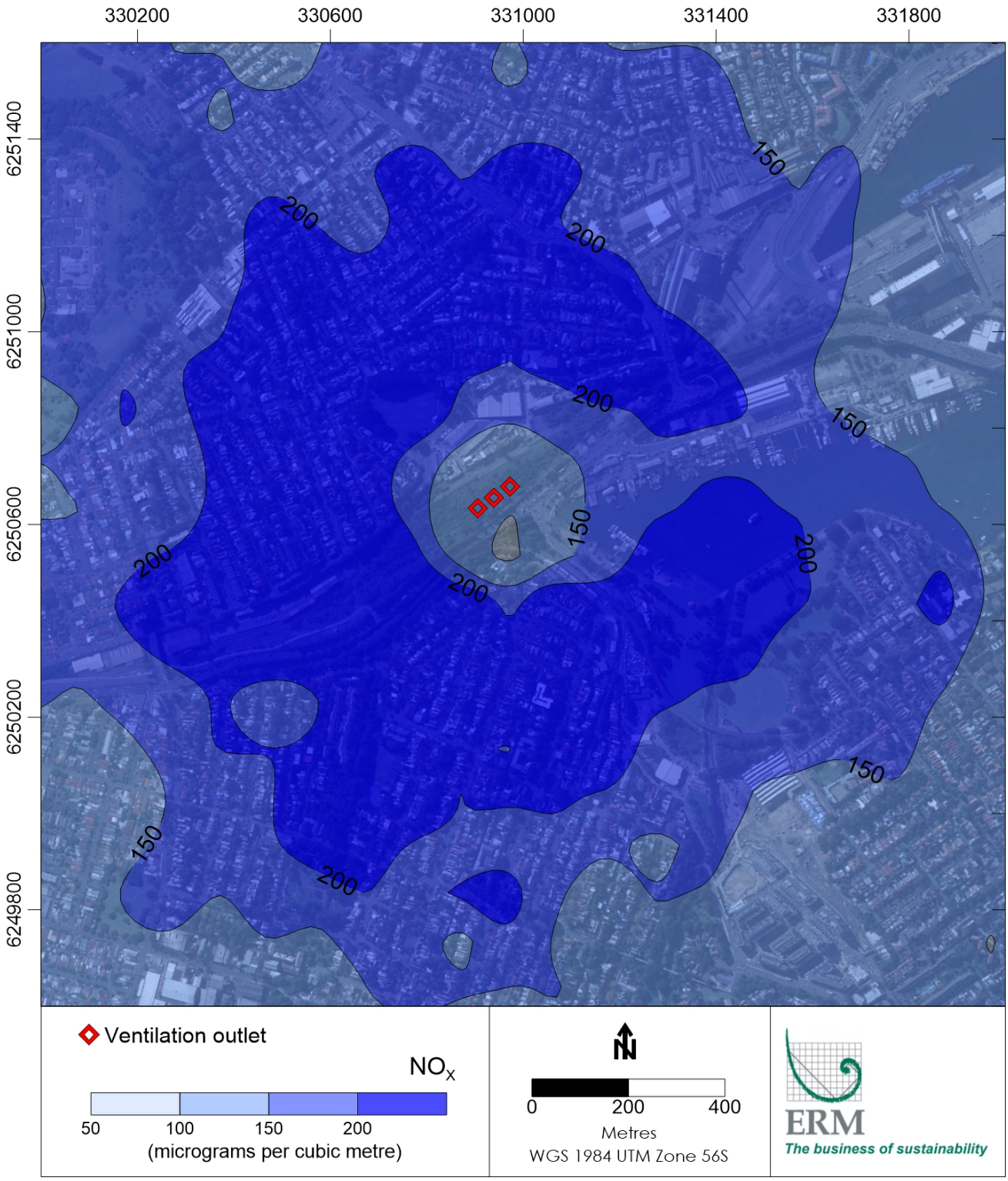

Figure B1-7 Contour plot of ventilation outlet contributions of maximum 1-hour NO_X at ground level for Rozelle Interchange in regulatory worse case 2037-Do something cumulative scenario

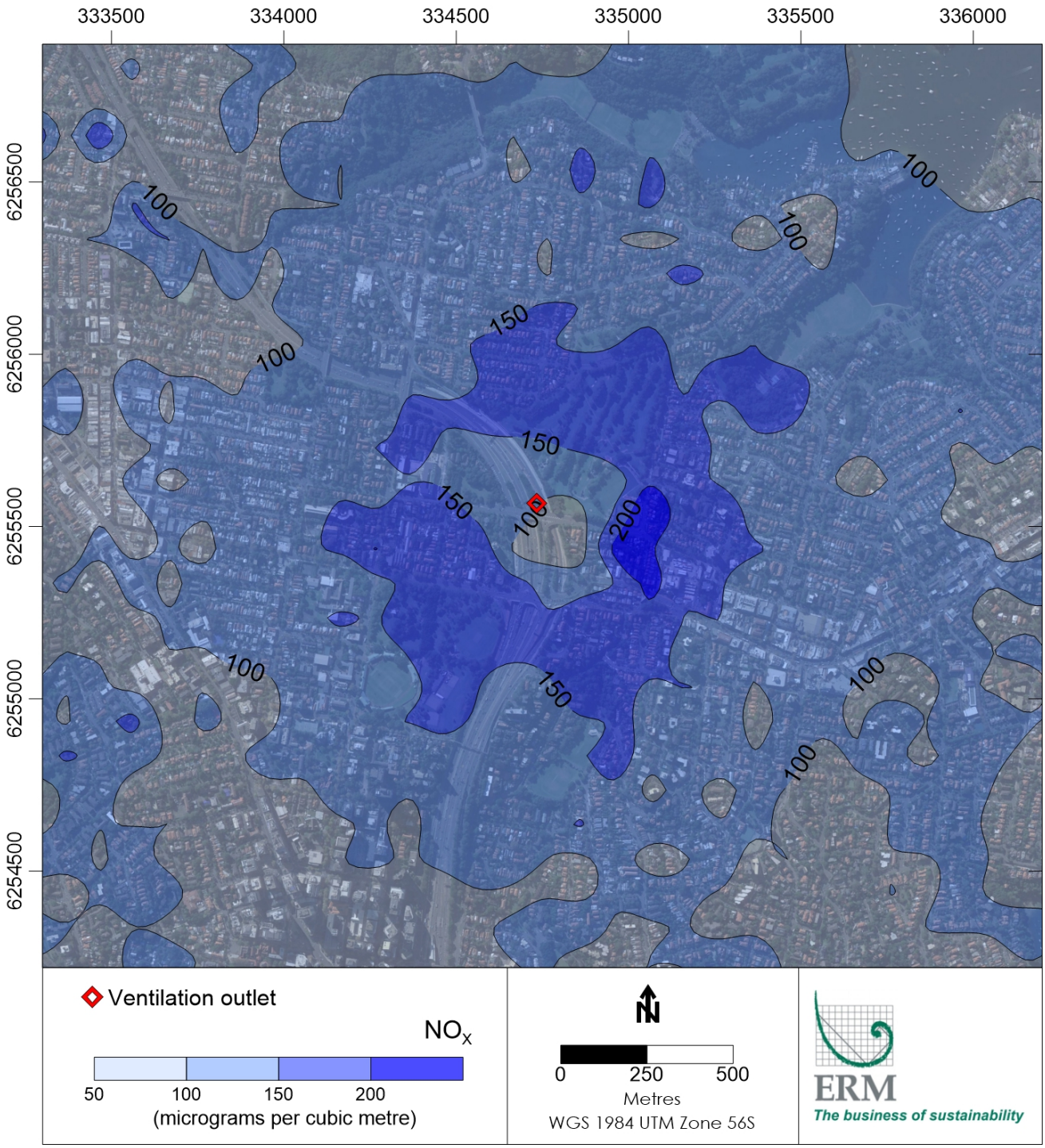

Figure B1-8 Contour plot of ventilation outlet contributions of maximum 1-hour NO_X at ground level for Warringah Freeway in in regulatory worse case 2037-Do something cumulative scenario

B1.6.4 Assessment methodology – impacts at elevated sensitive receivers

Issue raised

The NSW Environment Protection Authority outline that the assessment of impacts at elevated sensitive receivers has only been carried out for annual and 24 hour average $PM_{2.5}$ for the 2037-Do something cumulative scenario. Impacts were not assessed in the regulatory worst case scenario and impacts due to other pollutants were not analysed. Further, the assessment was carried out using the change in 24 hour $PM_{2.5}$ concentrations as a metric, and therefore does not consider background concentrations nor presents the actual predicted impact/pollutant exposure at these sensitive receiver locations.

Table 8-23 of Appendix H (Technical working paper: Air Quality) indicates that the potential for adverse impacts increases significantly for building heights greater than 30 metres, while Figure 8-12 of Appendix H (Technical working paper: Air Quality) illustrates there is at least one building of height greater than 30 metres within 300 metres of the ventilation outlets.

The NSW Environment Protection Authority request that further assessment is provided of existing and approved elevated receivers located in proximity to proposed ventilation outlets. The NSW Environment Protection Authority request that the assessment:

- Considers the regulatory worst-case scenario, as well as expected traffic scenarios
- Is conducted for existing and approved receivers at least 30 metres high and within 300 metres of the ventilation outlet
- Presents incremental (ventilation outlet), background (surface road and other non-surface road contributions) and cumulative concentrations for PM (24 hour and annual), and NO_2 (1 hour and annual)
- Quantifies the percentage of exceedances for the expected traffic scenario, both with and without the project
- Presents incremental (ventilation outlet) concentrations for air toxics.

Response

To address the issue raised by the NSW Environment Protection Authority in their submission, additional modelling has been carried out of all pollutants at elevated receivers, for the expected traffic cases and the regulatory worst case scenario at heights of 10 metres, 20 metres, 30 metres and 45 metres above ground level. The aim is to provide an evaluation of impacts at elevated receivers within 300 metres of the Western Harbour Tunnel ventilation outlets.

With the exception of one exceedance associated with the maximum 1-hour average NO_2 concentration, there were no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion, when considering the maximum ventilation outlet contribution. Note that this additional modelling was carried out for the regulatory worst case scenarios. The objective of the regulatory worst case scenarios is to present the maximum theoretical increase in ambient air quality due to the ventilation outlets operating continuously at the proposed emissions limits. The scenarios assessed emissions from the ventilation outlets only, with emissions continuously at the proposed emissions limits for all 8760 hours of the year. This is equivalent to both the project and the Beaches Link tunnels operating under breakdown scenarios continuously for a full-year. The regulatory worst case represents a theoretical upper bound that would never occur for periods longer that a few hours. The assumptions underpinning the regulatory worst case scenarios are very conservative, and result in contributions from project ventilation outlets that are much higher than those that could occur under any foreseeable operational conditions in the project tunnels. Results of the additional modelling are detailed further below.

The following information is presented for PM_{10}, $PM_{2.5}$ and NO_2 for expected traffic and regulatory worst case:

- Incremental (ventilation outlet) concentrations
- Background concentrations
- Total (cumulative) concentrations.

For air toxics, only incremental (ventilation outlet) concentrations have been presented, as requested by the NSW Environment Protection Authority. This response also quantifies the percentage of exceedances for the expected traffic scenario, both with and without the project.

A summary of the modelling for the expected traffic cases is provided below:

- Scenarios: 2037-Do Something Cumulative and 2037-Do Minimum
- Pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen oxides (NO_X) and air toxics
- Sources: ventilation outlets, portals and surface roads.

The modelling for the regulatory worse case includes the following:

- Scenarios: 2037- Do Something Cumulative
- Pollutants: PM_{10}, $PM_{2.5}$, NO_X and air toxics
- Sources: ventilation outlets.

In summary, the assessment presents the following:

- Selection of sensitive receivers for reporting
- Methodology for establishing background concentrations at height. Separate methodologies are provided for particulate matter (PM_{10} and $PM_{2.5}$) and NO_X/nitrogen dioxide (NO_2)
- Expected traffic modelling results for 2037-Do something cumulative scenario. This includes presentation of incremental (ventilation outlet) concentrations, background concentrations and total (cumulative) concentrations at selected residential, workplace, recreational receivers and comparison with NSW Environment Protection Authority impact assessment criteria. Results are provided for predicted concentrations at heights of 10 metres, 20 metres, 30 metres and 45 metres above ground level. This section also quantifies the percentage of exceedances for the expected traffic scenario, both with and without the project
- Regulatory worse case modelling results for 2037-Do something cumulative scenario. This section includes presentation of incremental (ventilation outlet) concentrations, background concentrations and total (cumulative) concentrations at selected recreational receivers and comparison with NSW Environment Protection Authority impact assessment criteria. Results are provided for maximum predicted concentrations at heights of 10 metres, 20 metres, 30 metres and 45 metres above ground level.

Receivers considered

Appendix H (Technical working paper: Air Quality) considered 35,490 residential, workplace and recreational[1] receivers. This is the total number of residential, workplace and recreational receivers considered across both the Western Harbour Tunnel and Beaches Link Projects (cumulative scenarios).

The analysis focuses on residential, workplace and recreational receivers within 300 metres of the Western Harbour Tunnel ventilation outlets. There are 191 residential, workplace and recreational receivers around ventilation outlet F (Rozelle East) and 129 residential, workplace and recreational

[1] Residential, workplace and recreational (RWR) receptors refer to those places where people spend their time, that is, Residential, Workplace and Recreational locations.

receivers around ventilation outlet G (Warringah Freeway). It should be noted that there are no existing receivers within 300 metres of ventilation outlet F that are above 30 metres, and there is only one existing receiver building within 300 metres of ventilation outlet G that is greater than 30 metres.

Figure B1-9 shows the residential, workplace and recreational receivers located within 300 metres of ventilation outlet F while Figure B1-10 shows the residential, workplace and recreational receivers located within 300 metres of ventilation outlet G.

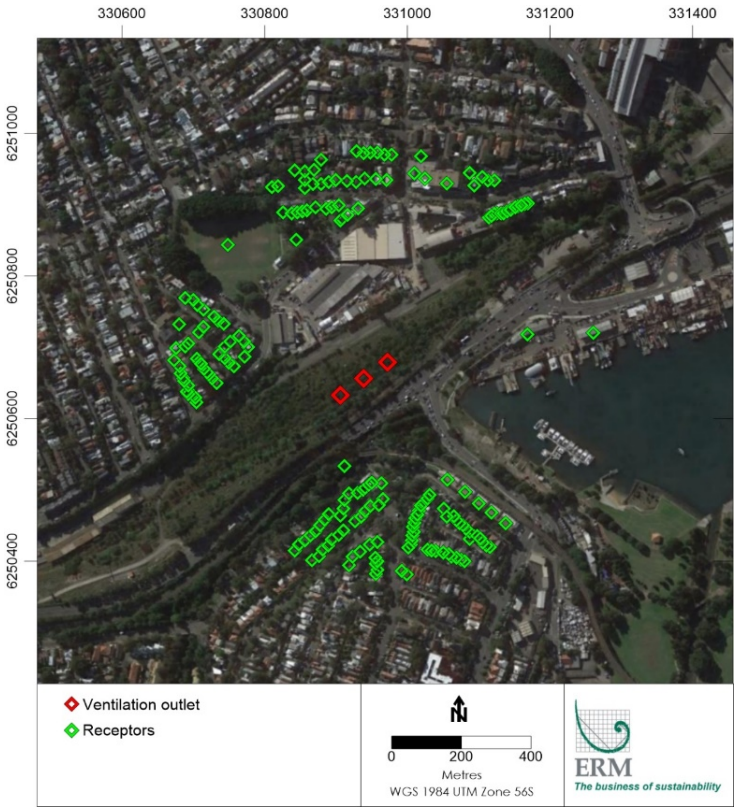

Figure B1-9 Residential, workplace and recreational receivers located within 300 metres of ventilation outlet F

Figure B1-10 Residential, workplace and recreational receivers located within 300 metres of ventilation outlet G

Results have been processed for all residential, workplace and recreational receivers within 300 metres of the Western Harbour tunnel ventilation outlets and results are presented for those most impacted. For the expected traffic and regulatory worse case modelling, the receivers were chosen based on the following process:

1. The maximum ventilation outlet concentration at residential, workplace and recreational receiver locations within 300 metres of the ventilation outlet at each modelled height (10 metres, 20 metres, 30 metres and 45 metres). This assumes that at residential, workplace and recreational receivers locations buildings exist at all heights, irrespective of the actual heights of existing buildings at those locations – described as 'maximum all locations'
2. The maximum ventilation outlet concentration at residential, workplace and recreational receiver locations within 300 metres of the ventilation outlet at each modelled height (10 metres, 20 metres, 30 metres and 45 metres). This only includes buildings that currently exist at each height – described as 'maximum existing'.

Receivers may not currently exist at all of the heights modelled. For example, a 10 metre building may exist at a particular location, and this location is modelled for all four heights. However, only the 10 metre prediction is relevant at that location as the building does not reach heights of 20 metres, 30 metres or 45 metres.

Establishing background concentrations at height

For the purposes of this report, separate methodologies for establishing background concentrations at heights have been prepared for particulate matter (PM_{10} and $PM_{2.5}$) and NO_X. For air toxics, only incremental (ventilation outlet) concentrations are being presented and therefore no methodology for calculating background concentrations is presented here.

The purpose of identifying the background concentrations is to combine project contributions to identify total concentrations. The total concentrations can then be compared with the NSW Environment Protection Authority impact assessment criterion, in accordance with the *Approved*

Methods for the Modelling and Assessment of Air Pollutants in NSW (Environment Protection Authority, 2016).

Particulate matter (PM_{10} and $PM_{2.5}$)

For annual average PM_{10} and $PM_{2.5}$, the methodology is as follows:

- Extract ground level surface road contribution for the expected traffic 2037-Do something cumulative scenario at residential, workplace and recreational receivers for PM_{10} and $PM_{2.5}$
- Subtract the surface road contribution from the background used in Appendix H (Technical working paper: Air quality) (spatially varying for annual mean) to get the 'residual' ground level background. It has been assumed that this background will be consistent at all heights (ground level, 10 metres, 20 metres, 30 metres and 45 metres).

For maximum 24-hour average PM_{10} and $PM_{2.5}$, the methodology is as follows:

- Extract ground level surface road contribution for the expected traffic 2037-Do something cumulative scenario at all residential, workplace and recreational receivers for PM_{10} and $PM_{2.5}$
- Determine the 98th percentile for the ground level surface roads contribution for receivers within 50 metres of the roads[2]
- Subtract the 98th percentile for the ground level surface roads contribution from the background used in the Appendix H (Technical working paper: Air quality) (48.04 µg/m^3 for PM_{10} and 22.06 µg/m^3 for $PM_{2.5}$) to get the 'residual' ground level background. It will be assumed that this background will be consistent at all heights (ground level, 10 metres, 20 metres, 30 metres and 45 metres).

NO_X / NO_2

For NO_X/NO_2, the methodology includes:

- Extract total project contribution for the expected traffic 2037-Do something cumulative scenario at each modelled height for each of the residential, workplace and recreational receivers for NO_X (annual average)
- Extract ventilation outlet contribution for the expected traffic 2037-Do something cumulative scenario at each modelled height for each of the residential, workplace and recreational receivers for NO_X (annual average)
- Subtract the ventilation outlet contribution from the total project contribution to identify the surface roads contribution for NO_X at each height
- Calculate the average reduction in NO_X concentration at residential, workplace and recreational receivers within 50 metres of modelled surface roads between each modelled height and ground level (eg 10 metres and ground level, 20 metres and ground level, 30 metres and ground level, 45 metres and ground level). This generates an average vertical profile
- Calculate the revised NO_X background concentration by applying the vertical reduction profile to the background concentration from Appendix H (Technical working paper: Air quality) (eg ground level background = 603.8 µg/m^3, reduction at 10 metres = 19 per cent, revised background at 10 metres = 489.1 µg/m^3).

Assumptions and limitations

General assumptions applicable to all pollutants were:

[2] Receptors that are located within 50 metres of modelled surface roads were used as these are the receptors most impacted by contributions from the roads.

- For short-term averaging periods, it has been determined that surface road contributions are total contributions minus ventilation outlet contributions
- To establish a profile, only receivers that are located within 50 metres of modelled surface roads were considered. A distance of 50 metres was chosen, as beyond this there is a drop-off in pollutant concentrations preventing a clear profile from being established.

Specific assumptions for NO_X / NO_2 were:

- The annual average NO_X concentration profile for receivers within 50 metres of modelled surface roads has been established comparing ground level concentrations (from surface roads only) with the concentrations at the heights modelled (10 metres, 20 metres, 30 metres and 45 metres). The surface roads contribution reduced by the following amounts:
  - 10 metres – 19 per cent reduction in ground level NO_X concentrations
  - 20 metres – 32 per cent reduction in ground level NO_X concentrations
  - 30 metres – 41 per cent reduction in ground level NO_X concentrations
  - 45 metres – 52 per cent reduction in ground level NO_X concentrations
- The annual average NO_X surface road concentration profile has been applied to the background 1-hour average and annual average concentrations.

Modelling Results – Expected Traffic

Section 3 of Appendix H (Technical working paper: Air quality) outlined the methodology for establishing background concentrations at height. The following discusses PM_{10}, $PM_{2.5}$ and NO_X/NO_2:

- Incremental (ventilation outlet) contribution
- Background (surface road and other non-surface road contributions)
- Total concentrations (ventilation outlet plus background)
- Comparison to NSW criterion.

For air toxics, only the incremental (ventilation outlet) contribution has been presented.

The results in the following sections are presented based on the maximum ventilation outlet contribution.

PM_{10}

Table B1-7 presents the annual average PM_{10} concentrations for selected residential, workplace and recreational receivers within 300 metres of ventilation outlet F at four modelled heights, while Table B1-8 presents the maximum 24-hour average PM_{10} concentrations for selected residential, workplace and recreational receivers within 300 metres of ventilation outlet G at four modelled heights.

Table B1-7 Expected traffic case annual average and maximum 24-hour average PM_{10} concentrations for selected residential, workplace and recreational receivers within 300 metres of ventilation outlet F

Receiver height (m)	Maximum all or existing	Receiver ID	Incremental (ventilation outlet) contribution (µg/m³)	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
Annual average PM_{10}						
	All[(a)]	RWR-26766	0.2	16.2	16.4	25

Receiver height (m)	Maximum all or existing	Receiver ID	Incremental (ventilation outlet) contribution (µg/m³)	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
10 m	Existing[b]	RWR-26776	0.1	16.7	16.9	25
20 m	All	RWR-26566	0.3	16.4	16.6	25
	Existing	-	-	-	-	-
30 m	All	RWR-33502	0.4	16.1	16.4	25
	Existing	-	-	-	-	-
45 m	All	RWR-26527	0.6	15.8	16.4	25
	Existing	-	-	-	-	-
Maximum 24-hour average PM_{10}						
10 m	All[a]	RWR-26701	1.3	43.5	44.8	50
	Existing[b]	RWR-26776	1.0	44.5	45.5	50
20 m	All	RWR-26010	2.2	43.2	45.4	50
	Existing	-	-	-	-	-
30 m	All	RWR-26184	4.9	40.6	45.5	50
	Existing	-	-	-	-	-
45 m	All	RWR-32645	7.5	40.6	48.1	50
	Existing	-	-	-	-	-

(a) Assumes at Residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

Table B1-8 Expected traffic case annual average and maximum 24-hour average PM_{10} concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet G

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
Annual average PM_{10}						
10 m	All[a]	RWR-33248	0.1	15.8	15.9	25
	Existing[b]	RWR-12338	0.1	15.6	15.7	25
20 m	All	RWR-33537	0.2	15.6	15.8	25
	Existing	RWR-12249	0.1	14.9	15.0	25
30 m	All	RWR-33249	0.3	15.3	15.6	25
	Existing	RWR-12249	0.2	14.9	15.1	25
	All	RWR-12516	0.6	14.2	14.8	25

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
45 m	Existing	-	-	-	-	-
Maximum 24-hour average PM_{10}						
10 m	All[(a)]	RWR-12276	1.0	46.1	47.1	50
	Existing[(b)]	RWR-12003	0.7	44.6	45.4	50
20 m	All	RWR-33248	1.9	42.0	44.0	50
	Existing	RWR-12249	1.6	43.2	44.8	50
30 m	All	RWR-12516	5.2	40.6	45.8	50
	Existing	RWR-12249	3.0	41.5	44.5	50
45 m	All	RWR-32899	6.1	41.6	47.8	50
	Existing	-	-	-	-	-

(a) Assumes at RWR receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

For the annual average PM_{10} concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 25 µg/m³, when considering the maximum ventilation outlet contribution.

For the maximum 24-hour average PM_{10} concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 50 µg/m³, when considering the maximum ventilation outlet contribution.

$PM_{2.5}$

Table B1-9 presents the annual average $PM_{2.5}$ concentrations for selected residential, workplace and recreational receivers within 300 metres of ventilation outlet F at four modelled heights, while Table B1-10 presents the maximum 24-hour average $PM_{2.5}$ concentrations for selected residential, workplace and recreational receivers within 300 metres of ventilation outlet G four modelled heights.

Table B1-9 Expected traffic case annual average and maximum 24-hour average $PM_{2.5}$ concentrations for selected residential, workplace and recreational receivers within 300 metres of ventilation outlet F

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
Annual average $PM_{2.5}$						
10 m	All[(a)]	RWR-26766	0.1	7.5	7.6	8
	Existing[(b)]	RWR-26776	0.1	7.6	7.7	8
20 m	All	RWR-26766	0.1	7.4	7.6	8
	Existing	-	-	-	-	-

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
30 m	All	RWR-26528	0.2	7.1	7.3	8
	Existing	-	-	-	-	-
45 m	All	RWR-26528	0.4	6.9	7.4	8
	Existing	-	-	-	-	-
Maximum 24-hour average $PM_{2.5}$						
10 m	All[(a)]	RWR-26665	0.9	18.7	19.5	25
	Existing[(b)]	RWR-26776	0.7	18.8	19.5	25
20 m	All	RWR-26257	1.3	17.8	19.1	25
	Existing	-	-	-	-	-
30 m	All	RWR-32645	3.1	17.6	20.7	25
	Existing	-	-	-	-	-
45 m	All	RWR-33502	5.2	17.5	22.7	25
	Existing	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background.

Table B1-10 Expected traffic case annual average and maximum 24-hour average $PM_{2.5}$ concentrations for selected RWR receivers within 300 m of ventilation outlet G

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
Annual average $PM_{2.5}$						
10 m	All[a]	RWR-33248	0.1	7.5	7.6	8
	Existing[b]	RWR-12003	0.1	7.3	7.3	8
20 m	All	RWR-33463	0.1	7.4	7.5	8
	Existing	RWR-12249	0.1	7.1	7.2	8
30 m	All	RWR-33249	0.2	7.3	7.5	8
	Existing	RWR-12249	0.1	7.0	7.1	8
45 m	All	RWR-12516	0.4	6.4	6.9	8
	Existing	-	-	-	-	-
Maximum 24-hour average $PM_{2.5}$						
10 m	All[a]	RWR-33248	0.63	18.8	19.5	25
	Existing[b]	RWR-11931	0.41	19.4	19.8	25
20 m	All	RWR-33249	1.19	18.0	19.1	25
	Existing	RWR-12249	1.02	18.2	19.3	25
30 m	All	RWR-12516	3.68	17.6	21.2	25
	Existing	RWR-12249	2.18	17.8	20.0	25
45 m	All	RWR-32899	4.34	17.7	22.0	25
	Existing	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

For the annual average $PM_{2.5}$ concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 8 µg/m³, when considering the maximum ventilation outlet contribution.

For the maximum 24-hour average $PM_{2.5}$ concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 25 µg/m³, when considering the maximum ventilation outlet contribution.

NO_2

Table B1-11 presents the annual average NO_2 concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet F at four modelled heights, while Table B1-12 presents the maximum 1-hour average NO_2 concentrations for selected Residential, workplace, recreational receivers within 300 metres of ventilation outlet G at four modelled heights.

Table B1-11 Expected traffic case annual average and maximum 1-hour average NO_2 concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet F

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental NO_X (ventilation outlet) contribution	Background NO_X ($\mu g/m^3$)	Total concentration NO_X ($\mu g/m^3$)	Total concentration NO_2 ($\mu g/m^3$)	Criterion ($\mu g/m^3$)
Annual average NO_X / NO_2							
10 m	All[(a)]	RWR-26689	1.2	36.5	37.6	20.5	62
	Existing[(b)]	RWR-26776	0.9	34.1	35.0	19.6	62
20 m	All	RWR-26704	1.5	29.7	31.2	18.3	62
	Existing	-	-	-	-	-	-
30 m	All	RWR-26575	2.2	25.5	27.7	17.0	62
	Existing	-	-	-	-	-	-
45 m	All	RWR-26235	4.1	22.5	26.6	16.5	62
	Existing	-	-	-	-	-	-
Maximum 1-hour average NO_X / NO_2							
10 m	All[(a)]	RWR-26669	47	1283	1329	219	246
	Existing[(b)]	RWR-26776	30	1661	1691	**271**	246
20 m	All	RWR-26528	58	796	854	201	246
	Existing	-	-	-	-	-	-
30 m	All	RWR-26183	94	721	815	199	246
	Existing	-	-	-	-	-	-
45 m	All	RWR-33269	213	519	733	195	246
	Existing	-	-	-	-	-	-

(a) Assumes at residential, workplace, recreational locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background.

Table B1-12 Expected traffic case annual average and maximum 1-hour average NO_2 concentrations for selected residential, workplace, recreational within 300 metres of ventilation outlet G

Receive r height (m)	Maximu m all or existing	Receiver ID (RWR (Residential , workplace, recreational))	Incremental NOX (ventilation outlet) contribution	Background NOX ($\mu g/m^3$)	Total concentration NOX ($\mu g/m^3$)	Total concentration NO2 ($\mu g/m^3$)	Criterion ($\mu g/m^3$)
Annual average NO_X / NO2							
10 m	All[(a)]	RWR-12007	1.7	35.3	37.0	20.3	62
	Existing[(b	RWR-12003	1.3	34.7	36.0	19.9	62
20 m	All	RWR-33249	2.2	24.8	27.0	16.7	62
	Existing	RWR-12249	1.3	28.4	29.6	17.7	62
30 m	All	RWR-33249	3.9	20.1	24.1	15.5	62
	Existing	RWR-12249	2.6	22.8	25.4	16.0	62
45 m	All	RWR-12516	7.8	17.5	25.3	16.0	62
	Existing	-	-	-	-	-	-
Maximum 1-hour average NO_X / NO_2							
10 m	All[(a)]	RWR-12146	61	847	908	203	246
	Existing[(b	RWR-12003	51	945	996	207	246
20 m	All	RWR-12189	94	645	739	195	246
	Existing	RWR-12249	68	691	759	196	246
30 m	All	RWR-12414	216	578	794	198	246
	Existing	RWR-12249	137	356	493	180	246
45 m	All	RWR-12414	355	307	661	191	246
	Existing	-	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

For the annual average NO_2 concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 62 $\mu g/m^3$, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average NO_2 concentrations there is one exceedance of the NSW Environment Protection Authority impact assessment criterion of 246 $\mu g/m^3$, when considering the maximum ventilation outlet contribution. The exceedance occurs at 10 metres at a residential, workplace, recreational receiver that exists at 10 metres (RWR-26776) around ventilation outlet F. The ventilation outlet NO_X contribution at RWR-26776 is 30 $\mu g/m^3$ which represents two per cent of the total NO_X contribution.

Air toxics

This section presents the maximum 1-hour average incremental air toxic concentrations for benzene, PAHs (as b(a)p), formaldehyde, 1,3-butadiene and ethylbenzene for selected residential, workplace, recreational receivers at four modelled heights. The conversion percentage of each of

the five air toxics has been applied after modelling and the values are the same as those applied in Appendix H (Technical Working Paper: Air quality).

Table B1-13 presents the maximum 1-hour average air toxics concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet F at four modelled heights. Table B1-14 presents the maximum 1-hour average air toxics concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet G at four modelled heights.

Table B1-13 Expected traffic case Maximum 1-hour average air toxics concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet F

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution (µg/m^3)				
			Benzene	PAH (as b(a)p)	Formaldehyde	1,3 butadiene	Ethylbenzene
Criterion (µg/m^3)			**29**	**0.4**	**20**	**40**	**8000**
10 m	All[(a)]	RWR-26686	0.08	0.00	0.10	0.02	0.03
	Existing[(b)]	RWR-26776	0.07	0.00	0.09	0.02	0.02
20 m	All	RWR-26807	0.10	0.00	0.13	0.03	0.03
	Existing	-	-	-	-	-	-
30 m	All	RWR-32598	0.15	0.00	0.20	0.04	0.05
	Existing	-	-	-	-	-	-
45 m	All	RWR-33269	0.42	0.01	0.55	0.12	0.14
	Existing	-	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receivers locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Table B1-14 Expected traffic case Maximum 1-hour average air toxics concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet G

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution (µg/m^3)				
			Benzene	PAH (as b(a)p)	Formaldehyde	1,3 butadiene	Ethylbenzene
Criterion (µg/m^3)			**29**	**0.4**	**20**	**40**	**8000**
10 m	All[(a)]	RWR-12182	0.16	0.00	0.20	0.04	0.05
	Existing[(b)]	RWR-12362	0.10	0.00	0.12	0.03	0.03
20 m	All	RWR-12189	0.22	0.00	0.29	0.06	0.07
	Existing	RWR-12249	0.17	0.00	0.22	0.05	0.05
30 m	All	RWR-12236	0.50	0.01	0.65	0.14	0.16
	Existing	RWR-12249	0.29	0.00	0.38	0.08	0.09
	All	RWR-12414	0.84	0.01	1.09	0.23	0.28

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution (µg/m³)				
			Benzene	PAH (as b(a)p)	Formaldehyde	1,3 butadiene	Ethylbenzene
45 m	Existing	-	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receivers locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

For the maximum 1-hour average benzene concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 29 µg/m^3, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average PAHs concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 0.4 µg/m^3, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average formaldehyde concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 20 µg/m^3, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average 1,3-butadiene concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 40 µg/m^3, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average ethylbenzene concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 8000 µg/m^3, when considering the maximum ventilation outlet contribution.

Quantification of exceedances

The above sections have considered total concentrations based on the maximum contribution from the Western Harbour Tunnel ventilation outlets. The discussion below considers all 320 receivers around the Western Harbour Tunnel ventilation outlets.

For the annual average PM_{10} concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 25 µg/m^3.

For maximum 24-hour PM_{10} concentrations, there are 17 predicted exceedances of the maximum 24-hour average PM_{10} NSW Environment Protection Authority impact assessment criterion which equates to five per cent of all 320 receivers assessed. All exceedances are additional exceedances when compared with the 2037-Do minimal scenario. Only two of these 17 receivers exist at the heights modelled.

Table B1-15 presents the maximum 24-hour average PM_{10} concentrations for the two residential, workplace, recreational receivers mentioned above that exceed the NSW Environment Protection Authority impact assessment criterion.

For the residential, workplace, recreational receivers presented in Table B1-15, the contribution from the ventilation outlet is only one per cent of the total concentration.

Table B1-15 Expected traffic case maximum 24-hour average PM_{10} concentrations for residential, workplace, recreational receivers that exceed the NSW Environment Protection Authority impact assessment criterion

Receiver height (m)	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution (µg/m³)	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
10 m	RWR-32856	0.5	49.9	**50.4**	50
	RWR-32857	0.5	50.0	**50.5**	50

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

For the annual average $PM_{2.5}$ concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 8 µg/m³.

For the maximum 24-hour average $PM_{2.5}$ concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 25 µg/m³.

For the annual average NO_2 concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 62 µg/m³.

For the maximum 1-hour average NO_2 concentrations, there are 10 predicted exceedances of the NSW Environment Protection Authority impact assessment criterion which equates to three per cent of all 320 receivers assessed. Nine of these 10 exceedances are additional exceedances when compared with the 2037-Do minimum scenario. Only three of these 10 receivers exist at the heights modelled. Table B1-16 presents the maximum 1-hour average NO_2 concentrations for the three residential, workplace, recreational receivers mentioned above that exceed the NSW Environment Protection Authority impact assessment criterion. It should be noted that for RWR-32859, also exceeds for the 2037-Do minimum scenario.

For the residential, workplace, recreational receivers in Table B1-16, the NO_X contribution from the ventilation outlet is less than two per cent of the total NO_X concentration. While there are predicted exceedances calculated, it is noted that these are not due to the outlet. For example, if the outlet is excluded from the NO_X to NO_2 conversion for the receivers shown in Table B1-16, the resulting NO_2 concentrations would be 285 µg/m³ (for RWR-32681), 266 µg/m³ (for RWR-26776) and 264 µg/m³ (for RWR-32859), all above the assessment criterion.

Table B1-16 Expected traffic case maximum 1-hour average NO_2 concentrations for residential, workplace, recreational receivers that exceed the NSW Environment Protection Authority impact assessment criterion

Receiver height (m)	Receiver ID (RWR (Residential, workplace, recreational))	Incremental (ventilation outlet) contribution (µg/m³)	Background (µg/m³)	Total NO_X concentration (µg/m³)	Total NO_2 concentration (µg/m³)	Criterion (µg/m³)
10 m	RWR-32861	25	1784	1809	**289**	246
	RWR-26776	30	1661	1691	**271**	246
	RWR-32859	24	1650	1673	**268**	246

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

Modelling Results – Regulatory Worst Case

This section presents the total concentrations for 2037-Do something cumulative scenario for regulatory worse case for all pollutants modelled for comparison with NSW Environment Protection Authority impact assessment criterion.

PM_{10}

Table B1-17 presents the annual average and maximum 24-hour average PM_{10} concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet F at four modelled heights. Table B1-18 presents the annual average and maximum 24-hour average PM_{10} concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet G at four modelled heights.

Table B1-17 Regulatory worst case annual average and maximum 24-hour average PM_{10} concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet F

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational)	Incremental (ventilation outlet) contribution (µg/m³)	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
Annual average PM_{10}						
10 m	All[(a)]	RWR-26776	0.6	16.7	17.4	25
	Existing[(b)]	RWR-26776	0.6	16.7	17.4	25
20 m	All	RWR-26527	0.9	16.4	17.2	25
	Existing	-	-	-	-	-
30 m	All	RWR-26527	1.4	16.1	17.5	25
	Existing	-	-	-	-	-
45 m	All	RWR-26527	2.6	16.0	18.6	25
	Existing	-	-	-	-	-
Maximum 24-hour average PM_{10}						
10 m	All[(a)]	RWR-26766	5.0	42.1	47.1	50
	Existing[(b)]	RWR-26776	4.8	44.5	49.3	50
20 m	All	RWR-26791	8.8	42.1	**50.9**	50
	Existing	-	-	-	-	-
30 m	All	RWR-26183	22.5	43.2	**65.7**	50
	Existing	-	-	-	-	-
45 m	All	RWR-26200	33.9	42.9	**76.8**	50
	Existing	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receivers locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background.

Table B1-18 Regulatory worst case annual average and maximum 24-hour average PM_{10} concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet G

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (Residential, workplace, recreational)	Incremental (ventilation outlet) contribution (µg/m³)	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
Annual average PM_{10}						
10 m	All[(a)]	RWR-33249	0.5	15.8	16.3	25
	Existing[(b)]	RWR-12003	0.5	15.3	15.7	25
20 m	All	RWR-33249	0.8	15.7	16.5	25
	Existing	RWR-12249	0.6	15.3	15.9	25
30 m	All	RWR-33249	1.2	15.7	16.9	25
	Existing	RWR-12249	1.0	14.9	15.9	25
45 m	All	RWR-12516	3.3	14.1	17.4	25
	Existing	-	-	-	-	-
Maximum 24-hour average PM_{10}						
10 m	All[(a)]	RWR-33248	3.3	43.5	46.7	50
	Existing[(b)]	RWR-11931	3.0	46.1	49.1	50
20 m	All	RWR-33249	7.6	46.3	**53.9**	50
	Existing	RWR-12249	5.8	44.0	49.8	50
30 m	All	RWR-12516	20.0	42.7	**62.7**	50
	Existing	RWR-12249	13.0	42.0	**54.9**	50
45 m	All	RWR-32899	24.5	41.0	**65.5**	50
	Existing	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

For the annual average PM_{10} concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 25 µg/m³, when considering the maximum ventilation outlet contribution.

For the maximum 24-hour average PM_{10} concentrations, there are exceedances of the NSW Environment Protection Authority impact assessment criterion of 50 µg/m³ at 20 metres, 30 metres and 45 metres when considering all residential, workplace and recreational receiver locations, irrespective of buildings that exist at those heights and when considering the maximum ventilation outlet contribution. When considering residential, workplace and recreational receivers that do exist at each modelled height, there is one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion of 50 µg/m³ at 30 metres at receiver RWR-12249. At this location, the contribution from the ventilation outlets is approximately 24 per cent of the total contribution.

In considering the above outcomes, note that the NSW Environment Protection Authority's submission (refer to Section 2 of the submission) suggests that predicted $PM_{2.5}$ and PM_{10} concentrations from the ventilation outlets have been overestimated by the model.

$PM_{2.5}$

Table B1-19 presents the annual average and maximum 24-hour average $PM_{2.5}$ concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet F at four modelled heights. Table B1-20 presents the annual average and maximum 24-hour average $PM_{2.5}$ concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet G at four modelled heights.

Table B1-19 Regulatory worst case annual average and maximum 24-hour average $PM_{2.5}$ concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet F

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (residential, workplace, recreational)	Incremental (ventilation outlet) contribution (µg/m³)	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
Annual average $PM_{2.5}$						
10 m	All[a]	RWR-26776	0.6	7.6	**8.2**	8
	Existing[b]	RWR-26776	0.6	7.6	**8.2**	8
20 m	All	RWR-26527	0.9	7.2	**8.0**	8
	Existing		-	-	-	-
30 m	All	RWR-26527	1.4	7.1	**8.5**	8
	Existing		-	-	-	-
45 m	All	RWR-26527	2.6	7.0	**9.6**	8
	Existing	-		-	-	-
Maximum 24-hour average $PM_{2.5}$						
10 m	All[a]	RWR-26766	5.0	18.3	23.2	25
	Existing[b]	RWR-26776	4.8	18.8	23.6	25
20 m	All	RWR-26791	8.8	18.0	**26.8**	25
	Existing		-	-	-	-
30 m	All	RWR-26183	22.5	18.0	**40.5**	25
	Existing		-	-	-	-
45 m	All	RWR-26200	33.9	17.5	**51.5**	25
	Existing		-	-	-	-

(a) Assumes at residential, workplace, recreational receivers locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

Table B1-20 Regulatory worst case annual average and maximum 24-hour average $PM_{2.5}$ concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet G

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (residential, workplace, recreational)	Incremental (ventilation outlet) contribution (µg/m³)	Background (µg/m³)	Total concentration (µg/m³)	Criterion (µg/m³)
Annual average $PM_{2.5}$						
10 m	All[(a)]	RWR-33249	0.5	7.6	**8.1**	8
	Existing[(b)]	RWR-12003	0.5	7.3	7.7	8
20 m	All	RWR-33249	0.8	7.4	**8.2**	8
	Existing	RWR-12249	0.6	7.1	7.7	8
30 m	All	RWR-33249	1.2	7.3	**8.5**	8
	Existing	RWR-12249	1.0	7.0	7.9	8
45 m	All	RWR-12516	3.3	6.4	**9.8**	8
	Existing	-	-	-	-	-
Maximum 24-hour average $PM_{2.5}$						
10 m	All[(a)]	RWR-33248	3.3	18.8	22.1	25
	Existing[(b)]	RWR-11931	3.0	19.4	22.3	25
20 m	All	RWR-33249	7.6	18.0	**25.5**	25
	Existing	RWR-12249	5.8	18.2	24.0	25
30 m	All	RWR-12516	20.0	17.6	**37.6**	25
	Existing	RWR-12249	13.0	17.8	**30.8**	25
45 m	All	RWR-32899	24.5	17.7	**42.2**	25
	Existing	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

For the annual average $PM_{2.5}$ concentrations, there are predicted exceedances of the NSW Environment Protection Authority impact assessment criterion of 8 µg/m³ at 10 metres, 20 metres, 30 metres and 45 metres when considering all residential, workplace, recreational receiver locations, irrespective of buildings that exist at those heights and when considering the maximum ventilation outlet contribution. When considering residential, workplace, recreational receivers that do exist at each modelled height, there is one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion of 8 µg/m³ at 10 metres at receiver RWR-26776. At this location, the contribution from the ventilation outlets is about seven per cent of the total contribution.

For the maximum 24-hour average $PM_{2.5}$ concentrations, there are exceedances of the NSW Environment Protection Authority impact assessment criterion of 25 µg/m³ at 20 metres, 30 metres and 45 metres when considering all residential, workplace, recreational receiver locations, irrespective of buildings that exist at those heights and when considering the maximum ventilation

outlet contribution. When considering residential, workplace, recreational receiver that do exist at each modelled height, there is one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion of 25 µg/m^3 at 30 metres at receiver RWR-12249. At this location, the contribution from the ventilation outlets under the regulatory worst case scenario modelled is about 42 per cent of the total contribution.

NO_2

Table B1-21 presents the annual average NO_2 concentrations for selected residential, workplace, recreational receiver within 300 metres of ventilation outlet F at four modelled heights. Table B1-22 presents the maximum 1-hour average NO_2 concentrations for selected residential, workplace, recreational receiver within 300 metres of ventilation outlet G at four modelled heights.

Table B1-21 Regulatory worst case annual average and maximum 1-hour average NO_2 concentrations for selected residential, workplace, recreational receiver within 300 metres of ventilation outlet F

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (residential, workplace, recreational)	Incremental NO_X (ventilation outlet) contribution	Background NO_X (µg/m^3)	Total concentration NO_X (µg/m^3)	Total concentration NO_2 (µg/m^3)	Criterion (µg/m^3)
Annual average NO_X / NO_2							
10 m	All[(a)]	RWR-26686	12.6	32.0	44.6	23	62
	Existing[(b)]	RWR-26776	10.8	34.1	44.9	23	62
20 m	All	RWR-26742	15.5	30.9	46.4	23	62
	Existing	-	-	-	-	-	-
30 m	All	RWR-26235	25.1	24.0	49.1	24	62
	Existing	-	-	-	-	-	-
45 m	All	RWR-26527	48.6	19.6	68.1	28	62
	Existing	-	-	-	-	-	-
Maximum 1-hour average NO_X / NO_2							
10 m	All[(a)]	RWR-32494	316	1271	1587	**254**	246
	Existing[(b)]	RWR-26776	206	1661	1867	**299**	246
20 m	All	RWR-26113	388	888	1277	217	246
	Existing	-	-	-	-	-	-
30 m	All	RWR-26183	720	634	1354	220	246
	Existing	-	-	-	-	-	-
45 m	All	RWR-33269	2598	747	3345	**535**	246
	Existing	-	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

Table B1-22 Regulatory worst case annual average and maximum 1-hour average NO_2 concentrations for selected residential, workplace, recreational receiver within 300 metres of ventilation outlet G

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (residential, workplace, recreational)	Incremental NO_X (ventilation outlet) contribution ($\mu g/m^3$)	Background NO_X ($\mu g/m^3$)	Total concentration NO_X ($\mu g/m^3$)	Total concentration NO_2 ($\mu g/m^3$)	Criterion ($\mu g/m^3$)
Annual average NO_X / NO_2							
10 m	All[a]	RWR-11923	9.8	34.9	44.6	23	62
	Existing[b]	RWR-12003	8.3	34.7	43.0	22	62
20 m	All	RWR-33249	13.1	27.2	40.3	21	62
	Existing	RWR-12249	9.3	27.4	36.7	20	62
30 m	All	RWR-33249	20.4	24.3	44.7	23	62
	Existing	RWR-12249	17.9	23.1	41.1	22	62
45 m	All	RWR-12516	57.0	17.4	74.4	29	62
	Existing	-	-	-	-	-	-
Maximum 1-hour average NO_X / NO_2							
10 m	All[a]	RWR-12559	250	1041	1291	218	246
	Existing[b]	RWR-12338	164	978	1142	213	246
20 m	All	RWR-12236	360	906	1266	217	246
	Existing	RWR-12249	263	876	1139	212	246
30 m	All	RWR-12407	718	629	1347	220	246
	Existing	RWR-12249	489	778	1267	217	246
45 m	All	RWR-12516	1428	599	2026	**324**	246
	Existing	-	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Background = surface road and non-surface road contributions

Total concentration = incremental ventilation outlet contribution + background

For the annual average NO_2 concentrations, there are no exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 62 $\mu g/m^3$, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average NO_2 concentrations there are exceedances of the NSW Environment Protection Authority impact assessment criterion of 246 $\mu g/m^3$ at 10 metres and 45 metres when considering all residential, workplace, recreational receivers locations, irrespective of buildings that exist at those heights and when considering the maximum ventilation outlet contribution. When considering residential, workplace, recreational receivers that do exist at each modelled height, there is one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion of 246 $\mu g/m^3$ at 10 metres at an existing residential, workplace, recreational receivers (RWR-26776). At this location, the NO_X ventilation outlet contribution is 206 $\mu g/m^3$ which is 11 per cent of the total NO_X contribution.

Air toxics

This section presents the maximum 1-hour average incremental air toxic concentrations for benzene, PAHs (as b(a)p), formaldehyde, 1,3-butadiene and ethylbenzene for selected residential, workplace, recreational receivers at four modelled heights. The conversion percentage of each of the five air toxics has been applied after modelling and the values are the same as those applied in the Appendix H (Technical working paper: Air quality).

Table B1-23 presents the maximum 1-hour average air toxics concentrations for selected residential, workplace, recreational receivers within 300 metres of each of the ventilation outlet F at four modelled heights. Table B1-24 presents the maximum 1-hour average air toxics concentrations for selected residential, workplace, recreational receivers within 300 metres of each of the ventilation outlet G at four modelled heights.

For the maximum 1-hour average benzene concentrations, there are no exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 29 µg/m^3, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average PAHs concentrations, there are no exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 0.4 µg/m^3, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average formaldehyde concentrations, there is one exceedances of the NSW Environment Protection Authority impact assessment criterion of 20 µg/m^3 at 45 metres when considering all residential, workplace, recreational receiver location, irrespective of buildings that exist at those heights, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average 1,3-butadiene concentrations, there are no exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 40 µg/m^3, when considering the maximum ventilation outlet contribution.

For the maximum 1-hour average ethylbenzene concentrations, there are no exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion of 8000 µg/m^3, when considering the maximum ventilation outlet contribution.

Table B1-23 Regulatory worst case maximum 1-hour average air toxics concentrations for selected residential, workplace, recreational receiver within 300 metres of ventilation outlet F

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (residential, workplace, recreational)	Incremental (ventilation outlet) contribution (µg/m^3)				
			Benzene	PAH (as b(a)p)	Formaldehyde	1,3 butadiene	Ethylbenzene
Criterion (µg/m^3)			**29**	**0.4**	**20**	**40**	**8000**
10 m	All[(a)]	RWR-32520	1.8	0.0	2.4	0.5	0.6
	Existing[(b)]	RWR-26776	1.4	0.0	1.8	0.4	0.5
20 m	All	RWR-26113	2.5	0.0	3.2	0.7	0.8
	Existing	-	-	-	-	-	-
30 m	All	RWR-26113	4.8	0.1	6.3	1.3	1.6
	Existing	-	-	-	-	-	-
45 m	All	RWR-33269	16.2	0.2	**21.0**	4.4	5.3
	Existing	-	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height
Numbers in **bold** represent an exceedance of the criterion.

Table B1-24 Regulatory worst case maximum 1-hour average air toxics concentrations for selected residential, workplace, recreational receivers within 300 metres of ventilation outlet G

Receiver height (m)	Maximum all or existing	Receiver ID (RWR (residential, workplace, recreational)	Incremental (ventilation outlet) contribution (µg/m³)				
			Benzene	PAH (as b(a)p)	Formaldehyde	1,3 butadiene	Ethylbenzene
Criterion (µg/m³)			**29**	**0.4**	**20**	**40**	**8000**
10 m	All[a]	RWR-33248	1.2	0.0	1.6	0.3	0.4
	Existing[b]	RWR-11931	1.1	0.0	1.4	0.3	0.4
20 m	All	RWR-12236	2.2	0.0	2.8	0.6	0.7
	Existing	RWR-12249	1.5	0.0	2.0	0.4	0.5
30 m	All	RWR-12414	5.0	0.1	6.5	1.4	1.6
	Existing	RWR-12249	3.2	0.0	4.2	0.9	1.1
45 m	All	RWR-12516	10.0	0.1	13.0	2.7	3.3
	Existing	-	-	-	-	-	-

(a) Assumes at residential, workplace, recreational receiver locations that buildings exist at all heights, irrespective of existing building heights at those locations

(b) Only includes buildings that exist at each height

Numbers in **bold** represent an exceedance of the criterion.

Summary

Expected traffic case

This section provides a summary of the findings of the elevated receiver modelling for the expected traffic case.

When considering the maximum ventilation outlet contribution the findings are as follows:

- For the annual average and maximum 24-hour average PM_{10} concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criteria
- For the annual average and maximum 24-hour average $PM_{2.5}$ concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criteria
- For the annual average NO_2 concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion
- For the maximum 1-hour average NO_2 concentrations, there is one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion. This exceedance occurs at 10 metres at a residential, workplace, recreational receivers that exists at 10 metres (RWR-26776) around ventilation outlet F. The ventilation outlet NO_X contribution at RWR-26776 is 30 µg/m³ which represents two per cent of the total NO_X contribution at this receiver
- For the maximum 1-hour average benzene, PAHs, formaldehyde, 1,3-butadiene and ethylbenzene concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criteria.

When considering all 320 receivers around the Western Harbour Tunnel ventilation outlets to provide a quantification of exceedances, the findings are as follows:

- For the annual average PM_{10} concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criteria
- For the maximum 24-hour average PM_{10} concentrations, there are 17 predicted exceedances of the NSW Environment Protection Authority impact assessment criteria which equates to five per cent of 320 receivers assessed. All of these exceedances are additional exceedances when compared with the 2037-Do minimum scenario. Only two of these 17 receivers exist at the heights modelled and these are RWR-32856 and RWR-32857
- For the annual average and maximum 24-hour average $PM_{2.5}$ concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criteria
- For the annual average NO_2 concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion
- For the maximum 1-hour average NO_2 concentrations there are ten predicted exceedances of the NSW Environment Protection Authority impact assessment criterion of 246 µg/m^3 which equates to three per cent of the 320 receivers assessed. Nine of these 10 exceedances are additional exceedances when compared with the 2037-Do minimum scenario. Only three of these 10 receivers exist at the heights modelled (RWR-32861, RWR-26776 and RWR-32859)
- For the maximum 1-hour average benzene, PAHs, formaldehyde, 1,3-butadiene and ethylbenzene concentrations, there are no exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criteria.

Regulatory worst case

This section provides a summary of the findings of the regulatory worse case elevated receiver modelling.

When considering the maximum ventilation outlet contribution the findings are as follows:

- For the annual average PM_{10} concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion
- For the maximum 24-hour average PM_{10} concentrations, there are predicted exceedances of the NSW Environment Protection Authority impact assessment criterion at 10 metres, 20 metres, 30 metres and 45 metres around both ventilation outlets when considering all residential, workplace, recreational receiver locations, irrespective of buildings that exist at those heights. When considering residential, workplace, recreational receivers that do exist at each modelled height, there is one predicted exceedance of the criterion at 30 metres at receiver RWR-12249, located near to ventilation outlet G. At this location, the contribution from the ventilation outlets is about 24 per cent of the total contribution
- For the annual average $PM_{2.5}$ concentrations, there are predicted exceedances of the NSW Environment Protection Authority impact assessment criterion at 10 metres, 20 metres, 30 metres and 45 metres when considering all residential, workplace and recreational receiver locations, irrespective of buildings that exist at those heights. When considering residential, workplace and recreational receivers that do exist at each modelled height, there is one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion at 10 metres at receiver RWR-26776, located near to ventilation outlet F. At this location, the contribution from the ventilation outlets is approximately seven per cent of the total contribution
- For the maximum 24-hour average $PM_{2.5}$ concentrations, there are predicted exceedances of the NSW Environment Protection Authority impact assessment criterion of 50 µg/m^3 at 20 metres, 30 metres and 45 metres when considering all residential, workplace, recreational receiver locations, irrespective of buildings that exist at those heights. When considering residential, workplace, recreational receiver that do exist at each modelled height, there is

one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion at 30 metres at receiver RWR-12249, located near to ventilation outlet G. At this location, the contribution from the ventilation outlets is about 42 per cent of the total contribution

- For the annual average NO_2 concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criterion
- For the maximum 1-hour average NO_2 concentrations there are predicted exceedances of the NSW Environment Protection Authority impact assessment criterion of 246 µg/m^3 at 10 metres around ventilation outlet F and 45 metres around ventilation outlet F and G, when considering all residential, workplace, recreational receiver locations, irrespective of buildings that exist at those heights. When considering residential, workplace, recreational receivers that do exist at each modelled height, there is one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion of 246 µg/m^3 at 10 metres at an existing residential, workplace, recreational receiver (RWR-26776), located near to ventilation outlet F. At this location, the NO_X ventilation outlet contribution is 206 µg/m^3 which is 11 per cent of the total NO_X contribution
- For the maximum 1-hour average benzene, PAHs, 1,3-butadiene and ethylbenzene concentrations, there are no predicted exceedances at any modelled height of the NSW Environment Protection Authority impact assessment criteria
- For the maximum 1-hour average formaldehyde concentrations, there is one predicted exceedance of the NSW Environment Protection Authority impact assessment criterion of 20 µg/m^3 at 45 metres at RWR-33269, located near to ventilation outlet F when considering all residential, workplace, recreational receivers, irrespective of buildings that exist at those heights.

The independent NSW Chief Scientist and Engineer has recently released a report in relation to road tunnel air quality. The report 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 Western Harbour Tunnel and associated ventilation systems would be built and operated compliance with any conditions of approval set by the Department of Planning, Industry and Environment. Further, the monitoring of ventilation outlet emissions during operation would be regulated under an Environmental Protection Licence prescribed under the POEO Act.

B1.6.5 Operational particulate emissions

Issue raised

The NSW Environment Protection Authority requests clarifications regarding whether the project contributes to additional exceedances in the annual average $PM_{2.5}$ criterion. Should the project result in additional exceedances, the incremental contribution from the ventilation outlets of the project should be provided.

Response

Additional exceedances are determined by comparing the Western Harbour Tunnel Do-Something or Do-Something-Cumulative scenario results for 2027 and 2037 with the Do-Minimum scenario results for 2027 and 2037. Table B1-25 presents the number of additional annual average $PM_{2.5}$ exceedances for each of the project scenarios.

Table B1-25 Number of additional annual average $PM_{2.5}$ exceedances for each of the project scenarios

Scenario	Number of additional exceedances
2027-Do something (WHT)	214
2027-Do something cumulative	196
2037-Do Something (WHT)	227
2037-Do something cumulative	176

The exceedances reported in Table B1-25 above are a result of background air quality being close to the $PM_{2.5}$ criterion detailed in Section 12.3.3 of the Environmental impact statement (eg by less than one decimal point). As such, marginal increases in $PM_{2.5\ levels}$ (even to the second and third decimal place) can result in an exceedance of ambient air quality criterion at some receivers.

For each of the additional exceedances for each of the project scenarios the maximum concentration by total concentration and by ventilation outlet contribution has been calculated. Table B1-26 to Table B1-29 present the annual average $PM_{2.5}$ concentrations for each project scenario for residential, workplace, recreational receiver which the maximum total concentration and the maximum ventilation outlet contribution.

Table B1-26 Annual average $PM_{2.5}$ concentrations for 2027-Do Something Western Harbour Tunnel for maximum total concentration and maximum ventilation outlet contribution

Maximum by total or ventilation outlet contribution	Receiver ID (RWR (residential, workplace, recreational receiver)	2027 Do Minimum Total Concentration ($\mu g/m^3$)	2027 Do Something (Western Harbour Tunnel) Total Concentration ($\mu g/m^3$)	2027 Do Something (Western Harbour Tunnel) Ventilation Outlet Contribution ($\mu g/m^3$)
By total	RWR-27200	8.0	8.2	0.1
By ventilation outlet	RWR-27003	8.0	8.1	0.1

For both residential, workplace, recreational receivers presented in Table B1-26, the ventilation outlet contribution is only 1.1 per cent of the total concentration.

Table B1-27 Annual average $PM_{2.5}$ concentrations for 2027-Do something cumulative for maximum total concentration and maximum ventilation outlet contribution

Maximum by total or ventilation outlet contribution	Receiver ID (RWR (residential, workplace, recreational receiver)	2027 Do Minimum Total Concentration ($\mu g/m^3$)	2027 Do Something Cumulative (Western Harbour Tunnel) Total Concentration ($\mu g/m^3$)	2027 Do Something Cumulative (Western Harbour Tunnel) Ventilation Outlet Contribution ($\mu g/m^3$)
By total	RWR-27200	8.0	8.3	0.1

Maximum by total or ventilation outlet contribution	Receiver ID (RWR (residential, workplace, recreational receiver)	2027 Do Minimum Total Concentration (µg/m^3)	2027 Do Something Cumulative (Western Harbour Tunnel) Total Concentration (µg/m^3)	2027 Do Something Cumulative (Western Harbour Tunnel) Ventilation Outlet Contribution (µg/m^3)
By ventilation outlet	RWR-27315	8.0	8.1	0.1

For both residential, workplace and recreational receivers presented in Table B1-27, the ventilation outlet contribution is only 1.3 per cent of the total concentration.

Table B1-28 Annual average $PM_{2.5}$ concentrations for 2037-Do Something (Western Harbour Tunnel) for maximum total concentration and maximum ventilation outlet contribution

Maximum by total or ventilation outlet contribution	Receiver ID (RWR (residential, workplace, recreational receiver)	2037 Do Minimum Total Concentration (µg/m^3)	2037 Do Something (Western Harbour Tunnel) Total Concentration (µg/m^3)	2037 Do Something (Western Harbour Tunnel) Ventilation Outlet Contribution (µg/m^3)
By total	RWR-26540	8.0	8.2	0.1
By ventilation outlet	RWR-27349	8.0	8.1	0.1

As shown in Table B1-28 for residential, workplace and recreational receiver RWR-26540, the ventilation outlet contribution is only 0.8 per cent of the total concentration. For residential, workplace and recreational receiver RWR-27349, the ventilation outlet contribution is only 1.3 per cent of the total concentration.

Table B1-29 Annual average $PM_{2.5}$ concentrations for 2037-Do Something Cumulative for maximum total concentration and maximum ventilation outlet contribution

Maximum by total or ventilation outlet contribution	Receiver ID (RWR (residential, workplace, recreational receiver)	2037 Do Minimum Total Concentration (µg/m^3)	2037 Do Something Cumulative (Western Harbour Tunnel) Total Concentration (µg/m^3)	2037 Do Something Cumulative (Western Harbour Tunnel) Ventilation Outlet Contribution (µg/m^3)
By total	RWR-26295	8.0	8.2	0.1
By ventilation outlet	RWR-27350	7.9	8.1	0.1

As shown in Table B1-29, for residential, workplace and recreational receiver RWR-26295, the ventilation outlet contribution is only 0.9 per cent of the total concentration. For residential, workplace and recreational receiver RWR-27350, the ventilation outlet contribution is only 1.4 per cent of the total concentration.

In summary, the maximum ventilation outlet contribution as a percentage of the total concentration is 1.4 per cent. The maximum change for the any of the residential, workplace and recreational receiver with an additional exceedance is only 0.3 µg/m^3, which is negligible when compared to the criterion.

B1.6.6 Vehicle emission modelling verification

Issue raised

The NSW Environment Protection Authority outline that validation of the in-tunnel emissions model is not presented, and insufficient data is provided to allow transparent demonstration that the stated methodology was correctly implemented.

The NSW Environment Protection Authority conducted an evaluation of the 'Do Something 2027' total emission flows presented in Figure 7-1 of the environmental impact statement using the fleet profile presented in Table 6.13 of the environmental impact statement, the Permanent International Association of Road Congresses (PIARC) emission factor workbook available on-line, traffic volumes estimated from Figure 6-5 of the environmental impact statement and from Appendix F (Technical working paper: Traffic and transport), and Western Harbour Tunnel gradients estimated from Figure 6.1 of the environmental impact statement. Based on the statement in Section 6.1.3.1 of the environmental impact statement, the NSW Environment Protection Authority assumed a constant speed of 80 kilometres per hour.

A comparison of the emissions estimated by the NSW Environment Protection Authority to those scaled off Figure 7-1 of the environmental impact statement are presented in Table B1-30.

Table B1-30 Environment Protection Authority emissions estimation

Time period	NO_X (g/hr)			$PM_{2.5}$ (g/hr)			CO (G/hr)		
	EIS	EPA	Diff.	EIS	EPA	Diff.	EIS	EPA	Diff.
7:00-9:00	12,950	11,082	17%	495	590	-16%	14,590	7032	107%
9:00-15:00	12,140	10,415	17%	547	529	3%	13,420	5893	128%
15:00-18:00	9920	8623	15%	-	-	-	12,920	5749	125%
18:00-7:00	4010	2809	43%	-	-	-	7010	1906	268%

There is concern that for CO, the emissions estimated in the environmental impact statement were consistently significantly higher than NSW Environment Protection Authority estimates by more than 100 per cent. In order to demonstrate that the sound and otherwise well documented methodology has been correctly implemented, the NSW Environment Protection Authority request that tabulated vehicle emission model verification be provided for one scenario (eg 'Do something 2027') presenting:

- Traffic volumes
- Tunnel lengths and gradients
- Emission factors
- Resulting total emissions.

Response

Vehicle emission, in-tunnel air quality and outlet emissions, have been estimated in accordance with the Permanent International Association of Road Congresses report number 2019R02EN, as described in Annexure K of Appendix H (Technical working paper: Air quality). The analysis was

carried out using tunnel-ventilation specific software, IDA Tunnel 1.2, developed by EQUA AB in Sweden.

One of the reasons for the use of the software for this analysis is to manage the excessive number of scenarios, assumptions and inputs such as traffic flow, fleet composition, traffic speeds and traffic flow splits at the junctions in the scope of the assessment. Another important reason, for using IDA Tunnel, is to assess the aerodynamics of a tunnel network, with numerous converging/diverging tunnels, air extraction and air supply points. Due to these complex interactions and multitude of inputs, it is not practical to provide a simplified tabulated calculation for any of the scenarios assessed in the environmental impact statement.

The following section outlines CO emission calculation procedure for a simplified tunnel, with simplified inputs to demonstrate the accuracy of the IDA Tunnel 1.2 software. The estimated CO emissions are than compared with results obtained using IDA Tunnel 1.2.

Tunnel Geometry inputs

The geometry of the sample tunnel system, for this analysis is given in Figure B1-11. The tunnel system has two on-ramps, two off-ramps and a mainline tunnel of five kilometres and air is extracted via outlets located prior to the exits.

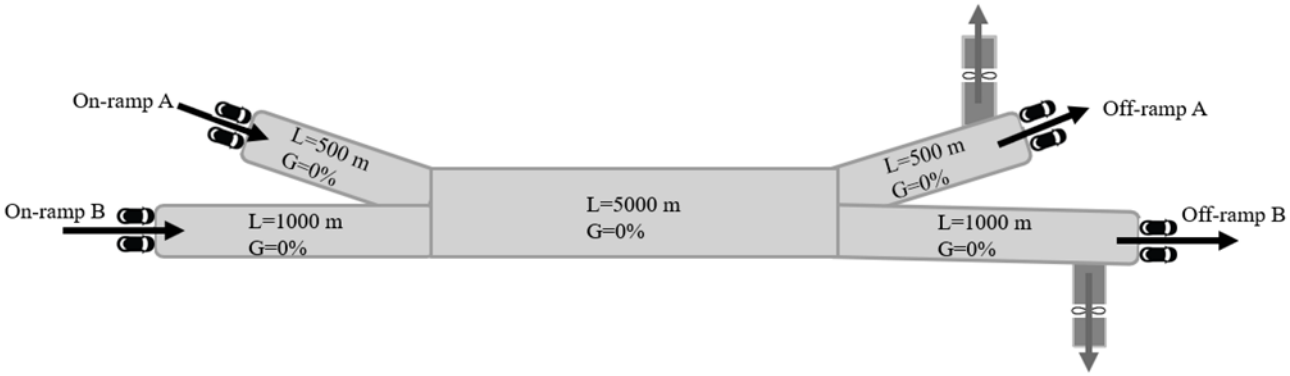

Figure B1-11 Sample tunnel system geometry

Traffic inputs

The traffic flow and fleet composition of the scenario are presented in Table B1-31. A free-flowing traffic with a constant speed of 80 kilometres per hour is assumed. Traffic split at the diverge before the off-ramps is assumed as 40 per cent and 60 per cent for off-ramp A and off-ramp B, respectively for all vehicle types.

Table B1-31 Traffic flow and fleet composition

Number of vehicles per hour		
Vehicle Type and Euro Class	On-ramp A	On-ramp B
PC Petrol - Euro 5	500	1000
PC Diesel - Euro 5	200	200
LDV Diesel - Euro 5	100	500
HGV Diesel - Euro 5	100	200

Emission rates of CO adopted from PIARC 2019 for the vehicle types used in this model for zero per cent grade and 80 kilometres per hour are presented in Table B1-32.

Table B1-32 CO emission rates for 80km/h and 0% grade

CO emission rates (g/h)	
PC Petrol Euro 5	17.39
PC Diesel Euro 5	1.04
LDV Diesel Euro 5	0.18
HGV Diesel Euro 5	78.98

Background CO concentration is assumed to be 1 mg/m^3.

The airflow flow distribution through the tunnel depends on the traffic splits, aerodynamic characteristics of the on and off-ramp and ventilation operation. To improve the accuracy of the calculation, air flowrate distribution through the tunnel is obtained using IDA Tunnel and is summarised in Figure B1-12 below.

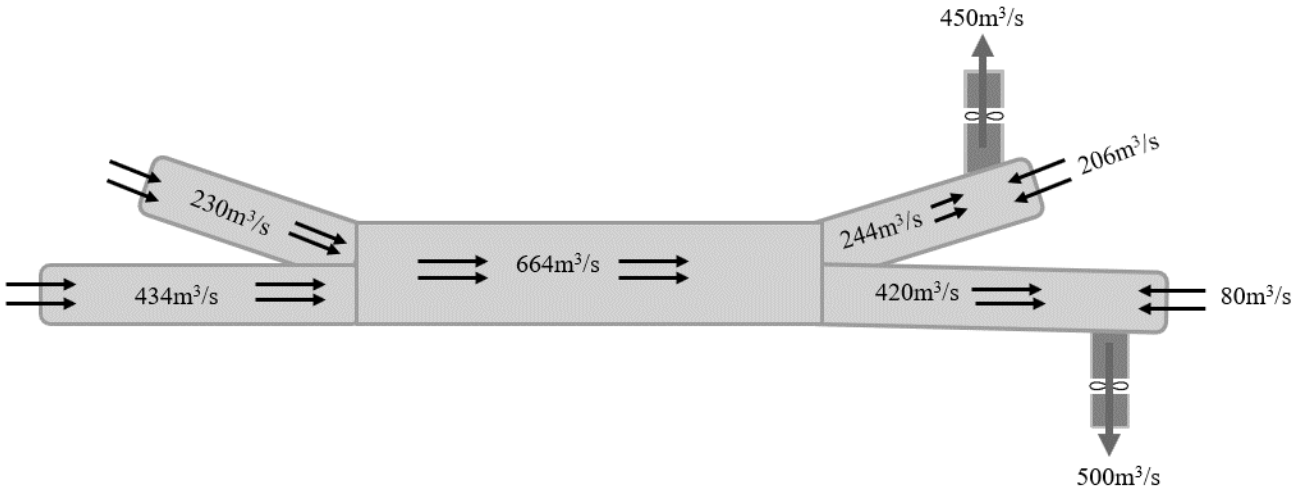

Figure B1-12 Airflow distribution

The emissions calculation procedure in PIARC 2019 was applied for each of the tunnel segments as illustrated in Figure B1-13.

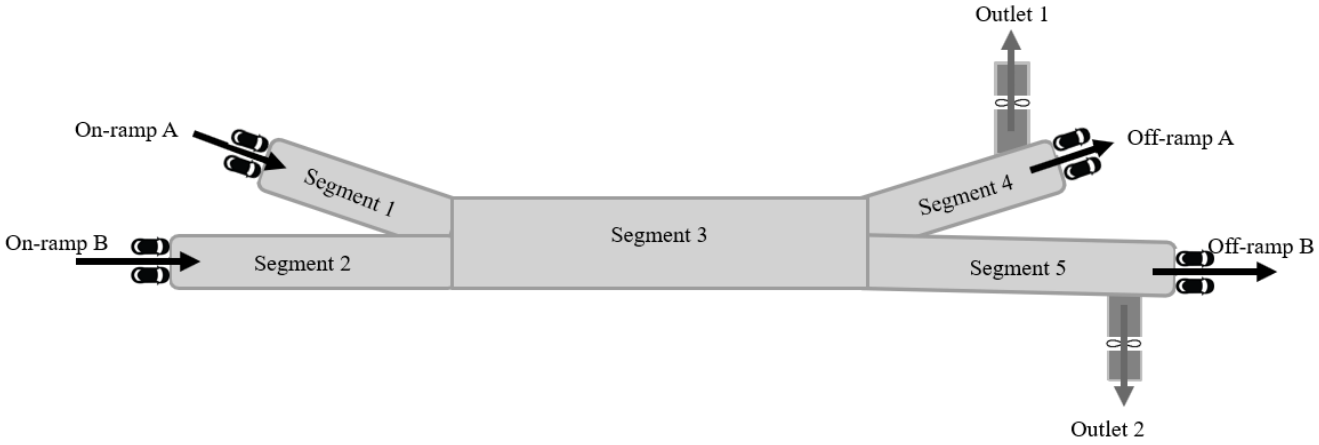

Figure B1-13 Tunnel Segments

PIARC 2019 Equation 8 and Equation 9 are used to calculate the time-mean number of the vehicles in the tunnel segments. The number of the vehicles for the tunnel segments based on the traffic conditions are shown in Table B1-33.

Table B1-33 Traffic distribution per tunnel segment

	Vehicle Category	Number of vehicles (veh/h)	Segment length (m)	Traffic density (veh/km)	Number of vehicles
Segment 1	PC Petrol - Euro 5	500	1000	6.25	6.25
	PC Diesel - Euro 5	200	1000	2.5	2.5
	LDV Diesel - Euro 5	100	1000	1.25	1.25
	HGV Diesel - Euro 5	100	1000	1.25	1.25
Segment 2	PC Petrol - Euro 5	1000	500	12.5	6.25
	PC Diesel - Euro 5	200	500	2.5	1.25
	LDV Diesel - Euro 5	500	500	6.25	3.125
	HGV Diesel - Euro 5	200	500	2.5	1.25
Segment 3	PC Petrol - Euro 5	1500	5000	18.75	93.75
	PC Diesel - Euro 5	400	5000	5	25
	LDV Diesel - Euro 5	600	5000	7.5	37.5
	HGV Diesel - Euro 5	300	5000	3.75	18.75
Segment 4	PC Petrol - Euro 5	600	500	7.5	3.75
	PC Diesel - Euro 5	160	500	2	1
	LDV Diesel - Euro 5	240	500	3	1.5
	HGV Diesel - Euro 5	120	500	1.5	0.75
Segment 5	PC Petrol - Euro 5	900	1000	11.25	11.25
	PC Diesel - Euro 5	240	1000	3	3
	LDV Diesel - Euro 5	360	1000	4.5	4.5
	HGV Diesel - Euro 5	180	1000	2.25	2.25

As the number of the vehicles determined, total CO emission rates of each segment is calculated as shown in Table B1-34.

Table B1-34 Emissions estimate per tunnel segment

	Vehicle Category	emission rate (g/h-veh)	Number of vehicles	total emission (mg/sec)
Segment 1	PC Petrol - Euro 5	17.39	6.25	30.19
	PC Diesel - Euro 5	1.04	2.5	0.72
	LDV Diesel - Euro 5	0.23	1.25	0.06
	HGV Diesel - Euro 5	78.98	1.25	27.42
			Segment A total	**58.40**
Segment 2	PC Petrol - Euro 5	17.39	6.25	30.19
	PC Diesel - Euro 5	1.04	1.25	0.36
	LDV Diesel - Euro 5	0.23	3.125	0.16
	HGV Diesel - Euro 5	78.98	1.25	27.42
			Segment B total	**58.13**
Segment 3	PC Petrol - Euro 5	17.39	93.75	452.86
	PC Diesel - Euro 5	1.04	25	7.22
	LDV Diesel - Euro 5	0.23	37.5	1.88
	HGV Diesel - Euro 5	78.98	18.75	411.35
			Segment C total	**873.32**
Segment 4	PC Petrol - Euro 5	17.39	3.75	18.11
	PC Diesel - Euro 5	1.04	1	0.29
	LDV Diesel - Euro 5	0.23	1.5	0.08
	HGV Diesel - Euro 5	78.98	0.75	16.45
			Segment D total	**34.93**
Segment 5	PC Petrol - Euro 5	17.39	11.25	54.34
	PC Diesel - Euro 5	1.04	3	0.87
	LDV Diesel - Euro 5	0.23	4.5	0.23
	HGV Diesel - Euro 5	78.98	2.25	49.36
			Segment E total	**104.80**

The total CO emission rates from Outlet 1 and Outlet 2 is calculated as below”

$$G_{Outlet1} = \left[\left(G_{seg1} + G_{seg2} + G_{seg3}\right) \times \frac{\dot{Q}_{seg4}}{\dot{Q}_{seg3}}\right] + G_{seg4} + \left(\frac{C_{background}}{1000} \times \dot{Q}_{outlet1}\right)$$

$$G_{Outlet2} = \left[\left(G_{seg1} + G_{seg2} + G_{seg3}\right) \times \frac{\dot{Q}_{seg5}}{\dot{Q}_{seg3}}\right] + G_{seg5} + \left(\frac{C_{background}}{1000} \times \dot{Q}_{outlet2}\right)$$

Where:

G_{Outlet}: $total\ emission\ rate\ at\ an\ outlet\ [\frac{g}{s}]$

G_{seg}: $total\ emission\ rate\ in\ a\ segment\ [\frac{g}{s}]$

$\dot{Q}_{seg}$: $air\ flow\ rate\ in\ a\ tunnel\ segment\ [\frac{m^3}{s}]$

$C_{background}$: $backgroung\ CO\ concentration\ [\frac{mg}{m^3}]$

$\dot{Q}_{outlet}$: $air\ flow\ rate\ at\ an\ outlet$

The results are as shown below:

$G_{Outlet1} = 0.84\ g/h = 3041\ g/h$

$G_{Outlet2} = 1.23\ g/h = 4410\ g/h$

Table B1-35 provides the comparison of the results obtained by the manual calculation described above, and the corresponding results obtained using IDA Tunnel software. Similar results are obtained using a tabulated emissions estimate method and by the use of IDA Tunnel software.

Table B1-35 Comparison of results obtained with IDA Tunnel

	IDA tunnel 1.2 results	Tabulated results	Difference %
Emission at outlet 1 (g/h)	3002	3041	1.3%
Emission at outlet 2 (g/h)	4414	4410	-0.1%

B1.6.7 Ventilation outlet temperatures

Issue raised

The environmental impact statement estimates ventilation outlet temperatures by applying the same ambient to ventilation outlet temperatures differential measured on the Lane Cove Tunnel to the Western Harbour Tunnel ventilation outlets. While the small temperature difference of the ventilation outlet to ambient temperature is likely to have a minor impact of ventilation outlet dispersion and the ventilation outlet contribution to the ambient pollutant concentrations is very small, the assumption underlying this approach is inappropriate. The temperature difference will be determined by the heat rejection of the vehicles passing through the tunnel, which primarily a function of traffic volumes, and the tunnel ventilation rates.

The NSW Environment Protection Authority requests additional justification for the methodology adopted to calculate ventilation outlet temperature, including any potential impact on assessment results presented. Furthermore, it is recommended that the IDA tunnel software modelling approach is taken in future.

Response

Data from existing road tunnels does not demonstrate a strong correlation between traffic flow and the temperature air at ventilation outlets. While there are a number of factors that may influence the temperature of air, review of existing tunnel data demonstrates that temperature of air discharged

from ventilation outlets is primarily influenced by temperature of ambient air drawn into the tunnel and the temperature of the ground.

During operation, ambient air enters the tunnels from entry and exit portals. While in the tunnel, the air is heated by the vehicles and the equipment in the tunnels. However, a significant amount of heat is transferred from the tunnel air to the tunnel walls due to the temperature difference between the tunnel walls and the moving air. Additionally, as traffic increases so too does the airflow, prior to discharging from the ventilation outlet. Tunnel air is also mixed with ambient air drawn in from the exit portal. Typically, the air is exhausted from the outlets with slightly increased temperature.

The amount of heat transferred to the tunnel walls is a function of thermal properties of the material surrounding the tunnel (typically damp, concrete lined sandstone) and the local climate (ambient air temperature). For this reason, Lane Cove Tunnel site data is considered to be representative for the temperature difference between the ventilation outlet temperatures and ambient temperature, as the road tunnel is geographically close to the Western Harbour Tunnel and both climate and geology is expected to be similar.

While it is feasible to use IDA tunnel software to estimate heat, the accuracy of the calculation is limited to the accuracy of inputs. At present, PIARC do not provide guidance on the heat emission factors to enable accurate estimate of vehicle heat emissions.

B1.6.8 Fleet profiles

Issue raised

The environmental impact statement assumed the introduction of Euro 6 for light duty petrol and diesel vehicles in 2019. The environmental impact statement performed a sensitivity analysis which found that NO_X and NO_2 increased by 12 to 26 per cent in 2027 if Euro 6 were not implemented.

The NSW Environment Protection Authority considers that no Euro 6 is the likely scenario as no progress has been made towards the promulgation of Euro 6 as of February 2020, and that the *Petrol Fuel Quality Standard* to require Euro 5/6 levels of sulfur will not take effect until 2027.

The NSW Environment Protection Authority therefore estimate that in-tunnel levels of NO_2 will be in the order of 20 per cent higher than estimated in the environmental impact statement having the potential to impact on ambient air quality. The NSW Environment Protection Authority therefore request additional justification for the adopted assumption of Euro 6 introduction in 2019, including any potential impact on assessment results presented.

Response

Given the small contribution that outlets make to the total ambient concentrations at ground level, when considered in conjunction with surface roads and background concentrations, there is likely to be no difference in outcomes when applying more conservative Euro 5 assumptions for tunnel emissions. Even when the maximum allowable emissions are used (as shown in the regulatory worst case analysis), the outlets do not account for exceedances of air quality assessment criteria. This is further explained below.

As outlined in Section 6.2.4 of Annexure K to Appendix H (Technical working paper: Air quality), the ventilation analysis assumes that there would be a transition of the passenger car and light duty vehicle fleet towards Euro 6 vehicle emissions standards in NSW. This assumption was not applied to the wider air quality assessment.

The composition of the fleet assumed in the ventilation analysis is provided in Section 6.2.4 of Annexure K to Appendix H (Technical working paper: Air quality) and consists of a range of emissions standards for different vehicle types and includes the proportion of high emitting pre-Euro emissions standards through to ADR79/04 (Euro 6). The in-tunnel air quality and surface road emissions factors do not account for or factor in the continued shift towards alternative fuelled low emission vehicles such as hybrids and battery electric vehicles.

Vehicle emission standards assumed in the ventilation analysis are consistent with the NSW Advisory Committee on Tunnel Air Quality (ACTAQ) technical paper *TP-01 Trends in Motor Vehicles and their Emissions*, prepared by the NSW Environment Protection Authority in November 2018. Conservatively, the ventilation analysis assumes that ADR80/04 (Euro VI for Heavy vehicles) would not be implemented in Australia.

To assess the impact of a potential delay in adoption of ADR/79/04 (Euro 6) in NSW on the ventilation system, a sensitivity analysis was included in Annexure K to Appendix H (Technical working paper: Air quality). This sensitivity analysis demonstrates the capability of the ventilation system to manage in-tunnel air quality, in the event that Euro 6 vehicle emission standards are not implemented in NSW by the year 2027.

With regard to ventilation outlets, an emission increase would not affect the in-tunnel concentrations since these are subject to regulatory limits and managed as such. However, the mass emission rate of NO_X through the outlet would increase.

In all cases, the ventilation system would be designed and operated to maintain in-tunnel air quality under all traffic scenarios, including breakdown and congested scenarios.

B1.6.9 Vehicle emissions

Issue raised

While the NSW Environment Protection Authority model predicts a PM_{10} to $PM_{2.5}$ ratio of 1.65 versus the environmental impact statement value of 1.45, this is not likely to have a significant impact as the in-tunnel $PM_{2.5}$ is overestimated. However, the NSW Environment Protection Authority predicts a GMR fleet wide THC:NO_X ratio of about 0.2 for 2026 (excluding evaporative emissions) versus the environmental impact statement figure of 0.068 for 2027. This will result in underestimation of volatile organic compounds (VOC) and air toxics from the ventilation outlet emissions.

As a result, the NSW Environment Protection Authority requests additional justification for the adopted ratio THC:NO_X, including any potential impact on assessment results presented.

Response

The NSW Environment Protection Authority comments on the potential overestimation of $PM_{2.5}$ in the ventilation analysis are acknowledged.

The PM_{10}:$PM_{2.5}$ and total hydrocarbon (THC): NO_X emission ratios were derived using emission rates for ventilation outlets of existing tunnels in the Greater Sydney area. These tunnels were; Lane Cove Tunnel (LCT); Cross City Tunnel (CCT); Sydney Harbour Tunnel (SHT); and the Eastern Distributor (ED) tunnel.

Ventilation outlet emissions for the existing tunnels were modelled using traffic predictions for the '2027- Do something cumulative' and '2037- Do something cumulative' scenarios. The mass emission rates of THC and NO_X were divided to derive the THC:NO_X ratio. Table B1-36 shows the mass emission rates and THC:NO_X ratio for each ventilation outlet used in the environmental impact statement. The overall average THC:NO_X ratio of 0.068 was adopted in the environmental impact statement assessment.

The results presented in Appendix H (Technical working paper: Air quality) show that air toxics derived from the THC predictions, are all well below their air quality assessment criterion, even for the regulatory worst case scenarios (as per Table 8-27 in Appendix H (Technical working paper: Air quality) and reproduced here in Table B1-37). If the ratio used was three times higher at 0.2, and these predictions would also be of the order of three times higher, they would still be well below the relevant air toxics criteria.

Table B1-36 THC:NO_X ratio calculation used in environmental impact statement

Tunnel	Ventilation Outlet Code	2027			2037		
		Mass Emission Rate (kg/h)		THC/NO_X Ratio	Mass Emission Rate (kg/h)		THC/NO_X
		THC	NO_X		THC	NO_X	
LCT	A-1	0.048	0.553	0.087	0.045	0.519	0.086
	A-2	0.242	3.070	0.079	0.222	3.105	0.071
	A-3	0.370	4.638	0.080	0.340	4.601	0.074
CCT	B-1	0.032	0.573	0.056	0.032	0.584	0.054
SHT	SHT-N-1	0.006	0.082	0.072	0.005	0.080	0.064
	SHT-N-2	0.068	0.940	0.072	0.059	0.919	0.064
	SHT-N-3	0.119	2.025	0.059	0.105	1.951	0.054
	SHT-S-1	0.009	0.110	0.084	0.008	0.112	0.074
	SHT-S-2	0.127	1.545	0.083	0.117	1.483	0.079
	SHT-S-3	0.159	1.919	0.083	0.145	1.826	0.079
ED	ED-N-1	0.023	0.680	0.034	0.021	0.675	0.031
	ED-N-2	0.063	1.749	0.036	0.066	1.667	0.040
	ED-N-3	0.079	2.682	0.030	0.075	2.623	0.029
	ED-S-1	0.043	0.537	0.080	0.039	0.502	0.078
	ED-S-2	0.120	1.552	0.077	0.112	1.502	0.074
	ED-S-3	0.163	2.267	0.072	0.157	2.208	0.071
Overall Average		-	-	**0.068**	-	-	**0.064**

Table B1-37 Results of regulatory worst case assessment (residential, workplace and recreational receivers) – air toxics

Pollutant and period	Units	Maximum ventilation outlet contribution at any receiver	
		Regulatory worst case scenario	Impact assessment criterion (µg/m³)
THC (annual)	(µg/m³)	3.24	-
THC (one hour)	(µg/m³)	60.69	-
Benzene (1 hour)	(µg/m³)	2.39	29
PAH (BaP) (1 hour)	(µg/m³)	0.022	0.4
Formaldehyde (1 hour)	(µg/m³)	2.07	20
1,3-butadiene (1 hour)	(µg/m³)	0.64	40

Pollutant and period	Units	Maximum ventilation outlet contribution at any receiver	
		Regulatory worst case scenario	Impact assessment criterion (µg/m^3)
Ethylbenzene (1 hour)	(µg/m^3)	0.79	8000

B1.6.10 Non exhaust particulate emissions

Issue raised

Tabulated particulate emission factors outlined in Table 6.16 of Annexure K of Appendix H (Technical working paper: Air quality), are stated to be $PM_{2.5}$ however the PIARC workbook states the emission factors to be PM_{10}. This will result in an overestimation of the $PM_{2.5}$ and PM_{10} in the tunnel and ventilation outlet emissions.

Response

The NSW Environment Protection Authority comments on the potential overestimation of $PM_{2.5}$ and PM_{10} in the ventilation analysis is acknowledged.

B1.7 Marine water quality

B1.7.1 Dredging impacts – contamination

Issue raised

During dredging activities, there is a risk of introducing contaminants into the dissolved phase of the water column by releasing contaminants from the sediment pore water and by desorption of contaminants from suspended sediment particles. Far-field transport of the contaminants could result in different exposures.

The NSW Environment Protection Authority requests contaminant levels for any sediment sampling data and pore waters for all proposed dredging areas to assess potential risk to receivers. The assessment of sediment quality should follow the Revision of the *ANZECC/ARMCANZ Sediment Quality Guidelines*, CSIRO Land and Water Science Report 08/07 (Simpson, Batley & Charlton 2013).

Modelling of the fate and transport of dissolved contaminants should be carried out where there is a risk of exceeding relevant guideline values. This includes any further laboratory (eg elutriate analysis) or desktop assessment of the potential concentrations of dissolved contaminants in the water column.

The data and modelling should be used to inform any additional mitigation measures required, which could include:

- Options to minimise the resuspension levels generated by any specific dredge methods such as slowing the dredge head descent just before impact with the sediment bed
- Reduced dredging rate or intensity in known contaminant hotspots or near sensitive areas
- Any needed restrictions of access to certain areas
- Warning signs for certain areas or times
- Any additional key monitoring locations.

The sediment contamination assessment and additional mitigation measures should be reviewed and approved by the NSW Environment Protection Authority-accredited site auditor.

Response

Contaminant levels for any sediment sampling data and pore waters

Characterisation of contamination within Sydney Harbour is provided in Section 16.3.5 of the environmental impact statement and Appendix M (Technical working paper: Contamination). In response to requests from the community, Transport for NSW has made the *Contamination Factual Report – Marine Investigations* Rev B (Douglas Partners and Golder Associates (DPGA), 2017) and *Contamination Factual Report – Marine Investigations* Rev C (DPGA, 2018) available on the project website *nswroads.work/whtbl*.

Subsequent to the 2017 investigation carried out by Douglas Partners and Golder Associates (2017), Royal HaskoningDHV have been engaged by Transport for NSW to carry out sediment coring, sampling and testing at the harbour crossing to better understand the level and extent of contamination in sediments. Investigations have been carried out and are ongoing. The purpose of these investigations is to assess the suitability of dredged sediments for offshore disposal, an activity regulated under the Commonwealth *Environment Protection (Sea Dumping) Act 1981*.

A response to the issues raised by the NSW Environment Protection Authority regarding sediment sampling contaminant levels as well as elutriate testing results are included in the Royal HaskoningDHV memo in Section 1 of Appendix C.2 of this submissions report.

Guidelines to assess sediment quality

Section 4.4.2 of Appendix M (Technical working paper: Contamination) states that the results of the laboratory analysis of harbour sediments were compared against the guideline criteria established in the ANZECC (2000) *High and Low Interim Sediment Quality Guidelines* (ISQS), the *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013) Ecological Investigation Levels* (EIL) and the Commonwealth of Australia (2009) *National Assessment Guidelines for Dredging* (NAGD). Annexure B of Appendix M (Technical working paper: Contamination) includes a tabulation of sediment sample locations and whether concentrations of a range of contaminant compounds at locations exceed the criteria under these various guidelines.

The NSW Environment Protection Authority has recommended application of the *Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines* (Simpson SL, Batley GB and Chariton AA (2013)). However it should be noted that the guideline values in the *ANZECC/ARMCANZ Sediment Quality Guidelines* (2013) are identical to the guideline values in NAGD (2009), as noted in Part II Section 3.8 of Simpson, Batley and Charlton (2013).

The *ANZECC/ARMCANZ Sediment Quality Guidelines* involve a tiered, decision-tree approach, in keeping with the risk-based approach introduced in the ANZG water quality guidelines. Following this framework, the total concentrations of contaminants are compared to sediment quality guideline values (SQGVs) and if the contaminant concentrations exceed one or a number of the SQGVs, further investigation is initiated to determine whether there is indeed an environmental risk associated with the exceedance. As discussed in these guidelines, the SQGVs are not to be used on a pass/fail basis.

A discussion on the sediment quality guidelines applied to the RHDHV investigation is presented in Section 1 of Appendix C.2 of this submissions report.

Fate and transport of dissolved contaminants modelling

As part of the Royal HaskoningDHV investigations, sampling of pore waters was not carried out due to the difficulties of in situ sampling of pore water and obtaining sufficient samples for analysis, and the possibility of geochemical transformation of the pore water during processing of the samples. Consequently, the option was taken, as recognised in Simpson, Batley and Charlton (2013) (refer Part I, Section 3.3.1) to conduct elutriate tests as an indication of potentially soluble contaminants.

The elutriate testing that has been carried out is discussed in Section 2 of Appendix C.2 of this submissions report.

Additional mitigation measures

A discussion on the mitigation measures suggested by the NSW Environment Protection Authority as well as other additional mitigation measures related to dredging are presented in Section 3 of Appendix C.2 of this submissions report.

NSW Environment Protection Authority-accredited site auditor

A NSW Environment Protection Authority-accredited Site Auditor would be engaged for specific sites where contamination is highly complex, such as where there is significant groundwater contamination, contamination that requires specialised remediation techniques, or contamination that requires ongoing active management during and beyond construction, as discussed above in Section B1.4.1.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B2 – NSW Health

SEPTEMBER 2020

B2 NSW Health

Contents

B2.1 Air quality

B2.1.1 Ambient air quality

Issue raised

Traffic-related air pollution, including fine particulate matter, is associated with a range of health effects. Although the individual risk is low, effects have been observed at the levels of air pollution experienced in Sydney. Therefore, it is important that reasonable measures are taken to minimise any increase in exposure to traffic-related air pollution. This is particularly important in places where $PM_{2.5}$ levels exceed, or are predicted to exceed, the NSW Environment Protection Authority's annual average impact assessment criterion of 8 µg/m^3.

A sensitivity analysis of traffic flows with a "regulatory worst case scenario" and a "sensitivity analysis scenario" is presented for each of the project's ventilation outlets (refer to Section 8.4.17 of Appendix H (Technical working paper: Air quality)). The "regulatory worst case scenario" and "sensitivity analysis scenario" predict a maximum increase in annual $PM_{2.5}$ of 0.89 µg/m^3 and 0.46 µg/m^3 respectively at the location of the most affected residential, workplace and recreational (RWR) receivers. The "sensitivity analysis scenario" demonstrates that underestimation of expected traffic flows has the potential to underestimate future $PM_{2.5}$ levels.

Given the sensitivity of $PM_{2.5}$ levels to traffic flows, it is recommended that the proponent demonstrates the ventilation system has sufficient capacity to achieve the optimal environmental outcome in the event that there is more traffic than expected. Tunnels with well-designed and operated ventilation outlets improve dispersion of traffic pollution and reduce local ground level concentrations, compared to emissions from surface roads and tunnel portals. Increasing the height of stacks above the currently proposed height should be considered to help disperse pollutants. While ventilation stacks have an important role in reducing local air pollution, parameters such as stack heights, exit velocity and ventilation rates should, where practical, be maximised to benefit local air quality. These actions are especially important given that some parts of the project area, such as the Balmain Peninsula, exceed annual and 24 hourly $PM_{2.5}$ National Environment Protection (Ambient Air Quality) Measure (Ambient Air Quality NEPM) levels at times.

Response

The tunnel ventilation systems for the project would be designed to ensure that in-tunnel air quality criteria are met. Annexure K of Appendix H (Technical working paper: Air quality) includes an assessment of the performance of the ventilation system. The assessment considered a range of expected traffic scenarios as well as worst case traffic scenarios. The assessment demonstrates that the proposed ventilation system would meet the New South Wales in-tunnel air quality criteria even under worst case conditions.

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, the analysis carried out is based in the “regulatory worst case scenario” and the “sensitivity analysis scenario” as discussed in Section 8.4.17 of Appendix H (Technical working paper: Air quality). Specifically, the analysis presented in Section 8.4.17 assesses the sensitivity of the contributions to annual average $PM_{2.5}$ concentrations at ground level due to emissions from the ventilation outlets.

The sensitivity assessment considers various scenarios. The “regulatory worst case scenario” assumes that emissions from the outlets are always at the regulatory limits, ie the outlets are operating at the regulatory limits for 8760 hours per year. The “sensitivity analysis scenario” takes the expected daily emission profile for the road and scales it up by between 2.9 and five times so that daily $PM_{2.5}$ emissions are at the regulatory limit. These scenarios are not based on modelled traffic scenarios. The traffic scenarios that would be required to produce these emission scenarios

are unrealistic. 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.

The model results for the community receptors presented in Figure 8-61 of Appendix H (Technical working paper: Air quality) indicate that average annual $PM_{2.5}$ concentrations at ground level in the vicinity of the project are predicted to be around 8 µg/m^3, with existing background levels and the emissions from vehicles on the surface road network making the greatest contributions. The results presented in Figure 8-105 of Appendix H (Technical working paper: Air quality) show the predicted contributions to annual average $PM_{2.5}$ at ground level at the most impacted residential, workplace and recreational receivers due to emissions from the ventilation outlets only. Results are provided for the "expected traffic scenario", the "regulatory worst case scenario" and the "sensitivity analysis scenario". The results indicate that ventilation outlet emissions for the "expected traffic scenario" are only predicted to make a contribution of around 0.05 to 0.15 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 around 0.1 µg/m^3 and 0.45 µg/m^3. These contributions are very low compared to the typical annual average $PM_{2.5}$ concentrations (around 8 µg/m^3) that are predicted in the vicinity of the project. Changes of this order of magnitude are so small that 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 scenarios, for all times of the day, 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.

A sensitivity analysis of ventilation outlet height was carried out and is presented in Section 8.4.16 of Appendix H (Technical working paper: Air quality). The Rozelle Rail Yard ventilation outlet (F) is proposed as 35 metres above ground level and the Cammeray ventilation outlet (G) as 30 metres above ground level. The outlet height sensitivity analysis considers $PM_{2.5}$ emissions for a ventilation height of 40 metres above ground level. The sensitivity analysis indicates that increasing the height of the ventilation outlet to 40 metres above ground level would result in lower $PM_{2.5}$ contributions at ground level compared to the proposed ventilation outlet heights. The maximum decreases, however, were around 30 per cent. As the contributions to $PM_{2.5}$ at ground level due to emissions from the ventilation outlet are already very small compared to overall predicted $PM_{2.5}$ concentrations, and only very small decreases (in absolute terms) would occur if the outlet height was raised, the potential benefits of increasing the height of the ventilation outlets would be minimal.

B2.1.2 Ventilation outlets

Issue raised

As the ventilation outlets are not filtered, it is recommended that the environmental impact statement and all public communications about the project clearly articulate the reasons for this.

Response

The independent NSW Chief Scientist and Engineer has recently released a report in relation to road tunnel air quality. The report 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*.

Further information on why the tunnel ventilation outlets would not be filtered are outlined in the environmental impact statement, and summarised below.

The modelling carried out demonstrates that the contributions to air quality at ground level due to emissions from the ventilation outlets would be minimal. The inclusion of tunnel filtration was

evaluated and found not to provide any material benefit to air quality or community health as discussed in Chapter 12 (Air quality) of the environmental impact statement.

The discussion on tunnel ventilation and filtration in the environmental impact statement reflects the outcomes of the review completed by the Advisory Committee on Tunnel Air Quality (ACTAQ, 2018b). The ACTAQ assessment reviewed options for treating road tunnel emissions (ACTAQ 2018b). The review concluded that:

- Decisions on how to best manage tunnel air can only be made at the project level. Health-based air quality standards must be a priority; however, engineering and economic factors also need to be considered
- Air filtration systems in tunnels are rare around the world. They have high infrastructure, operating and maintenance costs
- Although filtration for particulates or nitrogen dioxide is technically feasible, the available technologies will not lower concentrations of other air pollutants
- Alternatives such as portal air extraction (ie no portal emissions) and dispersion via ventilation outlets may achieve the same outcomes as filtration at a lower cost.

It is further noted that due to the reduction in surface road traffic caused by diversion to the tunnels, the project would generally result in a better outcome for ambient air quality than conditions without the project.

Project information provided to the community which references air quality and tunnel ventilation systems would explain the reasons why filtration is not appropriate and includes references to the NSW Chief Scientist and Engineer's report and website, and the Transport for NSW air quality portal. These references provide additional detail about why filtration is not required for NSW tunnels.

B2.1.3 Assessment of Warringah Freeway ventilation outlets

Issue raised

Given that ventilation outlets G and H (Warringah Freeway) are in close proximity to one another, predicted emission impacts and estimates of the influence of ventilation outlet temperatures should be assessed and presented for each outlet both separately and together. It is not clear whether the outlets have been assessed separately or together.

Response

The outlets at the Warringah Freeway have been modelled both separately and together, with:

- The outlet for the Western Harbour Tunnel (Outlet G) only operating in the 'Do something' (with project) scenarios
- 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 these scenarios (separate and combined) are presented in the assessment.

In addition, further analysis was done with varying temperatures to understand the sensitivity of ground level concentrations to temperature. This included both Outlets G and H combined, at temperatures 10ºC above and below the 25ºC used for the bulk of the modelling. The results are presented in Section 8.4.16 of Appendix H (Technical working paper: Air quality) and the effects of reduced (lower temperatures) and increased (higher temperatures) thermal buoyancy are summarised.

The Graz Lagrangian Model (GRAL) is a Lagrangian model in which concentrations of a pollutant are predicted by simulating the movement of individual 'particles' of the pollutant emitted from a source along trajectories in a three-dimensional wind field. The GRAL model takes into account temperature, and in particular can take into account the likely temperature effects due to adjacent

sources where the emission temperatures are elevated above ambient air temperature (buoyant plumes). When sources are in close enough proximity, such as Outlets G and H, the volumes (and energy) would merge and the resulting enhanced buoyancy is taken into account.

B2.1.4 Construction dust

Issue raised

Construction site dust is a potential source of local air pollution during construction. The project footprint is close to a number of sensitive receivers in Inner West Sydney. While standard dust suppression measures will be applied throughout the project, considerable community concern has arisen about dust from similar projects in recent years around M4 and M5 construction sites. Regular monitoring and review of the success of dust suppression measures (and increases in such measures as required) are vital to mitigating the impacts of construction dust on the local population, particularly at child care centres, schools, aged care facilities and health facilities.

Response

Environmental management measure AQ1 (refer to Table D2-1 of this submissions report) commits to the implementation of standard construction air quality mitigation and management measures during construction. These measures include regular monitoring and review of the success of dust suppression measures.

Environmental management measure AQ2 (refer to Table D2-1 of this submissions report) also proposes that dust and air quality complaints will be managed in accordance with the overarching complaints handling process for the project. Appropriate corrective actions, if required, will be taken to address dust-related issues in a timely manner.

B2.1.5 In-tunnel air quality

Issue raised

The modelled in-tunnel pollutant levels comply with current recommendations made by the Advisory Committee on Tunnel Air Quality. These recommendations are for short-term nitrogen dioxide exposure. Figures 8.1 and 8.2 of Annexure K to Appendix H (Technical working paper: Air quality) show the predicted nitrogen dioxide levels barely comply with the recommended average level of 0.5 parts per million under a 'worst case scenario' (heavy traffic, 20-40 km/h), meaning there is no excess capacity to achieve recommended levels if the modelling has underestimated pollutant levels. Therefore, it is imperative that the tunnel ventilation system is adequate to re-establish guideline levels should they be breached.

Motorists should be advised through signage and regular reminders to close their windows and recirculate the air in their vehicles while traveling through tunnels to reduce their exposure to traffic related air pollution.

Response

The comments that the in-tunnel pollutant levels comply with current recommendations 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 in order to assist in managing traffic flow and emissions, in the unlikely event that the ventilation system alone is unable to achieve the objectives.

Further, the tunnel ventilation system would be designed to cater for various traffic scenarios, including a case 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 incident scenarios.

Annexure K of Appendix H (Technical working paper: Air quality) includes an assessment of the performance of the ventilation system. 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 could conceivably to occur in the tunnels during operation. Worst case scenarios such as those in Figures 8.1 and 8.2 of Annexure K to Appendix H (Technical working paper: Air quality) demonstrate that the tunnel ventilation system can manage in-tunnel air quality even when traffic is at its theoretical maximum capacity in the tunnel and for any given speed.

Consistent with advice from the Advisory Committee on Tunnel Air Quality, 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 and would be implemented as part of the project. As outlined in Section 12.7.2 of the environmental impact statement, 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 to provide driver information and hence influence driver behaviour in tunnels to manage in tunnel emissions and ambient air quality.

B2.2 Operational noise impacts

B2.2.1 Monitoring and mitigation

Issue raised

There is emerging evidence of the health impacts of environmental noise. Measures to limit community exposure to noise are therefore important to protect public health.

The environmental impact statement discusses measures, such as noise barriers, to help limit the negative impacts of the project on receptors during operation. However, the exact mitigation measures to be used and their expectation in limiting residual noise exceedances are not documented. All reasonable options to minimise noise exposure by receivers should be explored and prioritised.

Response

The assessment of potential noise impacts in the operational phase of the project has been carried out in accordance with all relevant guidelines, as required by the Secretary's environmental assessment requirements. The guidelines aim to protect the amenity of sensitive receivers that might be affected by noise from the project.

As is normally the case for complex major infrastructure projects progressing through an environmental planning and assessment process, the design presented in the environmental impact statement is at planning stage and is indicative only. Operational mitigation measures are subject to refinement and would be confirmed in accordance with relevant policies and guidelines once project approval is obtained and the contractor delivering the project has further developed the design of the project.

It is important to recognise that for the majority of receiver buildings, there would be either a reduction or a relatively minor change in traffic noise levels due to the project. The requirement for additional noise mitigation requirements is mostly a result of existing road traffic noise levels already exceeding the *Noise Mitigation Guideline* (Roads and Maritime, 2015b) noise mitigation triggers. In the case of the Warringah Freeway, the project without mitigation is predicted to reduce traffic noise levels for the Warringah Freeway and surrounds at a large number of receiver buildings, mainly due to traffic being moved from the surface road network and into the tunnels.

The operational noise assessment has identified the potential noise mitigation measures that have been assumed (eg noise barriers), and identified what receiver buildings would be eligible for

consideration for at-property treatment to respond to residual impacts (refer to Section 7.2 of Appendix G (Technical working paper: Noise and vibration)).

Further noise modelling will be carried out during further design development to confirm the final noise barrier arrangements and the receivers (as identified in the environmental impact statement) that are eligible for consideration for at-property treatments as per 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 during further design development in accordance with *Noise Mitigation Guideline* (Roads and Maritime, 2015b).

As stated in environmental management measure ONV2 (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). Additional reasonable and feasible mitigation will be considered where any additional receivers are identified as qualifying for consideration of noise mitigation under the Roads and Maritime Services *Noise Mitigation Guideline*.

The operational facilities will be designed to meet project specific noise criteria derived in accordance with the *Noise Policy for Industry* (NSW Environment Protection Authority, 2017a). Refer to environmental management measure ONV3 (refer to Table D2-1 of this submissions report).

B2.3 Construction noise impacts

Issue raised

Many receptors will be exposed to noise during construction, and the intention is to implement noise mitigation measures to reduce these exposures. However, it is not possible to comment on these measures as this information will not be known until the detailed planning phase of the project and development of the Construction Noise and Vibration Management Plan.

Response

The construction approach presented in the environmental impact statement is at planning stage and is indicative only. Mitigation measures are subject to refinement and would be confirmed in accordance with relevant policies and guidelines once project approval is obtained and the contractor delivering the project has further developed the design and construction methodology of the project.

A construction noise and vibration management plan will be developed for the project as per environmental management measure CNV1 (refer to Table D2-1 of this submission report) to meet the requirements of the conditions of approval and the Environment Protection Licence issued for the project. As stated in environmental management measure CNV1 (refer to Table D2-1 of this submission report), the construction noise and vibration management plan will include the mitigation measures outlined in the *Construction Noise and Vibration Guideline* (Roads and Maritime, 2016a) and detail how and when these will be applied in the project. Transport for NSW would consult with relevant stakeholders during the development of the construction noise and vibration management plan as required by the conditions of approval.

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

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

SEPTEMBER 2020

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

Contents

B3.1 Introduction

The NSW Chief Scientist and Engineer commissioned a review of the Western Harbour Tunnel and Warringah Freeway Upgrade environmental impact statement by the Advisory Committee on Tunnel Air Quality (ACTAQ). ACTAQ has reviewed the environmental impact statement Chapter 12 (Air quality), and Appendix H (Technical working paper: Air quality) (parts 1 and 2), and the review builds on the Committee's previous review on Tunnel Air Quality carried out in September 2019.

B3.2 Assessment process

Issue raised

ACTAQ's overall conclusion regarding the Western Harbour Tunnel and Warringah Freeway Upgrade environmental impact statement is that it constitutes 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 of the view that the benefit of exploring alternative approaches would be questionable or marginal.

Response

Comments from ACTAQ on the assessment process are acknowledged.

B3.3 Air quality

B3.3.1 General comments on assessment methodology

Issue raised

The ACTAQ find that the assessment methodology is sound and represents best practice. All of the models and data used are appropriate and expertly used. No significant errors nor important omissions were identified.

Response

Comments from ACTAQ on the adequacy of the air quality impact assessment methodology are acknowledged.

B3.3.2 Emission modelling

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 stacks, is thoroughly and clearly described in the environmental impact statement, as is also the modelling of the emissions on surface roads. The ACTAQ note improvements over emission modelling undertaken for the F6 Extension environmental impact statement in 2018 including the application of the new PIARC approach for calculating vehicle emissions in tunnels and the modelling of worst-case traffic operation scenarios.

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 nitrogen oxides (NO_X).

The ACTAQ note that the in-tunnel emissions modelling in the environmental impact statement has assumed Euro 6 emission legislation being adopted in Australia for light duty vehicles and passenger cars from 2021. As this adoption is not yet clear, in-tunnel emissions in 2027 and 2037

may become higher than those presented in the environmental impact statement. However, since tunnel concentrations are subject to regulatory limits, an emission increase will not affect the tunnel concentrations, since the ventilation system operation will be managed and adjusted accordingly, but the emission rate (expressed in pollutant mass per time unit) through the ventilation stack will increase. The sensitivity analysis of the in-tunnel emissions modelling assuming no Euro 6 implementation by 2027 and 2037 in the environmental impact statement is acknowledged.

In section 6.2.4.5 it is stated that the new PIARC approach provides emission data as of year 2019 – this is incorrect, the correct reference should be 2018. Furthermore, it is unclear what is meant with the subsequent sentence “Therefore, no degradation for old engine technologies are required to be applied.” in this context.

Response

ACTAQ's comments on in-tunnel air quality modelling and dispersion modelling are acknowledged.

As outlined in Section 6.2.4.5 of Annexure K of Appendix H (Technical working paper: Air quality), emission rates are based on the year 2018. In accordance with the *Permanent International Association of Road Congresses* (PIARC) report number 2019R02EN, engine degradation factors are no longer appropriate for the emission modelling because the emissions databases are based on the year 2018, where either the degradation of old technology is already at its maximum (Euro 0 to Euro 4) or statistically valid information about engine degradation is not available (Euro 5 and Euro 6).

B3.3.3 Use and evaluation of meteorological and dispersion models

Issue raised

ACTAQ 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 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 contains complex terrain (specifically, the shallow valley through which the Warringah Freeway passes) having the potential to lead to the accumulation of some air pollutants, the ACTAQ are satisfied that the way the GRAMM-GRAL modelling suite has been used is sufficient to capture these potential effects. While the ACTAQ note that they are likely to be of minimal significance for this project, to provide additional confidence ACTAQ suggest additional dispersion modelling be undertaken for 2018 and compared with measurements undertaken at the project monitoring stations (see ACTAQ commentary in B3.3.4 below regarding the modelling base year). 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 model’s 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, ACTAQ observes that although outside of the scope of an environmental impact assessment, a considerable volume of additional data has become available from monitoring around the ventilation outlets of the M4 East tunnel, which provides an opportunity to re-evaluate the model.

Response

The comments from ACTAQ on the GRAMM-GRAL model evaluation are noted.

The GRAMM-GRAL is a system consisting of two main modules: a prognostic wind field model (Graz Mesoscale 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 (2016). However, the monitoring data available for model evaluation were limited at the commencement of the assessment. Only five monitoring stations were 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 B3.3.4 below.

Overall, the results of the model evaluation supported the application of GRAL in the assessment, along with the empirical conversion methods for nitrogen dioxide (NO_2), noting that the results are conservative. The results suggest that the estimated concentrations should be conservative for most of the modelling domain, introducing a clear margin of safety into the assessment.

It is acknowledged that monitoring data has become available around the ventilation outlets of the M4 East tunnel. The modelling competed to date is appropriate for the environmental impact assessment as confirmed by ACTAQ. Hence re-modelling is not considered warranted.

B3.3.4 Assessment of background air quality

Issue raised

ACTAQ acknowledges the challenges associated with assessment of background air quality in an environmental impact statement such as this. In common with previous WestConnex and NorthConnex projects considerable funds have been spent on air quality monitoring, putting the Western Harbour Tunnel project in the enviable position of having a far richer observational dataset available than most, if not all, comparable projects.

ACTAQ notes that while the environmental impact statement identifies that over a year's worth of data was collected from three monitoring stations specifically established for the Western Harbour Tunnel and Beaches Link projects, this data has not been directly used to establish background concentrations for the modelling. This appears to be due to the modelling base year being 2016 and the monitoring data not being available until October 2017. Acknowledging restrictions around the environmental impact statement timeframe, ACTAQ outlines that this mismatch may have been solved had 2018 been chosen as the base year, not 2016. However, it is unlikely that 2018 data is substantially different to 2016 data and more effort could have been made to show how 2018 data is a reasonable surrogate for 2016 data in many cases.

Notwithstanding, ACTAQ does not believe that the weakness in background air quality assessment is seriously influencing the key conclusions of the environmental impact statement, and in particular does not impact the health risk assessment. This is because the health risk assessment is based on the changes in air quality due to the project, independently of background air quality. Despite identified limitations, ACTAQ finds the current assessment of background air quality to be fit for purpose.

Response

The ACTAQ's comments in relation to the acceptability of the background air quality assessment are noted.

As outlined in Annexure F of Appendix H (Technical working paper: Air quality), the selection of a meteorological year is linked to the selection of the ambient air quality monitoring (background) year, as the two years need to be the same in any assessment. In both cases the selected year should also be taken as the base year for the assessment. The base year for the air quality assessment was taken to be 2016. The main reasons for this include:

- There is often an expectation that the most recent air quality data (for a complete year) are used in an assessment. The last complete year of validated data at the time the assessment commenced was 2016
- The use of 2016 data allowed for a roadside monitoring station (M4-M5:01 – City West Link) to be included in the dispersion model evaluation
- The air quality monitoring data for 2016 was representative of the longer-term trends
- The long-term wind speed and direction analysis for the selected meteorological stations showed consistency across the monitored years.

A comparison was carried out from a summary of the annual data recovery, average wind speed and percentage calms from 2009 to 2016 for all sites used in the dispersion modelling, which showed considerable year on year consistency in recorded values.

Three project-specific air quality monitoring stations for the Western Harbour Tunnel and Beaches Link program of works were established by Roads and Maritime Services in 2017:

- Reserve Street, Bantry Bay (WHTBL:01)
- Hope Street, Seaforth (WHTBL:02)
- Rhodes Avenue, Naremburn (WHTBL:03).

Given the date of deployment of the project-specific air quality monitoring stations, sufficient data was not available to be included in the development of background concentrations and model evaluation for the assessment carried out for the environmental impact statement. However, the data from the project-specific monitoring stations were used to:

- Supplement the existing Department of Planning, Industry and Environment (formerly Office of Environment and Heritage) and Transport for NSW (formerly Roads and Maritime Services) air quality monitoring stations in Sydney
- Establish the representativeness of the data from these stations that were used to characterise air quality in the Western Harbour Tunnel and Beaches Link program of works modelling domains
- Provide a time series of air quality data in the vicinity of the project.

The data from the air quality monitoring stations are presented in Annexure D and the locations of the stations are shown in Annexure E of Appendix H (Technical working paper: Air quality).

Table B3-1 shows a comparison of 2016 background concentrations of air pollutants data (ie background concentrations of air pollutants data used in the air quality assessment), with the 2018 background concentrations of air pollutants data for monitoring stations used to calculate the background concentrations (ie Lindfield, Rozelle and the M4 and M5 monitoring stations).

The comparison shows that pollutant concentrations in 2018 were consistent with or lower than those in 2016. Hence the adopted modelling base year being 2016 does not compromise the soundness of the assessment or the robustness of its conclusions nor impact the robustness of the health risk assessment.

Table B3-1 Comparison of background concentrations of pollutants for 2016 and 2018

Pollutant	Averaging period	Units	Measurement year	
			2016	2018
CO	1-hour	mg/m^3	3.13	1.25
NOx	1-hour	µg/m^3	603.8	554.1
	Annual *	µg/m^3	54.7	34.5
PM_{10}	24-hour	µg/m^3	43.6	43.8
	Annual *	µg/m^3	21.2	21.6
$PM_{2.5}$	24-hour	µg/m^3	22.8	19.0
	Annual *	µg/m^3	9.1	7.4

* Spatially varying maps were used to determine the background value for specific receivers, but this table presents the annual average for the monitoring sites used in the synthetic profiles for easier comparison

B3.3.5 Method to estimate NO_2 concentration

Issue raised

The method used has limitations, which the environmental impact statement appropriately acknowledges. However, the ACTAQ finds the empirical approach of estimating NO_2 concentrations using observational NO_2 and nitrogen oxides (NO) data to be sound, appropriate and the approach most suited to the purposes of the environmental impact statement.

Response

ACTAQ's comments on the methodology used to estimate nitrogen dioxide concentrations in the air quality assessment are acknowledged.

B3.3.6 Treatment of elevated receptors

Issue raised

This project contains a number of elevated receptors, ie taller buildings and locations where ground level is higher than at the base of the tunnel ventilation outlets. ACTAQ finds that this has been well-considered in the environmental impact statement with the explicit modelling of such receptors handled thoroughly and appropriately.

Response

ACTAQ's comments on the treatment of elevated receptors in the air quality assessment are acknowledged.

B3.3.7 Assessment and management of construction air quality impacts

Issue raised

The approach applied for the assessment and management of construction impacts (demolition, earthworks, construction and track out) in the Western Harbour Tunnel and Warringah Freeway Upgrade environmental impact statement is consistent with that applied in the previous environmental impact statements since 2015 (ie the F6 Extension Stage 1, the M4-M5 Link, the New M5 and the M4 East). ACTAQ notes that the risk assessment has been thoroughly conducted.

The construction footprint of the project, defined as the total above ground area facilitating all of the surface works associated with the project, was divided into five construction assessment zones. The risks of impacts for three impact categories were estimated by means of a semi-quantitative

approach for each zone. For all zones except one, risks (if unmitigated) were estimated to be medium or low. For one zone (Zone 5) risks (if unmitigated) were estimated to be high for all three impact categories (dust soiling, human health and ecological) and for all types of construction work, due to a high receptor sensitivity, a large number of receptors and a high potential for dust emissions. Also, trucks may need to accelerate uphill in this area.

A range of management measures are listed in the environmental impact statement to lower the generation of dust during construction works so as to reduce sensitive receptors' exposure and to minimise impacts. Most of these measures are routinely employed as 'good practice' on NSW construction sites. Thus, since "overall construction dust is unlikely to represent a serious ongoing problem, and any effects would be temporary and relatively short-lived and only arise during dry weather with the wind blowing towards a receptor," ACTAQ states that it is likely that with appropriate mitigation in place the effects would in summary be considered to be not significant.

Response

ACTAQ's comments on the methodology used to assess the impacts of construction works on air quality are noted.

B3.3.8 Air quality assessment conclusions and equity issues

Issue raised

ACTAQ 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 receivers. 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 and Western Distributor. As these central areas are amongst the most polluted in Sydney at present, the project could be seen as making a positive contribution to tackling the city's air pollution hot-spots. However, this is only true if the predicted traffic reductions actually occur. The 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. Although the submission authors have no expertise in traffic modelling, a predicted reduction of road traffic on the Western Distributor of 37 per cent (Table 8-21 of Appendix F (Technical working paper: Traffic and transport) seems remarkably high.

Response

As outlined in Section 8.2.4 of Appendix H (Technical working paper: Air quality), 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. 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 Strategic 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.

If induced demand were higher than 0.3 per cent, there would be additional trips on the network however, such additional trips and their contribution to ambient air quality would likely be negligible.

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.

The traffic forecasting (refer to sections 8.4 and 9.2 of the environmental impact statement) carried out for the environmental impact statement indicates that the project would increase combined cross-harbour traffic using the Sydney Harbour Bridge, Sydney Harbour Tunnel, and Western Harbour Tunnel by around five per cent (20,000 vehicles per day) when compared to conditions without the project. The potential increases in traffic due the additional capacity and reduced congestion/improved travel times (induced demand) that would the project would provide are therefore accounted for in the traffic modelling (and also, therefore, the dispersion modelling).

The traffic forecasting (refer to sections 8.4 and 9.2 of the environmental impact statement) carried out for the environmental impact statement also indicates that demand on the Sydney Harbour Bridge and ANZAC Bridge would reduce by about 16 per cent and 10 per cent respectively, as a result of the project. The forecast reduction on the Western Distributor is higher (37 per cent) as the section analysed serves a larger proportion of long-distance, regional trips than the Sydney Harbour Bridge and ANZAC Bridge. These trips are expected to benefit most from a switch to the alternative Western Harbour Tunnel. It is also noted that the Western Distributor accommodates much lower traffic demands in absolute terms than the Sydney Harbour Bridge and Sydney Harbour Tunnel, and hence the percentage change is more exaggerated. In this context, the predicted reduction of road traffic on the Western Distributor of 37 per cent referred to by ACTAQ is plausible.

B3.3.9 Recommendations for future projects and ongoing management of road transport emissions

Issue raised

Whereas ACTAQ currently has no reason to doubt the performance of the models used in this and previous environmental impact statements, it is possible than ongoing operational air quality monitoring might identify some errors or shortcomings. With multiple projects open or opening soon, each with specific air quality monitoring associated with both environmental impact statement preparation, construction and post-opening phases (often as a condition of approval) a very large database of near-road air quality is being amassed. Whereas this environmental impact statement, like similar ones before it for the WestConnex projects and F6 Extension, includes consideration of dispersion model evaluation and assessment of background air quality, these new large datasets provide new opportunities for a more thorough evaluation of dispersion model performance in the sorts of settings relevant to urban road tunnel projects and roads in general in Sydney. Such a re-evaluation would inform future road tunnel projects, but also be valuable for assessment and planning of road transport emissions generally in Sydney and across Australia and beyond. To

enable this, ACTAQ recommends that air quality data for all monitoring sites over central Sydney for the base year 2018 is extracted, modelled or re-modelled and the data published.

Response

As noted in Section B3.3.4, a comparison of the background concentrations assumed for the assessment, based on 2016 data, with data collected subsequently in 2018 found that levels in 2018 were consistent with or lower than those in 2016. Hence it is not considered that re-modelling for the base year 2018 is warranted.

B3.3.10 Minor errors

Issue raised

In Chapter 8 – Assessment of operational impacts of Appendix H - Air quality:

- Second paragraph from the bottom of page 81 and 4th paragraph from the top of page 82: Reference is given to the M4-M5 Link, ACTAQ suggest this should refer to the Western Harbour Tunnel?
- Page 91: There seems to be some minor inconsistencies between what the bars show in the Figure 8-7 and what appears in Table 8-8.

Response

The minor errors are acknowledged and clarified in Section A4 (clarifications) of this submissions report.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B4 – Sydney Water

SEPTEMBER 2020

B4 Sydney Water

Contents

B4.1 Adequacy and accuracy

Issue raised

Chapter 2 Assessment Process, Section 2.2.1 NSW Legislation – please add *Sydney Water Act 1994* under 'Other relevant legislation'.

Response

Sydney Water's comment is acknowledged.

The Sydney Water Act 1994 is listed in Section A1.4 of this submissions report as relevant NSW legislation applicable to the project. The project would comply with the requirements of the *Sydney Water Act 1994* in relation to connections to or impacts to Sydney Water's assets.

B4.2 Sydney Water wastewater and potable water assets

B4.2.1 Service provision

Issue raised

Sydney Water owns and operates trunk and reticulation assets located within and outside the project boundary for the proposed Western Harbour Tunnel & Warringah Freeway Upgrade. These assets provide wastewater and potable water services to our customers in the affected area.

Sydney Water, during and post works of the Western Harbour Tunnel & Warringah Freeway Upgrade, must continue to provide these services as per Sydney Water's Operating Licence and regulatory requirements.

Response

Transport for NSW acknowledges the importance of the water, wastewater and stormwater services that Sydney Water provides and the need to avoid, or minimise, any disruptions to the services. Appendix D (Utilities management strategy) includes an assessment of the potential impacts of the project on major utility assets, including Sydney Water assets. All utility impacts would be addressed in consultation with the relevant utility provider.

B4.2.2 Early and ongoing consultation

Issue raised

Sydney Water encourages early consultation and discussions with Transport for NSW during and post Western Harbour Tunnel and Warringah Freeway Upgrade works. We also recommend that all relevant information, plans, needs specifications for these assets are requested from Sydney Water.

Response

Consultation with Sydney Water on matters associated with the project would continue during further design development and construction. As described in Section 2.3 of Appendix D (Utilities management strategy), all utility works would be carried out in consultation with the relevant utility provider.

B4.2.3 Availability and volume of potable water

Issue raised

The environmental impact statement states there is a need for potable water use within and for the project. The availability and volume of these flows will depend on system capability and will be confirmed during detail design.

Response

Sydney Water's comment is acknowledged.

B4.2.4 Access

Issue raised

Sydney Water reserves the right to assess, based on final project layout and construction designs prepared by the project team and or their contractors, the impacts on our assets located within the project scope, and the potential needs for adjustments funded by the project to accommodate accessibility of our pipes for operational and maintenance purposes, new pavement locations and changes to structures.

Sydney Water requires safe unrestricted access to our assets throughout the life of the project. We need to ensure these assets are fully operational at all times.

Response

The assessment of proposed utility works in each area of interest within the construction footprint is discussed in Section 3.2 and Section 3.3 of Appendix D (Utilities management strategy).

In accordance with the proposed Sydney Water Interface Deed, Transport for NSW would ensure that during construction Sydney Water is able to safely access its assets as required for operation of the Sydney Water network in accordance with the Sydney Water Standards.

A number of Sydney Water assets have been identified within and outside the construction footprint that may be potentially impacted by the project. Table 3-1 and Table 3-2 of Appendix D (Utilities management strategy) contain proposed treatments for each asset, which would be confirmed in consultation with Sydney Water.

As discussed in Section 2.3 of Appendix D (Utilities management strategy), the approach proposed for treating utility services would be to:

- Where possible, redesign the works to allow retention of utility services in the current position
- Relocate or adjust utility services
- Protect utility services if and where required
- Remove any redundant utilities and infrastructure in agreement with the utility service provider
- Accommodate the utility service within the proposed design where practicable.

A significant amount of consultation and coordination between the project and Sydney Water has already occurred. Consultation and coordination of activities with Sydney Water would continue during further design development and construction in regard to assets in proximity to the construction footprint and construction support sites to ensure that the services Sydney Water provides are not unreasonably affected and Sydney Water can continue to access, operate and maintain its assets.

B4.2.5 Project program

Issue raised

Sydney Water recommends early consideration for staging and timing design work and delivery of the project. This is very critical to allow sufficient time for Sydney Water to schedule and program shutdowns and reconnections of its assets. This ensures that Sydney Water continues to meet its Operating Licence and most importantly maintain services to its customers. A Water Service Coordinator can assist with this process.

Response

Transport for NSW has been in close consultation with Sydney Water since the early planning stages of the project. All known directly impacted Sydney Water assets have been identified and discussed with Sydney Water and relocation designs are being completed and certified. A preliminary list of indirect impacts to Sydney Water assets has been detailed by Sydney Water and agreed criterion for assessing those impacts is being finalised to allow treatments to be agreed with the contractor.

Consultation with Sydney Water would continue throughout further design development and construction, with regard to the staging, timing and duration of works and potential impacts to Sydney Water assets and operations, particularly impacts that are anticipated early in the construction program.

B4.2.6 Sydney Water Asset Adjustment process

Issue raised

Sydney Water Asset Adjustment process, found on the Sydney Water website, should be adhered to for the relocation, adjustment and or protection of our assets. Additionally, if assets are required to be changed, the environmental approval will need to cover any works identified that may fall outside of the project boundary, but be a result of the project works.

Response

Transport for NSW would adhere to the Sydney Water Asset Adjustment process for utility relocation, adjustment and/or protection.

Transport for NSW acknowledges the requirement that the proponent must obtain approval from the relevant utility provider before relocation, adjustment and/or protection works.

Future design development phases may identify relocations that extend outside the construction footprint. Impacts on any existing utilities outside the construction footprint would be assessed during construction planning and management processes developed in consultation with Sydney Water.

B4.2.7 Trade waste licensing

Issue raised

Any trade waste licence request, most notably for removal of leachate, will need to meet Sydney Water's requirements.

Response

Sydney Water's comment is noted, subject to the proposed work being consistent with the project as approved and in accordance with the conditions of approval.

B4.2.8 Discharge protocols of chlorinated water

Issue raised

The environmental approval needs to meet the discharge protocols of chlorinated water due to watermain shutdown and reconnection of live Sydney Water assets that will need to be adjusted.

Response

Sydney Water's discharge protocols would be followed for water main shutdown and reconnection of live Sydney Water assets.

B4.2.9 Asset amplification

Issue raised

Amplification of assets may be required to facilitate future growth along the development corridor. This will be assessed as adjustment applications are referred to Sydney Water for review. Sydney Water consultation is required early to ensure any amplifications are identified, planned and confirmed early.

Response

Consultation on these matters has commenced with Sydney Water as noted in Section 7.2.2 of the environmental impact statement and would be ongoing during further design development and construction planning.

Identification of utility infrastructure that requires adjustment and/or relocation due to project construction is ongoing and would be confirmed upon further design development. Any utility adjustment and/or relocation would be carried out according to utility provider requirements on a like for like basis.

Where future network extensions or capacity expansions planned by Sydney Water coincide with proposed project utility works, there would be an opportunity to coordinate these works to minimise future impacts on the local community and business subject to complying with the relevant conditions of approval.

B4.2.10 Amendments to environmental impact statement Appendix D (Utilities management strategy)

Issue raised

Amendments to environmental impact statement Appendix D (Utilities management strategy), Section 2.3 Treatment approach to utilities to be updated to include the requirement that: the proponent must obtain approval from the relevant utility provider before commencement of works.

Response

Sydney Water Act 1994 approval requirements are noted. Transport for NSW would comply with relevant utility provider approval requirements for the project.

B4.2.11 Scoping report

Issue raised

Sydney Water notes that the Scoping Report identifies the need for further proposed assessment regarding flood management.

Further assessments should also include consultation with Sydney Water as owner of stormwater assets in the project vicinity, particularly at Whites Creek and the nearby Rozelle Interchange to ensure that the project is unlikely to: preclude, reduce or compromise the ability of Sydney Water or Council to cost effectively provide flood mitigation services and stormwater capacity amplifications to accommodate urban uplift in the vicinity.

Response

Since the Scoping Report, further investigations to assess project related flooding issues have been carried out to inform the environmental impact statement. These investigations are documented in Chapter 18 (Flooding) of the environmental impact statement and Appendix R (Technical working paper: Flooding).

The project has aimed to limit its impact in respect to flooding, both in terms of impacts on the project itself and the areas surrounding it. Table D2-1 of this submissions report outlines environmental management measures to reduce the impact of construction activities on flood

behaviour and sets out the specific measures to be incorporated into the detailed design of the project to mitigate flood risk during operation.

Where further flood investigations are required to be carried out during further design development for the project, consultation with Sydney Water would occur on relevant issues.

B4.2.12 Secretary's Environmental Assessment Requirements

Issue raised

Sydney Water note the following statements in the secretary's environmental assessment requirements:

- 9. Water – Hydrology: *"the environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved)."*
- 6. Biodiversity: *"The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity."*
- 6. Biodiversity*: "Offsets and / or supplementary measures which are equivalent to any remaining impacts of project construction and operation."*

A concept of 'offsets' has in preceding infrastructure projects been interpreted to allow water quality treatment works in one catchment as offset to the discharge of untreated or lesser treated runoff from a separate and distinct catchment and / or local receiving environment.

The interpretation of 'offsets' in this manner is not reasonable or supported. The stormwater runoff from each project site area shall be managed consistently within each and across all project catchment areas. Inter catchment and inter site 'offsets' tend to 'pick the low hanging fruit' elsewhere and preclude the opportunity for a more effective long-term overall catchment outcome.

We also note for flooding that the project maintains *"compatibility with the hydraulic functions of flood conveyance in flood ways and storage areas of the land".*

Flood storage consideration has been provided limited weight in previous infrastructure projects and should be considered of equal importance to other flood impact considerations.

Response

The reference to offsets within the Secretary's environmental assessment requirements is understood to relate to biodiversity values and to the Biodiversity Offset Scheme, established under the *Biodiversity Conservation Act 2016*. It is not intended to use an 'offset' approach when dealing with construction or operational stormwater runoff.

Section 4.3 of Appendix R (Technical working paper: Flooding) describes the existing flood behaviour in the vicinity of the project, including the hydraulic categorisation of the floodplain into floodways, flood storage and flood fringe for a one per cent annual exceedance probability flood.

Section 5.2 and Section 6.2 of Appendix R (Technical working paper: Flooding) describe the impacts of the project on flood behaviour as a result of changes to flow conveyance and flood storage across the floodplain. The assessment indicates that the project would not change peak flood levels with the exception of a small change in peak flood levels external to the Warringah Freeway corridor which would generally result in a neutral or beneficial effect on flood behaviour.

B4.2.13 Appendix D (Utilities management strategy)

Issue raised

Sydney Water notes that the Utilities management strategy (Appendix D), does not specifically note likely significant modifications to Sydney Water stormwater assets particularly in the vicinity of the Rozelle Interchange.

The strategy also notes that Transport for NSW does *"not allow for the upgrading of utilities apart from upgrades required to manage the requirements of the project".*

The no-upgrade approach for stormwater infrastructure is a reasonable presumption up until the project proposes to either:

- Adjust or deviate an existing Sydney Water stormwater asset.
- Install project infrastructure in a proximity and manner that may restrict the ability of Sydney Water to provide future flood mitigation services or related asset amplifications.

The no-upgrade presumption does not automatically apply in the foregoing circumstances. The project proponents shall undertake necessary investigations and negotiations to ensure that proposed and existing Sydney Water stormwater assets are 'future-proofed' for a growth Sydney. Sydney Water shall assess each circumstance on merit.

Response

Transport for NSW does not plan to modify any Sydney Water stormwater assets at the Rozelle Interchange. Surface works in the vicinity of Rozelle Interchange are limited to the reconfiguration of line marking and signage of the City West Link on/off ramps.

B4.2.14 Consultation

Issue raised

Close consultation with Sydney Water during the concept and detailed design, construction and operational phases of the project must be required to ensure that the objectives are met and that the impacts to Sydney Water stormwater assets is minimised, or improvements to the receiving environment can be achieved.

Response

Consultation with Sydney Water on matters associated with the project commenced in 2017 and has occurred regularly since. Further consultation would continue during further design development and construction.

B4.2.15 Protection of stormwater assets

Issue raised

Strict requirements for Sydney Water's stormwater assets apply to this project. Transport for NSW should ensure that satisfactory steps/measures been taken to protect existing stormwater assets, such as avoiding building over and/or adjacent to stormwater assets and building bridges over stormwater assets.

Transport for NSW should consider taking measures to minimise or eliminate potential flooding, degradation of water quality, and avoid adverse impacts on any heritage items, and create pipeline easements where required.

Response

Appendix D (Utilities management strategy) identified a number of Sydney Water assets that may be impacted by the project and proposed treatments to each asset, which would be confirmed with Sydney Water through ongoing consultation. All known impacts are currently being processed under Sydney Water Building Over or Adjacent Assets applications.

Table D2-1 of this submissions report details the environmental management measures proposed during construction and operation of the project to manage flooding, surface water quality and heritage impacts.

B4.2.16 Sydney Water's stormwater quality targets

Issue raised

Sydney Water's stormwater quality targets will apply when a connection to our asset is required (Refer to Sydney Water's website *http://www.sydneywater.com.au/SW/waterthe-environment/how-we-manage-sydney-s-water/stormwater-network/stormwaterquality-targets/index.htm*).

Response

Sydney Water's stormwater quality targets are noted.

The project would install and operate water treatment devices during operation to achieve the Sydney Water pollutant load reduction targets for direct connections to Sydney Water assets where feasible and reasonable. The need for new stormwater connections would be reviewed during further design development and construction planning, with consultation with Sydney Water as required.

B4.2.17 Stormwater quality monitoring

Issue raised

Sydney Water requests that stormwater quality monitoring results for stormwater discharges should be provided to Sydney Water prior to, during and post construction of the road (3 years).

Response

Water quality monitoring programs for construction and operation of the project and any associated reporting requirements would be carried out in accordance with the conditions of approval for the project and/or any environment protection licence.

B4.2.18 Consultation on flood assessment

Issue raised

Continual communication with Sydney Water regarding the detailed design and flood assessment will be required. Any weakening of the environmental impact statement position during detailed design will be critically examined by Sydney Water.

Response

The project's impact on flooding behaviour would be managed in accordance with the conditions of approval required by the Department of Planning, Industry and Environment and relevant environmental management measures that are identified in Table D2-1 of this submissions report. Consultation with Sydney Water would continue during further design development and construction.

B4.3 Other findings in Appendices

B4.3.1 Appendix N – Groundwater – Groundwater drawdown

Issue raised

Appendix N (Technical working paper: Groundwater) notes that *"after 100 years of operation, predicted drawdown magnitudes are similar to end of construction, with a maximum drawdown of about 40 metres in Rozelle (particularly Easton Park, an area of environmental interest for contamination)".*

Sydney Water seeks further clarification to understand the potential for groundwater drawdown generally to impact the structural integrity of its assets.

Response

Chapter 16 (Geology soils and groundwater) of the environmental impact statement discusses the assessment of ground settlement induced by tunnel excavation due to both stress redistribution in the surrounding ground and groundwater drawdown around drained tunnels.

Overall, the calculated surface angular distortion above the Western Harbour Tunnel is predicted to be negligible at all locations with the exception of the Warringah Freeway portal and at the location where the tunnel crosses Sydney Harbour. At these two locations, the maximum slope of ground (angular distortion) slightly exceeds 1:500.

Transport for NSW is currently working with Sydney Water to understand any potential settlement impacts to Sydney Water assets. Appropriate management measures would be developed in consultation with Sydney Water.

B4.3.2 Appendix N – Groundwater - Whites Creek naturalisation

Issue raised

Section 5.2 of Appendix N (Technical working paper: Groundwater) references a Sydney Water concept design (2016) for naturalisation of part of Whites Creek.

Sydney Water seeks further clarification to understand the interface and complementary design elements by the project proponents.

Response

Section 5.2 of the environmental impact assessment noted that, at Rozelle, the project would be connected to and from the City West Link via on/off ramps. These ramps would not encroach nor impact on the Whites Creek channel or foreshore areas.

The connecting ramps would integrate with the M4-M5 Link project and its upgraded stormwater drainage system that will discharge into Rozelle Bay.

B4.3.3 Appendix O – Surface water quality and hydrology – tunnel water discharge

Issue raised

Sydney Water note the following statements in Appendix O (Technical working paper: Surface water quality and hydrology):

> *'the key water quality objective would be to ensure downstream waterways are protected against potential impacts from surface runoff generated during the construction phase of the project.'*
>
> *'during the operation of the project, tunnels would incorporate drainage infrastructure to capture and treat wastewater generated from groundwater ingress and rainfall runoff in tunnel portals. A permanent operational wastewater treatment plant located at Rozelle is proposed to treat discharge and manage adverse impacts on the receiving environment at Rozelle Bay.'*

Other tunnel projects have proposed discharge of groundwater into existing Sydney Water stormwater drains. The indicated strategy to manage tunnel water (groundwater and portal stormwater ingress) discharges separate from Sydney Water drainage infrastructure is supported and preferred.

Response

Sydney Water's comment is acknowledged.

B4.3.4 Appendix O – Surface water quality and hydrology - stormwater quality management

Issue raised

Sydney Water note the following statement in Appendix O (Technical working paper: Surface water quality and hydrology):

> *"existing water quality in all waterways indicates a highly urbanised catchment with elevated nutrients and heavy metals."*

A proposition that existing water ways are already of poor quality and that *'residual risk to sensitive receiving environments and environmental values is expected be low provided the proposed management measures are implemented, maintained and monitored'* should not be interpreted to justify reduced stormwater runoff quality management effort for any specific site or catchment.

Response

Appendix O (Technical working paper: Surface water quality and hydrology) presents an assessment of surface water quality impacts during construction and operation.

As required by environmental management measure SG5 (refer to Table D2-1 of this submissions report), during construction, the project would maintain existing stormwater runoff quality through the implementation of erosion and sediment control management and mitigation measures at all construction support sites and surface works areas. Tunnel inflows during construction would be prevented from generating runoff. Tunnel inflows would be captured and treated at wastewater treatment plants during construction.

As outlined in Section 6.2.1 of Appendix O (Technical working paper: Surface water quality and hydrology), during operation, the project would maintain stormwater runoff quality as follows:

- At the Rozelle Interchange, the project connecting ramps runoff would be directed into the M4-M5 Link project upgraded stormwater drainage system
- At the Western Harbour Tunnel, tunnel runoff would be collected at a sump and pumped to the project wastewater treatment plant at Rozelle
- At the Warringah Freeway, runoff would continue to be collected through existing drainage arrangements. Formal water quality treatment infrastructure is not proposed for the Warringah Freeway as the freeway road surface pollutant loading would not be expected to change from the existing case. The proposed motorway facilities at the existing Cammeray golf course would have water quality infrastructure to treat runoff before discharge to the existing local stormwater network.

Surface water quality monitoring during construction and operation of the project would be carried out in accordance with the conditions of approval required by the Department of Planning, Industry and Environment and relevant environmental management measures for the management of water quality that are identified in Table D2-1 of this submissions report.

B4.3.5 Appendix O – Surface water quality and hydrology – water quality targets

Issue raised

Appendix O (Technical working paper: Surface water quality and hydrology) references water quality guidelines and policies including *Sydney Harbour Water Quality Improvement Plan* (Sydney Metropolitan Catchment Management Authority (SMCMA, 2010)) and the project should ensure stormwater runoff management targets from each site should at least directly meet the minimum requirements of the plan.

Response

Section 2.2 of Appendix O (Technical working paper: Surface water quality and hydrology) identifies the guidelines and policies considered during the water quality assessment for the project. This includes the *Sydney Harbour Water Quality Improvement Plan* (SMCMA, 2010) as the project's surface roads runoff would ultimately drain to Sydney Harbour.

Potential impacts on surface water quality during operation of the project are assessed in Section 6.2 of Appendix O (Technical working paper: Surface water quality and hydrology).

Runoff from the project's connecting ramps at the Rozelle Interchange would be discharged into the M4-M5 Link project stormwater drainage system which is being designed and constructed to deliver Water Sensitive Urban Design (WSUD) outcomes in line with the intent of the *Sydney Harbour Water Quality Improvement Plan* (SMCMA, 2010).

As noted in Section B1.3.4, runoff from the upgraded Warringah Freeway would continue to be collected through existing drainage arrangements. Section 6.2.1 of Appendix O (Technical working paper: Surface water quality and hydrology) outlines the reasoning for no additional water quality treatment infrastructure being proposed for the Warringah Freeway Upgrade component of the project.

Should further design development identify the need for water quality controls, water quality design targets would be implemented in accordance with the targets in (Environment Protection Authority, 2007).

B4.3.6 Appendix R - Flooding

Issue raised

We note that there is an emphasis to minimise adverse impacts on existing flood characteristics in Appendix R of the environmental impact statement (Technical working paper: Flooding).

The foregoing criteria is limiting. The assessment of project related works is to also consider the project works in the context of likely local community urban uplift ambitions and facilitating/not precluding the provision of future flood mitigation services to accommodate a growth Sydney.

Response

The assessment presented in Chapter 18 (Flooding) of the environmental impact statement and Appendix R (Technical working paper: Flooding) has been carried out in accordance with the Secretary's environmental assessment requirements. The Secretary's environmental assessment requirements addressed in the environmental impact statement include the assessment of increases in the potential flood affectation of the project infrastructure and other properties, assets and infrastructure and assessment of impacts upon existing community emergency management arrangements for flooding.

Consideration of community urban uplift ambitions and the facilitation of future flood mitigation services are requirements outside the Secretary's environmental assessment requirements and are considered beyond the scope of the project.

Section 6.3 of Appendix R (Technical working paper: Flooding) considered the project's consistency with state government and local council flood plans and policies. It notes that no floodplain risk management studies or plans have been prepared for the catchments through which the project runs. Without specific future flood mitigation plans, it would be difficult to consider these in the assessment.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B5 – Department of Planning, Industry and Environment - Environment Energy and Science Group

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B5 Department of Planning, Industry and Environment - Environment, Energy and Science Group

Contents

B5.1 Flooding

B5.1.1 Consideration of flood planning areas

Issue raised

In addressing the Secretary's environmental assessment requirements requiring the identification of flood planning areas, only the Leichhardt Local Environmental Plan 2013 (LEP) is referenced. Reference should also be made to the Willoughby LEP 2012 and further discussion regarding relevant planning areas for the different areas should be included.

Response

Section 2.4.1 of Appendix R (Technical working paper: Flooding) makes reference to both the Leichardt and Willoughby Local Environment Plans (LEPs), noting that both the Leichhardt LEP 2013 and Willoughby LEP 2012 contain flood planning clauses that apply to land at or below the flood planning level, which is defined in both documents as equal to the peak one per cent annual exceedance probability (or 1% AEP) flood level plus 0.5 metres.

Figure 4.7 (seven sheets) of Appendix R (Technical working paper: Flooding) shows the extent of the Flood Planning Area, which has been defined as land which lies below the flood planning level (per the definition presented in the Leichhardt LEP 2013 and Willoughby LEP 2012). As outlined in Section 6.3 of Appendix R (Technical working paper: Flooding) and in accordance with the Secretary's environmental assessment requirements, the flood planning area shown on Figure 4.7 is based on mainstream flooding along the major creeks and tributaries that are crossed by the project, as well as the main paths associated with major overland flow. The mapping has used available council flood planning maps from Inner West Council and Willoughby City Council, and the above definition in lieu of available flood planning mapping from North Sydney Council.

A clarification has been provided in Table A-7 of this submissions report to note that Table 1.1 of Appendix R (Technical working paper: Flooding) should also include reference to the Willoughby LEP 2012.

B5.1.2 Confirmation of flooding construction impacts during detailed design

Issue raised

The submission notes that all construction impacts on the Western Harbour Tunnel area have been considered, and that the majority of works are outside flood prone areas. The project's construction would have limited impacts on the flood behaviour in the catchments. In detailed design, construction impacts need to be confirmed as details may change.

Response

Comments relating to the limited impact of the project on flood prone areas and flood behaviour are acknowledged. Section 18.5 of the environmental impact statement identifies that the majority of construction support sites would involve work within the floodplain that would need to be managed; however, as described in Table 18-2 the majority of sites are modelled as being in the 'low hazard flood fringe' during storms up to the 1% AEP in intensity or are not subject to flooding. Construction activities elsewhere within the construction footprint, while temporary, would also have the potential to change flood behaviour and that these impacts would need to be managed.

A new environmental management measure F8 has been included as follows (refer to Table D2-1 of this submissions report) to refine and further clarify the requirements to manage changes to flood behaviour during construction:

Detailed construction planning will consider flood risk at construction sites and 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.*

B5.1.3 Flooding operational impacts – sensitive receivers

Issue raised

The reported impact on the James Milson Village (Retirement and Residential Care) and potentially some surrounding properties appears to be between 0.1 and 0.2 metres in a 10% Annual Exceedance Probability (AEP) storm event which is outside the acceptable limits of a project, though it is difficult to see from Figure 6.4 (sheet 2) in Appendix R (Technical working paper: Flooding). More detail should be provided on management measures that have potential to mitigate these impacts.

Response

Modelling has shown that increases in flood depth of up to about 75 millimetres may occur at the James Milson Village during a 10% AEP storm event, and increases of up to about 40 millimetres during a 1% AEP storm event. The larger increase for the more frequent storm event is a function of the relatively larger change that would occur in the rate of flow discharging through the development as a result of the project.

Impact of the project on flood behaviour during operation will be confirmed during further design development. Revised environmental management measure F1 (refer to Table D2-1 of this submissions report) requires a floor level survey to be carried out where flood levels in the 1% AEP storm event are predicted to increase at any residential, commercial or industrial building as a result of operation of the project (including James Milson Village). Further refinements to the design of permanent project components may be required based on outcomes of the survey to minimise the potential for impacts.

Assessments during the detailed design process would include detailed ground surveys to determine the impact the project would have on flood behaviour in the retirement village, and hence the depth to which the James Milson Village basement would be flooded under pre- and post-project conditions. The assessment would also include the existing flood mitigation measures applied to the retirement village that have not been captured in the current assessment, including a bund prior to the entry to the carpark basement and a pump system for the carpark basement. The findings of this investigation will determine whether additional flood mitigation measures will need to be incorporated in the project.

A new environmental management measure F9 has been included as follows (refer to Table D2-1 of this submissions report) to further clarify the assessment of flooding during further design development:

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.

B5.1.4 Flooding operational impacts – Warringah Freeway and Sydney Harbour Tunnel portals

Issue raised

The Environment, Energy and Science group understands that the Sydney Harbour Tunnel was not designed to the (current) tunnel design requirement of flood immunity in a Probable Maximum Flood event. Section 6.2 of Appendix R (Technical working paper: Flooding) states that “While floodwater

currently enters the Sydney Harbour Tunnel via its portals during a Probable Maximum Flood event, the increased depth of ponding at the southern Warringah Freeway would result in an increase in the rate and volume of floodwater discharging to the tunnel system during an extreme flood event." While the project is not required to alleviate flooding in the Sydney Harbour Tunnel, it should not exacerbate this risk.

The figures in Appendix R (Technical working paper: Flooding) do not show clearly the level of increased depth of flooding in the rainfall events under assessment. That this should be clarified and exact impacts of the project on the Sydney Harbour Tunnel should be given, including updates to figures to clearly show the flooding in the areas of concern.

Response

The flood modelling carried out as part of the environmental impact statement (as outlined in Appendix R (Technical working paper: Flooding)) indicates that the project would generally reduce the peak flow that would discharge to the portals of the Sydney Harbour Tunnel for all storm events up to the Probable Maximum Flood (PMF) event, with the exception that there would be an increase in the peak flow discharging to the southbound carriageway portal during extreme storm events. The southbound carriageway of the Sydney Harbour Tunnel is presently subject to high hazard flooding conditions during extreme storm events and as such the increase in peak flow attributable to the project would only act to increase the length of carriageway that is subject to flooding during the PMF event.

Flood mapping for the PMF event in the vicinity of the Sydney Harbour Tunnel has been included as Appendix D to this submissions report. Figures 1 and 2 of Appendix D to this submissions report show the indicative extent and depth of inundation in the vicinity of the northern Sydney Harbour Tunnel portals under pre- and post-project conditions for the PMF event, while Figure 3 shows the impact that the project would have on flood behaviour for a PMF event. Included on Figures 1 and 2 is the peak flow which would enter the southbound and northbound tubes during a PMF event, while Figure 3 shows the change in peak flow entering each which is attributable to the project. Environmental management measure F2 requires the hydraulic capacity of the traverse drainage of the Warringah Freeway to be maintained where reasonable and feasible, and environmental management measure F7 requires flood emergency management measures to be incorporated into relevant environmental and safety management documentation (refer to Table D2-1 of this submissions report).

B5.1.5 Climate change impacts

Issue raised

Section 6.4 of Appendix R (Technical working paper: Flooding) addresses the impact of future climate change on flood behaviour. The 0.5% and 0.2% AEP are used as proxies to assess the impact of a 10 per cent and 30 per cent rainfall increase. Appendix R (Technical working paper: Flooding) contains the statement:

"*For example, depths of ponding at the southern Warringah Freeway sag would be increased by 280 millimetres and 260 millimetres for the scenarios where the intensity of a 1% AEP storm event are increased by 10 per cent and 30 per cent, respectively*."

The Environment, Energy and Science group's submission presumes an error in the reporting, as it is unlikely that a 10 per cent increase in rainfall would increase levels by 280 millimetre while a 30 per cent increase would only increase levels by 260 millimetres. Clarification is required to confirm (and if necessary correct) the error.

Response

The values quoted in Appendix R (Technical working paper: Flooding) are the impact that the project would have on flood behaviour for the 0.5% and 0.2% AEP storm events and relate to the information shown on Figures B.5 (Sheet 2) and B.6 (Sheet 2), respectively.

The values which should have been quoted in the report are 35 millimetres and 78 millimetres for the case where 1% AEP rainfall intensities are increased by 10 per cent and 30 per cent, respectively (ie based on the information shown on Figures B.7 (Sheet 2) and B.8 (Sheet 2), respectively). A clarification has been provided in Section A4.1 of this submissions report to include this update.

B5.2 Biodiversity

B5.2.1 Presentation of Biodiversity development assessment report

Issue raised

Environment Energy and Science has reviewed Appendix S (Technical working paper: Biodiversity development assessment report) and can advise that it is generally well presented, containing an appropriate level of detail to demonstrate compliance with the Biodiversity Assessment Method.

Response

The comments from Environment, Energy and Science regarding the suitability of Appendix S (Technical working paper: Biodiversity development assessment report) are noted.

B5.2.2 Scientific naming of Large Bent-winged Bat

Issue raised

Due to a taxonomic revision of the *Miniopterus* genus the common and scientific names of this species, at least for the purposes of the *Biodiversity Conservation Act 2016* and NSW environmental assessment, have recently been changed from the previous Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*) by which the species is referred to in the environmental impact statement and the biodiversity development assessment report. The new name, that is the Large Bent-winged Bat (*Miniopterus orianae oceanensis)* should be used in any approval conditions or related documentation.

Response

The comments from Environment, Energy and Science regarding the new scientific names of species is acknowledged. A clarification has been provided in Section A4.2 of this submissions report to include this update. Relevant environmental management measures have been updated to refer to the revised common and scientific names of this species, and included in Table D2-1 of this submissions report.

B5.2.3 Construction impacts on Large Bent-winged Bat

Issue raised

A winter roosting site of the Large Bent-winged Bat is located in one of the tunnels of the Former coal loader at Berrys Bay, now part of the Coal loader centre for sustainability. The Coal loader tunnel would not be directly impacted by the project, but the Sydney Harbour North cofferdam (WHT6) construction site is adjacent, and the proposed Western Harbour Tunnel mainline tunnels would be excavated directly beneath the site.

The biodiversity development assessment report (Section 5.4.1.1) states that the top of the tunnel excavation will be around 27 or 28 metres below floor of the coal loader tunnel, while the environmental impact statement (Section 19.4.2) states that construction includes locations "around 10 metres below the coal loader tunnels." This inconsistency, along with the predicted ground-borne noise that is considered in Appendix S (Technical working paper: Biodiversity development assessment report) (Section 5.1.1) needs to be reviewed and clarified.

The biodiversity development assessment report/environmental impact statement do not explore to a sufficient degree the potential impacts from high noise events on resilience of Large Bent-winged

Bats and their ability to tolerate noise, and are inconclusive on whether this will render the Coal loader tunnel uninhabitable during over-winter roosting period. It is therefore not known whether ongoing disturbance could affect resilience and therefore survival of the roosting colonies.

The biodiversity development assessment report/environmental impact statement also lacks consideration of how timing of activities might be employed to avoid noise, light and vibration impacts. The Biodiversity Assessment Method Operational Manual Stage 2 mentions timing/scheduling of activities as an impact avoidance measure, and the Environment, Energy and Science recommends that the biodiversity development assessment report should be revised accordingly.

Response

Tunnel depth

Section 19.4.2 of the environmental impact statement incorrectly states that construction works would occur around 10 metres below the Coal loader tunnels. The top of the tunnel excavation would be approximately 27 or 28 metres below the floor of the Coal loader tunnel as identified in Section 5.4.1.1 of Appendix S (Technical working paper: Biodiversity development assessment report). This clarification is listed in Section A4.2 of this submissions report. Ground-borne noise levels predicted in the Coal loader tunnels therefore do not require revision.

Construction noise impacts

Several studies have demonstrated that disturbance (eg human visitation) to microbat roosting habitat, particularly during winter, can affect behaviour by arousing microbats from torpor and resulting in an increase in activity (A. Bush pers. comm 30 June 2020, Sloggett 2018, Speakman et. al. 1991). As microbats are aroused from torpor, they expend energy and frequent arousals may cause the premature depletion of fat reserves (Thomas 1995, Speakman et. al. 1991), thereby adversely affecting their resilience. However, there is limited information available on the effects of noise-related disturbance to a roost, and specifically, the effects of noise-related disturbance to an over-winter roost for Large Bent-winged Bats in an urban environment.

Large Bent-winged Bats are known to roost in locations that are subject to sustained urban noise and vibration across Sydney (such as in the North Sydney, Northern Beaches and Inner West local government areas). This includes within stormwater drains in proximity to public open space and residential developments, in culverts beneath busy arterial roads and in disused tunnels within active rail corridors (Hoye 2000, B. Law pers. comm. 30 June 2020, B. Smith pers. comm. 1 July 2020). The persistence of Large Bent-winged Bats in roosts that are subject to particularly high levels of noise and vibration (ie passing passenger and freight trains, heavy road traffic, mining) throughout the over-winter roost period suggests that the species is tolerant of disturbance.

As outlined in Section 5.4.1.1 of Appendix S (Technical working paper: Biodiversity development assessment report), construction activities in the vicinity of the Coal loader tunnel that are considered to be the highest potential noise and vibration construction activities are:

- Excavation of the mainline tunnels by roadheaders. Ground borne noise and vibration levels would be highest when the roadheader is directly below the Coal loader tunnels and would decrease as the roadheader moves away further along the tunnel (up to 44 dBA)
- The installation and removal of cofferdams, in particular the piling that is required for the installation of the Sydney Harbour north cofferdam (WHT6) located next to the Coal loader tunnel (up to 64 dBA)
- Rock hammering required for benching and/or tunnel fitout works within the mainline tunnels (up to 60 dBA).

There is a general lack of scientific literature pertaining to the response of the species to specific noise and vibration levels (dBA), source (type), proximity of the source to the roost and duration (constant versus sporadic) at known roost sites. However, preliminary data at a mine site in regional NSW suggests the species inhabiting a nearby adit can withstand overpressure from mining blasts

measured up to 130 dBA around 50 metres from the adit (pers. comm Andrew Lothian 2 July 2020). This is about 85 dBA at the adit entrance (*http://noisetools.net/noisecalculator2*), 20 dBA higher than the highest noise levels predicted at the Coal loader tunnels from construction activities.

It is difficult to conclude what type and level of noise can be tolerated by the species at the Coal loader tunnel and what type and level of noise may adversely affect Large Bent-winged Bats during their over-winter roosting period. The mining example, whilst showing tolerance of noise levels higher than predicted during construction, is not an impact likely to be similar to noise duration, proximity to source and frequency as construction noise associated with the project. And in the absence of published studies in more similar environments and replicating similar impacts, it is difficult to conclude what impacts the project (specifically, construction-related noise and vibration) would have on the Large Bent-winged Bat that roost in the Coal loader tunnel. Though based on their history of tolerating high noise and vibration environments, including noise levels higher than those predicted at the Coal loader tunnel, it is hypothesised that the species would either:

1. Tolerate construction noise and vibration and remain roosting at levels similar to pre-construction, noting that these fluctuate considerably
2. Inhabit the Coal loader tunnel at levels lower than normal fluctuations/exit during periods of particularly high construction noise and vibration
3. Leave the Coal loader tunnel for the duration of construction and move to other roosts.

Though unlikely, it is also possible that the species abandons the roost during the day and this eventuation has been considered in mitigation (see discussion in Section B5.2.4 below).

Excluding microbats from roosting habitat prior to a disturbance of such roosting habitat is a management measure often used to mitigate potential adverse impacts on a species. This technique should only be used when direct impacts are anticipated or if the bats exhibit a significant level of distress – for example, roost abandonment during daytime hours. The construction activities listed above could result in the disturbance of roosting habitat within the Coal loader tunnel, and therefore could warrant the exclusion of Large Bent-winged Bats from the Coal loader tunnel prior to winter (when bats are most susceptible to disturbance). Preventing Large Bent-winged Bats from being subjected to high levels of construction during their over-winter period would avoid the potential arousal of torpid bats and the associated depletion of fat reserves as bats expend energy unnecessarily.

However, the exclusion of Large Bent-winged Bats from the Coal loader tunnel would result in the loss of access to roosting habitat that is known to support several hundred individuals over winter in recent years. Retaining the Coal loader tunnel in its existing condition (as per the project description) means that the project would not result in the loss of winter roosting habitat for Large Bentwing-bats.

Consultation with microbat specialists and review of available literature has suggested that Large Bent-winged Bats that occupy the Coal loader tunnel rarely enter full torpor, regularly forage throughout winter and frequently move between roosts in the surrounding locality and wider Sydney area (Hoye 2000, L Gonsalves and B Law 2018, personal communication, 6 August 2020). Some of these alternate roosting sites are subject to noise and vibration; between the 1960s and 1990s, the species was known to roost in a disused rail tunnel at North Sydney, in proximity to the active train network (Hoye 2000, Sydney Morning Herald 1960). As the Coal loader tunnel is not used as a maternity roost (Gonsalves and Law, 2017a) and the species has the ability to use a variety of alternate roosting habitats, temporary indirect impacts (ie construction noise) are unlikely to affect the resilience and therefore survival of Large Bent-winged Bats.

It is not feasible to reschedule the highest potential noise and vibration construction activities outside of the over-winter period due to the reasons outlined below. Therefore, these attributes and behaviours of the species may facilitate Large Bent-winged Bats to temporarily vacate the Coal loader tunnel when conditions (ie noise levels) are unfavourable, and return at a later stage when noise-related disturbance is lower. Due to the uncertainty in the exact response of the species to

construction, adaptive management is proposed with pre-construction monitoring to inform an adaptive management plan. Results of the ongoing monitoring during construction would trigger implementation of the developed adaptive management measures. The adaptive management plan is discussed in Section B5.2.4 below.

Avoidance and minimisation through design and scheduling

Several alignments were considered for the crossing of Sydney Harbour, some of which included options that did not pass in the immediate vicinity of the Coal loader. These options (the Brown, Red and Orange corridors) were not preferred due to the length of the proposed crossings, increased construction difficulty (and impacts) and cost.

As detailed in Section 4.4.3 of the environmental impact statement, the Blue corridor (being the project alignment) was selected on the basis of its superior performance relative to the other alternatives. In particular, the preferred option provided improved operational outcomes (including safety and air quality) as well as the shortest harbour crossing, significantly reducing exposure to poor geology, construction risk, cost and program duration.

The final arrangement of project elements was determined following further consideration of surrounding constraints (refer to Section 4.5 of the environmental impact statement). Specific to the areas in the vicinity of the Coal loader, this included a range of constructability, environmental and property considerations such as:

- Avoiding direct impacts on the former coal loader (on land), and minimising impacts to the associated wharf structure
- Avoiding encroachment into the HMAS Waterhen naval base to the north of the Former coal loader
- Improving constructability of the project by locating the northern cofferdam in rock where water depths are relatively shallow
- Keeping the Sydney Harbour north cofferdam clear of the main shipping channel
- Aligning the tunnel with favourable geology.

The preferred alignment achieves all of the aforementioned, with the harbour crossing skewed to enable construction of the temporary cofferdam to the south of the former coal loader wharf. This avoids direct impacts to the former coal loader.

The Large Bent-winged Bat is known to roost within the Coal loader tunnel for around seven months over the winter period, with individuals detected at the roost site as early as March and as late as September.

The harbour crossing spans across four years of construction. Construction noise and vibration during this period would vary across any day and according to the activity, however piling works would represent the loudest activity which would span several months.

Construction of the cofferdams, harbour crossing and mainline tunnels would be sequenced works. Delays to one element would have subsequent impacts to either harbour works or underground works for the mainline tunnel. The installation of the cofferdam structures are considered to be critical works. As such, there would be no ability to cease work for up to seven months of the year to avoid the roosting season without substantial impacts to the duration of the construction program for works within Sydney Harbour, and for the total project. This impact to program would have cost implications, as well as extended environmental and social impacts.

While the key stages of construction cannot be scheduled outside the roosting season, Transport for NSW and its contractor will investigate what opportunities are available to manage discrete activities at the surface or underground to minimise impacts to the roosting habitat. This may include:

- Certain activities being carried out during less sensitive times of the day for the bat species, However, this would require consideration to other potential impacts (such as impacts to nearby residents)
- Progressively increasing the intensity of construction activities to understand the resilience of the species to construction noise (as per Table B5-1in Section B5.2.4 below).

These opportunities will be investigated prior to construction and considered for inclusion in the adaptive management plan for development during detailed design and construction planning. Other opportunities may include exclusion of bats from the tunnel should significant abandonment at the site occur, as well as surveying other known roosting sites in proximity to the Coal loader prior to construction (as per environmental management measure B6 in Table D2-1 of this submissions report) and investigating options to increase their capacity.

B5.2.4 Microbat adaptive management strategies

Issue raised

Appendix S (Technical working paper: Biodiversity development assessment report) states that consultation about some potential adaptive management strategies took place with the microbat specialists of Department of Planning, Industry and Environment's Regions, Industry, Agriculture and Resources division (former Department of Primary Industries), however consultation carried out was based on very limited detail of the project.

Environment, Energy and Science recommends a plan for monitoring and adaptive management measures for impact to the Large Bent-winged Bat (*Miniopterus orianae oceanensis*) be prepared prior to any relevant construction activity and not after any impact is recognised (as currently proposed). The Plan should be prepared in consultation with Department of Planning, Industry and Environment (Regions, Industry, Agriculture and Resources division) microbat specialists and Environment, Energy and Science, to consider possible scenarios, and be consistent with the BAM (Section 2.7 *Management of uncertain impacts*), 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, 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.

<u>Suggested changes to environmental management measures</u>

EMMs B6, B7, B8 should be revised in line with plan requirements.

Response

Consultation about potential adaptive management strategies was carried out in August 2018 with the microbat specialists of Department of Planning, Industry and Environment's Regions, Industry, Agriculture and Resources division (former Department of Primary Industries) based on the detail available at the time. Consultation has been ongoing (in June 2020) and will continue to inform the adaptive management for the project.

Environmental management measure B6 requires inspections of Large Bent-winged bat roosting sites in the surrounding locality prior to construction. The “Phase” column has also been updated in Table D2-1 of this submissions report, to note that environmental management measure B6 will be carried out “Pre-construction” instead of during construction. Environmental management measure B8 has been revised to confirm that monitoring of Large Bent-winged bats in the Coal loader tunnel will be done both prior to, and during construction, therefore environmental management measure B7 has been removed. Results of the pre-construction monitoring would help inform an adaptive management plan.

Environmental management measures B8 and B9 have also been revised to clarify that the monitoring program and adaptive management measures, are to be included in an adaptive management plan, will be developed prior to construction and in consultation with the Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour (refer to Table B5-1, and as consolidated in Table D2-1 of this submissions report).

The adaptive management plan would be prepared in accordance with the requirements of Section 2.7 of the *Biodiversity Assessment Method Operational Manual Stage 2* (DPIE, 2019) as per Table B5-1 below.

Table B5-1 Adaptive management plan requirements for the Large Bent-winged Bat in the Coal loader tunnel

Adaptive management plan requirements (from 2.7 of the Biodiversity Assessment Method Operational Manual Stage 2 (DPIE 2019))	How it will be addressed in the proposed adaptive management plan for the Large Bent winged Bat population at the former coal loader
Relevant baseline data, collected prior to impacts, of variables to be used to monitor changes	Monitoring of the Large Bentwing-bat population would occur at the Coal loader tunnel and known roosts in the locality in the overwinter period of 2020. Roosting capacity would also be assessed at known local roosts prior to construction (environmental management measure B6).
Seasonal changes or relevant impacts to be measured	The species resilience to construction noise and vibration would be measured in the context of known behaviour and population fluctuations from pre-construction monitoring and previous studies.
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	Monitoring methods would be determined during development of the adaptive management plan. The frequency of monitoring would initially be dependent on the monitoring results when there is greater ability to predict the response of the bats to different construction activities and noise impacts. Diurnal and dusk/night monitoring would occur.
Frequency and type of reporting	Reporting frequency and type of reporting would be determined during development of the adaptive management plan.
Completion and performance criteria, adhere to SMART principles and are ecologically based, that can be used as	Triggers for management intervention during construction: • Abandonment of the Coal loader tunnel roost in the day. To be managed in accordance with revised environmental management measure B9

Adaptive management plan requirements (from 2.7 of the Biodiversity Assessment Method Operational Manual Stage 2 (DPIE 2019))	How it will be addressed in the proposed adaptive management plan for the Large Bent winged Bat population at the former coal loader
triggers for management intervention actions	• Bat population fluctuations/changing behaviour at the Coal loader tunnel outside normal range/known behaviour (based on pre-construction monitoring and previous studies (eg North Sydney Council monitoring, Hoye 2000 and Gonsalves and Law 2018)). Noise monitoring would further supplement the ability to detect and predict an impact to the species and whether management intervention is likely to be required.
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.	Mitigation measures would be developed in the adaptive management plan, informed by pre-construction baseline monitoring and potentially a preconstruction noise trial (if feasible) to determine the species response to predicted noise levels. Amendment and refinement to mitigation would be further informed by construction monitoring results. Some measures to be considered in the adaptive management plan include: • Progressively increasing the intensity of construction activities to understand the resilience of the species to construction noise • Certain activities being carried out during less sensitive times of the day for the species. The results may inform future management of microbats on other Transport for NSW projects.

Revised and new mitigation measures relevant to the Large Bent-winged Bat roost in the former coal loader are provided below in Table B5-2.

Table B5-2 Revised environmental management measures (B8, B9)

Existing EMM	Revised/new EMM
B8: Monthly monitoring of Eastern Bentwing-bats in the Coal loader tunnel during construction (in the months of March to September) will be carried out, preferably by utilising thermal camera imaging at tunnel entrances (a less invasive method than carrying out counts within the tunnel itself).	~~Monthly monitoring~~ **Monitoring** of ~~Eastern~~ **Large** Bent-winged bats in the Coal loader tunnel **prior to and** during construction (in the months of March to September) will be carried out~~, preferably by utilising thermal camera imaging at tunnel entrances (a less invasive method than carrying out counts within the tunnel itself)~~. **The frequency and methods of the monitoring will be provided in an adaptive management plan developed prior to the commencement of construction and in consultation with the Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and**

Existing EMM	Revised/new EMM
	an appropriately qualified expert in microbat biology and behaviour.
B9: Adaptive management measures (supplemented by additional monitoring if required) to minimise impacts on the Eastern Bentwing-bat will be developed in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour, if monthly monitoring during construction suggests Eastern Bentwing-bat behaviour is affected by construction noise.	**Prior to the commencement of construction of the Sydney Harbour north cofferdam (WHT6), excavation of the mainline tunnel and any rock hammering works within close proximity to the Coal loader roosting site**, ~~Adaptive~~ **adaptive** management measures ~~(supplemented by additional monitoring if required)~~ to minimise impacts on the ~~Eastern~~ **Large** Bent-winged bat will be developed in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour. **These measures will be detailed in an adaptive management plan.**

B5.2.5 Large Bent-winged Bat offset requirements

Issue raised

In relation to the uncertain prescribed impacts on Large Bent-winged Bat, the Environment, Energy and Science recommends that the approval authority, consider its discretion to require biodiversity credits to be retired, or other conservation measures to be undertaken, if the increase is justified having regard to the environmental, social and economic impacts of the proposed development, in accordance with clause 6.1(2)(b) of the Biodiversity Conservation Regulations.

Response

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

B5.2.6 Impacts on possible roost sites for other microbat species

Issue raised

Environmental management measure B12 states that pre-clearing surveys for microbat roosts will be carried out only in relation to the wharf structures to be demolished at Yurulbin Point (WHT4) and Berrys Bay (WHT7) construction support sites. Noting that Table 6-19 of the environmental impact statement states that the existing buildings within the Berrys Bay site would be retained and reused only *where feasible*, it is possible that they could be demolished or substantially refurbished. Pre-clearing surveys should apply to *any* buildings or structures with potential roosting habitat that are to be demolished or refurbished. Environmental management measure B12 should therefore be amended accordingly, with surveys to be carried out by a suitably qualified and experienced microbat specialist.

Response

The recommended amendments to environmental management measure B12 are acknowledged and considered reasonable. Environmental management measure B12 is proposed to be amended as (**bold**) in Table B5-3 (changes also included in Table D2-1 of this submissions report):

Table B5-3 Revised environmental management measures (B12)

Existing EMM	Revised/new EMM
B12: Pre-clearing surveys for microbat roosts will be carried out on the wharf structures to be demolished at Yurulbin Point (WHT4) and Berrys Bay (WHT7) construction support sites. If microbats are identified roosting in these structures, individuals will be excluded from this roosting habitat.	Pre-clearing surveys for microbat roosts will be carried out **by a suitably qualified person** on ~~the wharf structures to be demolished at Yurulbin Point (WHT4) and Berrys Bay (WHT7) construction support sites~~ **all buildings or structures with potential roosting habitat that are to be demolished or refurbished**. If microbats are identified roosting in these structures, individuals will be excluded from this roosting habitat.

B5.2.7 Clearing of native vegetation

Issue raised

The environmental impact statement indicates the project would require the removal of about 7.29 hectares of vegetation. The inclusion of environmental management measure B1 provides that "vegetation removal will be further minimised where feasible and reasonable" for minimising impacts on native vegetation and threatened species habitat during construction.

Suggested changes to environmental management measures

Environment, Energy and Science recommends the following:

- Environmental management measure B1 is amended so that the clearing of planted native species is limited to the minimum extent necessary
- Recommendation that the project includes the following additional environmental management measure: Any resident fauna potentially impacted by the removal of the trees should be relocated in a sensitive manner under the supervision of a qualified ecologist/licensed wildlife handler.

Response

Based on the outcomes of the desktop assessment and field surveys carried out for the Biodiversity development assessment report, opportunities to avoid or minimise biodiversity impacts were considered as part of the project design development, including minimising the clearing of native vegetation to the minimum required to construct the project.

Project development to date has sought to limit clearing of native vegetation to the minimum extent required to construct the project (as presented in the environmental impact statement), and environmental management measure B1 requires Transport for NSW and its contractor to explore further opportunities to minimise this impact. The environmental management measure B1 has been revised (**bold**) to clarify that clearing vegetation (including native vegetation and fauna habitat) will be further minimised where possible. Refer to Table B5-4 below (changes also included in Table D2-1 of this submissions report).

Environmental management measure B11 requires pre-clearing surveys to be carried out in accordance with *Guide 1: Preclearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011). This guide requires the use of qualified ecologists with experience in fauna handling to conduct flora and fauna searches as part of the pre-clearing process. Additionally, environmental management measure B10 requires fauna to be managed in accordance with *Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011). This guide requires the use of a licensed wildlife carer or ecologist to carry out any fauna handling. No additional environmental management measures are considered necessary.

Table B5-4 Revised environmental management measures (B1)

Existing EMM	Revised/new EMM
B1: Vegetation removal will be further minimised, where feasible and reasonable.	Vegetation removal **including the clearing of native vegetation and fauna habitat** will be further minimised, where feasible and reasonable.

B5.2.8 Storage dam at Cammeray Golf Course

Issue raised

The environmental impact statement notes the existing storage dam at Cammeray Golf course would be relocated during construction and reinstated within the north-western end of the golf course (Section 17.4.5). It indicates the new dam would be provided at the operational stage of the project (Section 17.5.6). The dam has not been identified in the biodiversity development assessment report as freshwater habitat, or even as a component of the project, nor is it identified in the freshwater ecology impact assessment (Annexure D of Appendix S (Technical working paper: Biodiversity development assessment report)).

The surface water quality and hydrology report (Appendix O (Technical working paper: Surface water quality and hydrology)) indicates the storage dam is about 45 metres by 35 metres in size and has become habitat for wildlife such as ducks (Section 4.9). Details are required as to whether the existing dam provides potential habitat for native fauna including native aquatic fauna, and/or foraging habitat for threatened fauna etc. However, habitat is marginal at best; aerial photography shows there is no fringing vegetation and no Threatened Species records are recorded in Bionet. If the dam provides habitat for native fauna, it is recommended:

- The replacement dam is constructed prior to dewatering and removal of the existing dam
- A Dewatering Plan which includes a Fauna Relocation Plan is prepared to develop a strategy regarding the transfer of any native aquatic fauna and the acclimatisation of aquatic fauna to different water conditions prior to dewatering and removing the dam. This should be included as an environmental management measure/condition of approval.

Details are required as to where the dewatering of the dam at the Cammeray Golf Course will be discharged to and whether it is proposed to discharge it to Willoughby Creek, which flows to the harbour.

<u>Suggested changes to environmental management measures</u>

Environment, Energy and Science recommends the project includes the following as an additional environmental management measure or condition of approval:

A Dewatering Plan which includes a Fauna Relocation Plan must be prepared by a suitably qualified and experienced ecologist prior to any dewatering and removal of the existing dam at Cammeray Golf course commencing. The Plan must include details on, but not be limited to, the following:

- 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
- Details of the need for a suitably qualified ecologist to be present during the dam dewatering.

Response

Construction of replacement dam

Consultation with North Sydney Council and the operators of the Cammeray Golf Club is ongoing around the most suitable location for the replacement stormwater harvesting dam within the golf course.

Transport for NSW is considering various alternative locations within the local government area in consultation with North Sydney Council to establish a permanent basin with similar capacity and function to the existing dam. Subject to timely agreement with Cammeray Golf Club and North Sydney Council regarding a suitable alternative location, Transport for NSW will install a new permanent replacement storage dam within the golf course prior to decommissioning of the existing dam, in line with revised environmental management measure WQ8 (refer to Table D2-1 of this submissions report).

Habitat values

A site inspection of the Cammeray Golf Course was conducted on the 24 February 2020 (refer to Figure B5-1 and Figure B5-2). The dam has a black plastic lining, visible in places, and cut sandstone along the edges which are partially or fully submerged. Aquatic vegetation instream and on the dam edge is minimal with *Cyperus eragrostis*, Persicaria sp. and *Paspalum dilatatum* recorded. Floating algae was observed on the dam edge. Adjacent to the dam is mown grass and planted trees and shrubs. The dam provides habitat for native and exotic disturbance-tolerant aquatic fauna (fish), foraging habitat for native and exotic aquatic birds and a water source for local terrestrial fauna, both native and exotic eg woodland birds, possums, dogs and foxes. Four bird species were observed in the dam or on the dam foreshore at the time of the site visit, all of which are native species:

- Australian Wood Duck (*Chenonetta jubata*)
- Australian White Ibis (*Threskiornis moluccus*)
- Pacific Black Duck (*Anas superciliosa*)
- Australasian Grebe (*Tachybaptus novaehollandiae*).

It is likely that the above species use the dam for foraging. Due to limited fringing vegetation, breeding is unlikely. Nonetheless, a pre-clearing check will be completed for nesting birds. If any nests are found, they will be managed in accordance with *Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011) as required by environmental management measure B10 (refer to Table D2-1 of this submissions report). Aquatic fauna handling management measures will be included in a dewatering plan as required by new environmental management measure B29 in Table B5-5 below. Refer to Section D1 of this submissions report for further information on construction environmental management plans.

No fish were observed during the site visit, though it is likely that hardy native and/or exotic fish species inhabit the dam (eg eels, mosquito fish).

Due to the limited habitat provided by the dam and urban locality, it is unlikely any threatened flora or fauna species listed under the *Biodiversity Conservation Act 2016*, the *Environment Protection and Biodiversity Conservation Act 1999* or the *Fisheries Management Act 1994* would inhabit the dam.

Management of discharges

Water from the existing dam would be discharged into Willoughby Creek, if opportunities to re-use water cannot be identified. This process would be managed in accordance with the dewatering plan as part of the construction environmental management plan. Willoughby Creek is currently equipped to receive existing stormwater inflows. Water quality would be tested prior to discharge and would

be discharged at a rate that would not significantly increase ambient flows in the creek. As such, impacts to the freshwater ecology of downstream environments is unlikely.

Figure B5-1 Cammeray Golf Course dam view looking southeast

Figure B5-2 Cammeray Golf Course dam view looking northwest

Figure B5-3 Cammeray Golf Course dam edge with exposed plastic lining, sandstone rock and fringing aquatic vegetation

Suggested changes to environmental management measures

The Environment, Energy and Science recommended addition to the project environmental management measures have been noted. The request is considered to be reasonable and a new environmental management measure B29 is proposed as provided in Table B5-5 (changes also included in Table D2-1 of this submissions report).

Table B5-5 Revised environmental management measures (B29)

Existing EMM	Revised/new EMM
N/A	**B29: A dewatering plan will be developed prior to dewatering of the stormwater harvesting dam at Cammeray Golf Course. The dewatering plan will include native aquatic fauna relocation requirements.**

B5.2.9 Urban tree canopy

Issue raised

Appendix W (Technical working paper: Arboricultural impact assessment) notes that further arboricultural investigation is necessary as some areas were inaccessible at the time of the study. This implies additional trees may be impacted. It is therefore unclear how many additional trees may be removed and greater certainty around this is required. Further detail should be provided on the breakdown of numbers of:

- Native species (local and introduced)
- Invasive/weed species
- Exotic species.

Response

Appendix W (Technical working paper: Arboricultural impact assessment) identifies trees that may be impacted directly, or indirectly as result of impacts to tree roots. The assessment is preliminary, was limited by site access and is subject to confirmation during further design development with consideration of the detailed design and construction methodologies.

Environmental management measures V8 and V9, with revised environmental management measure B1 (refer to Table D2-1 of this submissions report) will seek to minimise direct impacts to vegetation within or adjacent to the construction footprint for the project.

B5.2.10 Offsetting

Issue raised

Environment, Energy and Science also notes the record of a single plant of *Acacia terminalis* subsp. *Terminalis* from a disturbed landscaped area adjacent to Warringah Freeway within the development footprint. This plant is assumed to be of wild provenance since the location is within the known range of the species, and therefore species credits to offset its destruction have been documented (Appendix S (Technical working paper: Biodiversity development assessment report), Table 7-1). Section 7.2 of Appendix S (Technical working paper: Biodiversity development assessment report) indicates that it is proposed to use the Biodiversity Offsets Payment Calculator to determine the cost of all or part of the credit obligations and satisfy it by making a payment to the Biodiversity Conservation Fund.

Environment, Energy and Science notes and agrees that two other threatened plants – *Eucalyptus nicholii* and *Eucalyptus scoparia*, which have been identified within the project footprint – do not require offsetting because they do not naturally occur within the subject land and appear to have been planted.

Response

The comment in relation to *Acacia terminalis subsp. terminalis, Eucalyptus nicholii* and *Eucalyptus scoparia* is noted.

B5.2.11 Invasive species management

Issue raised

The project proposes to retain some invasive trees and weed species including African olive, Camphor laurel, European hackberry, Broad-leaf privet. Invasive trees and weed species should be removed and not retained, and any resident fauna potentially impacted should be relocated by a suitably qualified wildlife handler.

<u>Suggested changes to environmental management measures</u>

Environment, Energy and Science recommends the following:

- Environmental management measure B14 indicates weed species will be managed for the construction phase. Ongoing weed management and maintenance should also be undertaken following the construction phase until the areas disturbed by the project are stabilised. The weed management/maintenance should be undertaken in areas disturbed by the project during construction and areas downslope of, and/or adjoining the disturbed areas

- Recommendation that the project includes the following additional environmental management measure: Invasive trees/weed species within the project footprint shall be removed and replaced by local native provenance trees.

Response

The purpose of Appendix W (Technical working paper: Arboricultural impact assessment) is to:

- Identify trees within the project area and within 15 metres of the construction footprint
- Assess the current overall condition of the subject trees
- Evaluate their significance
- Assess potential construction impacts to the subject trees
- Identify tree management measures that could assist with tree retention.

Appendix W (Technical working paper: Arboricultural impact assessment) does not identify species that could be removed for environmental purposes rather than due to a construction impact. 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 will be detailed in the construction environmental management plan and will be carried out in accordance with environmental management measures B14 and B15 (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 roads.

Relocation procedures for any resident fauna potentially impacted during vegetation removal for the project will be addressed in the construction environmental management plan. Fauna will be managed in accordance with environmental management measure B10 (refer to Table D2-1 of this submissions report), and pre-clearing surveys will be carried out in accordance with environmental management measure B11 (refer to Table D2-1 of this submissions report).

Landscaping will be designed and maintained to ensure establishment following construction in accordance with the Strategic urban design framework for the project, which includes consideration of the *Landscape design guideline: Design guideline to improve road safety and cost effectiveness of road corridor planting and seeding* (Roads and Maritime, 2018) (Landscape design guideline). This guideline sets out maintenance requirements, including weed management. This is discussed further in Section B5.2.12 of this submissions report.

Landscaping and revegetation species are discussed in Section B5.2.13 of this submissions report. The extent of planting and particular species would be confirmed during further design development.

B5.2.12 Revegetation

Issue raised

While the project makes a commitment that “vegetation will be re-established, where feasible and reasonable…” (environmental management measure B4), the project needs to provide details of the replacement trees/vegetation. The project should achieve a net increase in tree canopy within or adjacent to the construction footprint. The submissions report should provide details on this, including:

- The number of replacement trees
- Replacement planting locations
- Replacement species.

If replacement trees cannot be accommodated within the project footprint, locations outside the project footprint should be identified for compensatory plantings. Details should be provided on locations, in addition to the points listed above.

Suggested changes to environmental management measures

Environment, Energy and Science recommends the following:

- The following bold amendments should be made to environmental management measure B4:

"Vegetation will be re-established **within the project footprint where feasible and reasonable. Where replacement trees can't be accommodated within the project footprint, locations outside the project footprint shall be identified for compensatory plantings. Trees removed by the project will be replaced at a ratio greater than 1:1. The replacement trees will consist of local native provenance species from the vegetation community that once occurred in this locality (rather than plant exotic or non-local native trees)."**

- Recommendation that the project includes the following additional environmental management measure:
  - A Landscape Plan shall be prepared and implemented and include details on:
    - The location of landscape areas and tree plantings
    - The native vegetation community (or communities) that once occurred in the locality
    - A list of local provenance species to be used in the landscaping
    - The quantity and location of plantings
    - The pot size of the trees to be planted
    - The area/space required to allow the planted trees to grow to maturity
    - Plant maintenance regime. The planted vegetation must be regularly maintained and watered for 12 months following planting. Should any plant loss occur during the maintenance period the plants should be replaced by the same plant species.

Response

The principles for designing urban elements of the project are outlined in the Strategic urban design framework and summarised in Table 22-3 of the environmental impact statement. 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 3.4.10 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, such as at Yurulbin Park, Berrys Bay and Cammeray.

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 that will be developed for the project in accordance with new environmental management measure V12 (refer to Table D2-1 of this submissions report). This will confirm the required extents of disturbed areas within the construction footprint, which will enable the number of trees requiring replacement to be more accurately quantified.

Environmental management measure V10 (refer to Table D2-1 of this submissions report) commits to restoring all areas disturbed by construction and that are not required for operation to the existing condition or in accordance with the urban design and landscape plan where applicable. For example, once the project is complete, Transport for NSW will work with North Sydney Council and

the community to develop new public open space at Berrys Bay (refer to Section 5.5.6 of Appendix V (Technical working paper: Urban design, landscape character and visual impact) for further detail). Temporary use of land will be managed and rehabilitated in accordance with environmental management measure LP2 (refer to Table D2-1 of this submissions report).

Environmental management measure B4 (shown in Table B5-6 below) clarifies that vegetation will be re-established within the project footprint where feasible, and trees removed by the project will be replaced at a ratio equal to or greater than 1:1. Where replacement trees cannot be accommodated within the project footprint, locations outside the project footprint shall be identified for compensatory plantings. The replacement trees will consist of local native provenance species from the vegetation community that once occurred in this locality (rather than plant exotic or non-local native trees) where available and subject to the urban design and landscape plan.

Further, based on the current level of design development, a likely net increase in vegetation will be achieved in the following locations:

- Yurulbin Park
- Berrys Bay
- High Street Reserve
- Arthur Street Reserve
- Anzac Park
- Ernest Street southbound on ramp
- Cammeray Park
- Warringah Freeway on cut and cover structures.

As discussed in Section B5.2.11, landscaping design and maintenance will be carried out in accordance with the Strategic urban design framework for the project and the urban design and landscape plan that will be developed in accordance with environmental management measure V12 (refer to Table D2-1 of this submissions report).

Suggested changes to environmental management measures

Environmental management measure B4 is proposed to be amended as (**bold**) in Table B5-6 below (changes also included in Table D2-1 of this submissions report). A new environmental management measure (V12) outlining the commitment to an urban design and landscape plan is also captured in Table B5-6 below.

Table B5-6 Revised environmental management measures (B4, V12)

Existing EMM	Revised/new EMM
B4: Vegetation will be re-established, where feasible and reasonable, in accordance with Guide 3: Re-establishment of native vegetation of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Vegetation will be re-established **within the project footprint** where feasible~~ and reasonable~~, in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). **Where replacement trees cannot be accommodated within the project footprint, locations outside the project footprint shall be identified for compensatory plantings. Trees removed by the project will be replaced at a ratio equal to or greater than 1:1. The replacement trees will consist of local native provenance species from the vegetation community that once occurred in this locality (rather than plant exotic or non-local native**

Existing EMM	Revised/new EMM
	trees) where available and subject to the urban design and landscape plan.
N/A	**V12: 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. 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.**

B5.2.13 Landscaping and revegetation species

Issue raised

The environmental impact statement indicates the landscape treatments aim to maximise the use of endemic species (Section 5.2.12). While Section 5.3.10 of the environmental impact statement states landscape treatments for the Warringah Freeway upgrade would include the use of native species it does not specify local native provenance species are to be used. The project provides an opportunity to improve local biodiversity by using local provenance plant species in the landscape areas. Recommendations on how to achieve this improvement are outlined below.

Suggested changes to environmental management measures

Environment, Energy and Science recommends the project includes the following additional environmental management measures:

- The landscaping for the project, tree plantings and the rehabilitation of disturbed areas shall use a diversity of appropriate local native provenance species (trees, shrubs and groundcover)
- Tree planting shall use advanced and established local native provenance trees, preferably with a minimum plant container pot size of 100-200 litres, or greater for local native tree species which are commercially available. Other local native tree species which are not commercially available may be sourced as juvenile sized trees or pre-grown from provenance seed
- Native trees to be removed are salvaged and used to enhance habitat in the landscape/rehabilitated areas including tree hollows and tree trunks (greater than approximately 25-30 centimetres in diameter and three metres in length).

Response

The Strategic urban design framework includes the requirement to incorporate endemic species where appropriate into 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). New environmental management measure V12 (outlined in Table B5-6 above and Table D2-1 of this submissions report) requires an urban design and landscape plan to be developed (during further design development) in line with the Strategic urban design framework for the project. 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. Where possible, the urban design and landscape plan would include local endemic species that reflect local ecology and habitats. This is reflected in revised environmental management measure B4 (outlined in Table

B5-6 above and Table D2-1 of this submissions report) which states that replacement trees will consist of local native provenance species where available.

Landscaping would be carried out progressively as construction progresses and would contain a mix 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.

As discussed in Section B5.2.11 of this submissions report, landscaping would be designed with consideration of the Landscape design guideline, which sets out further objectives for Transport for NSW road projects, including improvements to local biodiversity. Landscaping will be maintained until vegetation has successfully established, as per the requirements of the Landscape design guideline. This will be detailed in the construction environmental management plan.

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B6 – Department of Primary Industries - Fisheries

SEPTEMBER 2020

B6 Department of Primary Industries - Fisheries

Contents

B6.1 Marine biodiversity

B6.1.1 White's Seahorse

Issue raised

Immediately prior to construction, in any area that is potential habitat for the endangered Whites Seahorse, underwater surveys must be performed by a marine ecologist to identify and relocate any Syngnathid species to suitable alternative habitat nearby (in consultation with DPI Fisheries). A Section 37 permit under the *Fisheries Management Act 1994* must be obtained from DPI Fisheries (now referred to as the Department of Planning, Industry and Environment (Regions, Industry Agriculture and Resources)) for this Syngnathid relocation work.

Response

In response to this submission, Transport for NSW has included an additional environmental management measure (B27) for pre-construction surveys of seagrass and rocky reef habitat to be carried out by suitably qualified marine ecologists within the marine project area to search for, locate and translocate Syngnathid species that may be present to nearby unaffected habitat (refer to Table D2-1 of this submissions report).

The translocation procedure will be developed in consultation with Department of Planning, Industry and Environment (Regions, Industry Agriculture and Resources).

The need for a Section 37 permit under the *Fisheries Management Act 1994* for any translocation is acknowledged.

B6.1.2 Black Rockcod

Issue raised

Mitigation measures must also be employed to ensure that no vulnerable Black Rockcod are trapped within cofferdams.

Response

Construction of the project would be supported by two cofferdams, Sydney Harbour south (WHT5) and Sydney Harbour north (WHT6) cofferdam, which would be located within the harbour.

Potential impacts on Black Rockcod would be managed in accordance with environmental management measure B25 (refer to Table D2-1 of this submissions report), which requires the salvage of live fish, including Black Rockcod, during cofferdam dewatering. All salvaged fish will be immediately relocated to similar unaffected habitat nearby by a suitably qualified professional with appropriate catch and release experience. An inspection of the cofferdams will be carried out prior to the commencement of dewatering. Mesh covers would be placed over pumps and the rate of dewatering would be limited to prevent injury and mortality. Suitable release locations will be identified prior to commencing dewatering.

B6.1.3 Seagrass

Issue raised

The Biodiversity Study notes that the proposed dredging work has the potential to impact 300 square metres of seagrass. DPI Fisheries considers this area of seagrass to be substantial. A permit to harm marine vegetation under section 205 of the *Fisheries Management Act 1994* will be required prior to construction. Any harm to marine vegetation will require offset or compensation at a rate of 2:1, in accordance with the DPI Policies and Guidelines for Fish Habitat Conservation and Management.

Response

Section 19.4.4 of the environmental impact statement states that turbidity and sedimentation caused by dredging during the construction of the project has the potential to impact on two patches of seagrass, totalling about 0.03 hectares. However, further modelling to assess the impact of the predicted sedimentation load on seagrass habitats carried out for the project indicated that dredging operations are unlikely to substantially impact these habitats. Impacts on marine aquatic habitats, including seagrass, associated with turbidity and sedimentation would be temporary and limited to the construction phase of the project, and would not adversely impact the broader ecological functioning of marine communities. The assessment for the project also noted that seagrasses have exhibited tolerance to elevated turbidity frequently experienced in bays of Sydney Harbour and would be expected to recover fully following the construction phase. On this basis offsets for loss of seagrass are not anticipated to be required.

To further reduce the potential for impacts on seagrass, specific environmental management measures have been committed to by Transport for NSW. These measures include the installation of silt curtains around sensitive marine habitats (including seagrass habitats) (environmental management measure B19), adoption of exclusion zones to avoid disturbance to sensitive marine habitats (environmental management measure B17), minimising the velocity of discharged wastewater to avoid scour impacts (environmental management measure B18) and the ongoing monitoring of dredge plumes to validate the dredge plume dispersion predictions (environmental management measure WQ6). The complete list of environmental management measures is provided in Table D2-1 of this submissions report.

As the project is State significant infrastructure, it 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 requirement for a permit to harm marine vegetation under section 205 of the *Fisheries Management Act 1994*.

B6.1.4 Noise impacts on seahorses

Issue raised

It would be helpful to see more information on the effects of underwater noise on seahorses, as these species are less able to relocate if noise becomes harmful.

Response

As outlined in Section 19.4.4 of the environmental impact statement, underwater noise would be caused by dredging and piling during the construction of the project in Sydney Harbour. It is acknowledged that potential seahorse habitat is present within the marine project area and could support a range of seahorse species. These seahorse species likely have limited mobility, so would be sensitive to underwater noise impacts.

Little is known about the sensitivity of seahorses to underwater noise. Potential impacts may include behavioural changes in response to underwater noise generated by the project. Modelling carried out for the project indicated that underwater noise impacts would be largely limited to the immediate location of piling and dredging activities (between Sydney Harbour south cofferdam (WHT5) and Sydney Harbour north cofferdam (WHT6)). However, the modelling suggested that underwater noise impacts may extend to about 0.43 kilometres of the noise source, with the potential to impact up to 0.02 hectares of seagrass habitat and 0.79 hectares of rocky reef habitat.

As different species have different tolerance thresholds to underwater noise, there would be a range of potential responses to these impacts. Few studies exist on the impacts of underwater noise on seahorses. One study by Anderson *et al*. (2011) was carried out for lined seahorses (*Hippocampus erectus*). Although the species studied by Anderson et al. (2011) is not found in Sydney Harbour, the study indicates that seahorses in general could be adversely affected by very loud underwater noise.

The precise number of affected seahorses, including the endangered White's seahorse, although likely to be small, is uncertain, but impacts to the population in Sydney Harbour can be estimated by considering the area of potentially affected seahorse habitat relative to the area of similar unaffected White's seahorse habitat in the entire harbour. This would be a very small amount and indicates that the number of affected seahorses would be small relative to the total White's seahorse population in the estuary.

The life history of seahorses suggests that populations may be reasonably resilient (Harasti *et al.,* 2012). It is considered that a potential loss of a small number of individuals would not affect the viability of local populations. Notwithstanding this, as outlined in Section B6.1.1 of this submissions report, environmental management measure B27 has been developed to minimise adverse underwater noise impacts on seahorses (refer to Table D2-1 of this submissions report).

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B7 – Fire and Rescue NSW

SEPTEMBER 2020

B7 Fire and Rescue NSW

Contents

B7.1 Consultation

B7.1.1 Consultation during detailed design, construction and operation

Issue raised

Fire and Rescue NSW offer no comments or recommendations regarding the environmental impact statement given that limited information is available relating to the fire and life safety systems for the development. It is expected that extensive stakeholder consultation would be carried out throughout the various project phases as part of the design development such that agency requirements and considerations are addressed.

Fire and Rescue NSW request to be given the opportunity to review the draft conditions of consent when available such that any specific agency requirements may be addressed at this time.

Response

Transport for NSW will continue to consult with key stakeholders throughout detailed design, 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. 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 A-7 of this submissions report). Consultation for the project will be carried out in accordance with the Community consultation framework as per environmental management measure SE4 (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*, applicable Austroads and Transport for NSW guidelines, and the outcomes of consultation with emergency services, including Fire and Rescue NSW.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B8 – Heritage Council of NSW

SEPTEMBER 2020

B8 Heritage Council of NSW

Contents

The Heritage Council of NSW (Heritage NSW) submission focuses upon those items listed on the NSW State Heritage Register, which would be impacted by the project either directly or indirectly. The submission identifies four items listed on the State Heritage Register that would be directly impacted, and four listed items that would be indirectly impacted.

B8.1 Sydney Harbour Bridge, approaches and viaducts (SHR00781)

Issue raised

The Warringah Freeway Upgrade would require a new toll gantry at the (northbound) Lavender Street exit. The gantry would be situated on the Bradfield Highway side of the Lavender Street railway arch, which forms part of the northern approach of the Sydney Harbour Bridge. The form of the gantry would need to be refined during design development to minimise impacts to the Sydney Harbour Bridge.

Response

While no decision on tolls has yet been made, the project includes provision for tolling gantries for northbound traffic should the government elect to introduce a northbound toll.

New toll gantries would be included on northbound locations of the Sydney Harbour Bridge and Sydney Harbour Tunnel.

Environmental management measure NAH1 (refer to Table D2-1 of this submissions report) requires that the form of the tolling gantry would be designed in consultation with relevant stakeholders (such as Heritage NSW) to avoid direct impacts to the heritage item and to minimise the visual obstruction of the Lavender Street arch. All works potentially affecting the Sydney Harbour Bridge will be carried out in accordance with *Sydney Harbour Bridge Draft Conservation Management Plan 2020*.

B8.2 Nominated SHR items and the impact of the project

B8.2.1 Yurulbin Point Park and Reserve

Issue raised

Yurulbin Point Park and Reserve was nominated for listing on the State Heritage Register in 2018, based on its “significance as a parkland where nature, artefact and outstanding views framed by carefully placed trees are combined to create a landscape of high aesthetic quality. The draft statement of significance also identifies Aboriginal archaeological values as well as maritime heritage values”.

Response

The nomination of Yurulbin Point Park and Reserve to the State Heritage Register is acknowledged. The environmental impact statement assesses Yurulbin Park as a Local heritage item. Subsequent to the Heritage NSW submission, Transport for NSW requested all available information on the State Heritage Register nomination listing. In May 2020 Heritage NSW provided further advice on this matter and the State Heritage Nomination papers for Yurulbin Park (including proposed nomination and curtilage prepared by the Australian Institute of Landscape Architects) have now been considered in this submissions report.

It should be noted that Transport for NSW was subsequently advised by Heritage NSW on 9 July 2020, that the State Heritage Register Committee agreed in its meeting on 7 July 2020 not to progress the State Heritage nomination for Yurulbin Point Park at this time. However, this submissions report has considered the State Heritage values in case a future decision is made to progress this matter.

Yurulbin Park, Birchgrove is assessed as item 4 in Chapter 14 (Non-Aboriginal heritage) of the environmental impact statement and Appendix J (Technical working paper: Non-Aboriginal

heritage). Maritime heritage values associated with Yurulbin Point were considered as part of Appendix K (Technical working paper: Maritime heritage).

The project's potential impacts on Aboriginal archaeological sites at Yurulbin Point are documented in Section 15.4 of the environmental impact statement. Table 15-4 of the environmental impact statement summarises the areas of submerged Aboriginal archaeological potential between Yurulbin Point and Waverton, while Table 15-5 of the environmental impact statement lists outcomes of archaeological surveys carried out for the project.

It is acknowledged that four known sites in the vicinity of Yurulbin Point recorded on the Aboriginal Heritage Information System (AHIMS) were not surveyed during preparation of the environmental impact statement due to private property access constraints, namely:

- 5 Hands Shelter (AHIMS 45-6-2967)
- Yerroulbin Cave (AHIMS 45-6-2287)
- Long Nose Point 1 (AHIMS 45-6-1901)
- Shed Cave (AHIMS 45-6-2672).

These sites were subsequently surveyed by qualified archaeologists on 19 and 20 February 2020. The findings of that survey are documented in Appendix B of this submissions report.

State Heritage Register nomination

Table B8-1 presents the local environmental plan significance assessment against the information prepared for the nomination of Yurulbin Park to the State Heritage Register (updated significance assessment). Consideration of the updated significance assessment, and potential impacts from the project is also discussed. As stated earlier, the State Heritage Register Committee recently advised in July 2020 they will not be progressing the State Heritage nomination for Yurulbin Point Park at this time. However, this submissions report has considered the State Heritage values in case a future decision is made to progress this matter.

Table B8-1 Local environmental plan significance assessment, State Heritage Register nomination

Criterion	Leichhardt Local Environmental Plan 2013	Nomination to the State Heritage Register 2018 updated significance assessment	Consideration of updated significance assessment and potential impacts from the project
A – Historical significance	The Park is of high local historic significance as part of the early subdivision and waterfront development of the local area from the 1860s. Its development as a public park from the 1970s represents the closing of maritime activities in the area and shift away from industrial to primarily residential use of the area and public use of prime waterfront sites. The park significantly retains a sense of the former slipway that remains as a reminder of the former use of the site.	Yurulbin Point Park and Reserve, at Birchgrove (1973-76), is of historic significance on a State level as one of the first modern Sydney parks created from former derelict industrial sites, transforming industrial land to public use. Its design, together with that of Illoura Reserve, brought native vegetation back to inner city sites, challenged notions of conventional inner city parks, and became iconic examples of modern city park design. The development of Yurulbin Point Park and Reserve was a continuation of the gesture, which had begun with Illoura Reserve, in 1970 (formerly Peacock Point), in the bicentennial year of Captain Cook's landing at Botany Bay. The 1974 Master Plan for Long Nose Point to transform the former site of Morrison and Sinclair Shipbuilding Works to a park that echoed the vegetation of Ball's Head Reserve across the Harbour nearby established Bruce Mackenzie's place as an innovator in Australian park design or 'Alternative Parkland'. This approach was a direct response to the place and without denying its industrial past, it brought back native vegetation to the foreshore. The underlying sandstone was brought to the fore and in many places scraped back to provide an easily maintained surface and remnant pre-existing industrial structures provided design inspiration. This set a new direction in approach that subsequent generations of designers have developed.	As noted in Section 5.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage): *"The design of the project works at Yurulbin Park have been developed in consultation with Bruce Mackenzie, the original designer of the park. This has resulted in a design that minimises impacts to significant features and changes to the permanent landform at Yurulbin Park. Some mature trees within the park would be directly impacted, but areas of exclusion have been identified and replacement plantings would be provided on completion of construction as part of the redesign. Opportunities to temporarily remove, store and reinstate certain elements such as stone flagging, stone walls and steps would be investigated and implemented if these elements need to be temporarily removed.* *While permanent impacts would occur to areas of archaeological potential during site establishment, specialist investigations would provide an opportunity to obtain information about the archaeology and history of the site not available from other sources. Reinstatement works following the completion of construction would be designed in consultation with Bruce Mackenzie. The new design would seek to retain and enhance the existing character and the original design intent as much as possible. These works would also improve the quality and long-term*

Criterion	Leichhardt Local Environmental Plan 2013	Nomination to the State Heritage Register 2018 updated significance assessment	Consideration of updated significance assessment and potential impacts from the project
		Yurulbin is of historic significance for its commemoration of the Aboriginal history at the tip of Birchgrove and for its importance as a place of confluence of Aboriginal and European values. Evidence of Aboriginal occupation in the vicinity of the place in the form of middens has imbued an association with the Wangal people to the site. It is of importance as a site of reconciliation between Aboriginal/Torres Strait Islanders and non-indigenous Australians following the first Week of Prayer for Reconciliation in 1993. Reconciliation was symbolised in a renaming of the point to Yurulbin in a ceremony in 1994 in which Federal Minister for Aboriginal and Torres Strait Islander Affairs, Hon Robert Tickner, launched the Commonwealth Government's Local Government Reconciliation Program.	*viability of landscaping and usability of the park."* In relation to the historical significance of the heritage item for its Aboriginal history and heritage, the middens described as being in the vicinity of the heritage item have been addressed in Appendix L (Technical working paper: Cultural heritage assessment report). The four registered Aboriginal sites (comprising rock shelter, midden and art sites) are identified in Figure 4.2, Table 6.2 and impacts to these assessed in Table 8.3 of Appendix L (Technical working paper: Cultural heritage assessment report). The State heritage nomination discusses the significance of a commemorative plaque related to the first Week of Prayer for Reconciliation. A new environmental management measure (NAH25) has been included to address this issue. The environmental management measure states that the commemorative plaque will be protected or temporarily removed for the duration of construction and then reinstated as part of the rehabilitation of the park after construction is completed, in consultation with relevant Aboriginal representatives (refer Table D2-1 of this submissions report). In addition to the above, as stated in Section 5.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage), the direct impacts to the heritage item would also be managed through preparation of a conservation management plan "*identifying those original designed features and remnant elements of*

Criterion	Leichhardt Local Environmental Plan 2013	Nomination to the State Heritage Register 2018 updated significance assessment	Consideration of updated significance assessment and potential impacts from the project
			Aboriginal and non-Aboriginal use of the site that can be conserved, retained or reconstructed to enhance the heritage significance of the heritage item." This requirement has been included as environmental management measure NAH24 (refer to Table D2-1 of this submissions report). Also, an archival photographic recording of the entire heritage item, and a condition survey of stone flagging, steps and elements will be carried out prior to construction works commencing in accordance with environmental management measures NAH5, NAH6 and NAH9 (refer to Table D2-1 of this submissions report).
B – Historical association significance	The site is associated with a number of local land speculators and developers and local maritime and shipping industries which developed here from the 1860s. From the early decades of the 20th century it was associated with Morrison and Sinclair Pty Ltd, shipbuilders, who acquired and used the site until the 1970s. The park is associated with prominent landscape architects Bruce Mackenzie and Associates, and Leichhardt Municipal Council.	Yurulbin Point Park and Reserve is of historic significance for its association with landscape designer Bruce Mackenzie (b.1932) and his associates, including landscape architect Catherin Bull. Mackenzie was one among a small group of practitioners, who during the late 1960s -1970s, formulated a modern, ecological approach to landscape design, complementary to the Sydney School of architects. This movement was shaped by environmentalism, a design ethos that grew out of a distinctly non-horticultural approach to planting and a dismissal of modernist featurism. The main protagonists were Harry Howard (1930-2000), Bruce Mackenzie (b.1932) and Bruce Rickard (1929-2010), who ran individual practices and Allan Correy, (1931-2016), who from 1967-70 headed the Landscape Section of the Public Works Department of NSW.	This aspect of Yurulbin Park's significance would be managed as stated above (against Criterion A), and is presented in Section 5.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage). The association with Bruce Mackenzie would be strengthened through his ongoing involvement with the design of the project to minimise impact to the Park, and with his involvement in the new Park design following construction.

Criterion	Leichhardt Local Environmental Plan 2013	Nomination to the State Heritage Register 2018 updated significance assessment	Consideration of updated significance assessment and potential impacts from the project
		Yurulbin Reserve is also associated with Modernist architect and planner Nigel Ashton (1911-2008) and Lindsay Robertson (1936-1974), the first landscape architect appointed to the State Planning Authority, who implemented the principles outlined in the Sydney Harbour Foreshore Study (December 1967). Ashton and Robertson, who raised a new awareness for landscape values at the time, were at the State Planning Authority and played a critical role in acquiring a number of sites for harbourside parks, including Peacock Point and Longnose Point.	
C – Aesthetic significance	The Park is of high local aesthetic significance due to its Harbour side location, rock outcrops and stone walls and sequence of spaces created by built structures and plantings. The park design demonstrates two philosophies that were dominant in landscape design in the 1970s – one was to attempt to design within an ecological framework using native plants to create an environment in sympathy with its natural environs, and the other sought to create a “natural” environment and escape in an urban context.	Yurulbin Point Park and Reserve is of aesthetic significance at a State level for its ability to demonstrate the evolving philosophy of 'Alternative Parkland' of both a prominent landscape designer, Bruce Mackenzie and the broader ethos of the Sydney Bush School of landscape architecture. Mackenzie's incorporation of the identifiable industrial past into the park's design demonstrates his developing ability to work in this idiom. It is considered one of the icons of 1970s inner city park design and of the full flowering in New South Wales of the Modern Movement in landscape architecture, which embraced environmental design as a holistic approach to making spaces for people to live. Yurulbin Park is of significance for the use of Australian native trees and shrubs in an inner city context, unusual for the early 1970s; for the use of recycled building stone, wharf piles and discarded telephone poles so that	This aspect of Yurulbin Park’s significance would be managed as stated above (against Criterion A), and presented in Section 5.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage), particularly with the ongoing involvement of the original landscape architect, Bruce Mackenzie. In relation to the park design paying ‘homage to the seawalls and wharves of the ‘old’ Sydney Harbour’ through its use of recycled stone, wharf piles and discarded telephone poles, the proposed archaeological investigation of the actual industrial maritime use of the site as part of ‘old’ Sydney Harbour’s history, has the potential to provide further information and possibly material remains that could form part of the future design, supporting and enhancing its aesthetic significance. For further discussion regarding historical archaeology at Yurulbin Park, see Section B8.3.1 of this submissions report.

Criterion	Leichhardt Local Environmental Plan 2013	Nomination to the State Heritage Register 2018 updated significance assessment	Consideration of updated significance assessment and potential impacts from the project
		the park is a homage to the seawalls and wharves of the 'old' Sydney Harbour. At Yurulbin nature and artefact are combined in a landmark Sydney Harbour location with outstanding views framed through carefully placed trees resulting in a landscape of high aesthetic quality. Its layout, transition between levels, exposed rock surfaces, sea walls and tree groupings combine to provide an environment that seems removed from its city location, a quality which adds to its appeal.	
D – Social significance	The area is of social significance to the local and wider community as an open public foreshore park area.	The reserve is highly valued for its benchmark status as the work of a prominent landscape architect by members of the Australian Institute of Landscape Architects (AILA). Yurulbin Reserve was awarded the 1986 Australian Institute of Landscape Architects Award of Merit. In 2016 Yurulbin was selected as one of the ten most significant works of Australian landscape architecture 1966–2000 by AILA. These projects represented the foundations of the landscape architecture profession in Australia and the best of their time. The peninsula park reserve has a strong association with local Aboriginal people within the Inner West.	This aspect of Yurulbin Park's significance would be managed as stated above (against Criterion A), presented in Section 5.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage), particularly with the ongoing involvement of the original landscape architect, Bruce Mackenzie.
E – Research potential	The Park retains some remnant stone outcrops, sea and stone walls which reveal information of the earlier character and development of the area	There is no archaeological potential as the site has been reshaped for industrial use and then for the design of the park.	The assessment against Criterion E suggests that only Aboriginal archaeology was considered. No historical archaeological assessment related to the industrial maritime use of the heritage item, which is noted as

Criterion	Leichhardt Local Environmental Plan 2013	Nomination to the State Heritage Register 2018 updated significance assessment	Consideration of updated significance assessment and potential impacts from the project
	(including earlier buildings associated with the shipyard).		part of its significance, has been provided in the State Heritage Register nomination. Response to Heritage Council comments related to the historical archaeology of Yurulbin Park are addressed in see Section B8.3.1 of this submissions report.
F – Rarity	Like the Illoura Reserve, the Park is a relatively rare environment and cultural landscape that retains some evidence of the early use of the Balmain waterfront and evidence of landscape philosophies of the 1970s.	Yurulbin Reserve is rare for its status as an early example of a Sydney Bush School foreshore park on Sydney Harbour and is a benchmark as one of the earliest attempts to reclaim the qualities of a lost indigenous landscape.	This aspect of Yurulbin Park's significance would be managed as stated above (against Criterion A), and presented in Section 5.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage), particularly with the ongoing involvement of the original landscape architect, Bruce Mackenzie, and the preparation of a conservation management plan that would consider all aspects of its significance, Aboriginal and non-Aboriginal heritage.
G – Representa-tiveness	Yurulbin Park is one of two waterfront parks in the local government area designed by Bruce Mackenzie and Associates between 1972 and 1977. The firm also designed Illoura Reserve in 1970.	Yurulbin Reserve is a fine, early example of the Sydney Bush School of landscape architecture in New South Wales, which is characterized by environmentally aware, site responsive designs, inspired by the Hawkesbury Sandstone landscape and its rock formations and flora of nearby Sydney Harbour landscape.	This aspect of Yurulbin Park's significance would be managed as stated above (against Criterion A), and presented in Section 5.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage), particularly with the ongoing involvement of the original landscape architect, Bruce Mackenzie, and the preparation of a conservation management plan that would consider all aspects of its significance, Aboriginal and non-Aboriginal heritage.

B8.2.2 Balls Head Coal Loader Complex

Issue raised

Balls Head Coal Loader Complex is being considered for Notice of Intention to List at the State Heritage Register Committee meeting of 31 March 2020. Transport for NSW is aware of the nomination. Appendix J (Technical working paper: Non-Aboriginal heritage) has not assessed the Balls Head Coal Loader as a complex, rather it focuses on the coal loader pier as an individual item. The environmental impact statement does not acknowledge the item's current status or its nomination to the State Heritage Register, and the full impact to this nominated State Heritage Register item. It advises the coal loader pier (only) will be managed within an exclusion zone, but no details are provided around vibration monitoring, or its impact on the adjacent Coal Loader seawall/unloading wharf, and management by the project or commitments to this end.

The project places the new cofferdam such that it abuts the current seawall/unloading wharf, and these overlap with the current proposed State Heritage Register curtilage for the Balls Head Coal Loader Complex. The project has not assessed how the placement of the new cofferdam will affect the sea wall/unloading wharf which is within the currently proposed curtilage of the Balls Head Coal Loader Complex. The full impact to this nominated State Heritage Register item does not appear to have been adequately addressed in the environmental impact statement, contrary to the Secretary's environmental assessment requirements. This should be addressed.

Response

Potential direct and indirect impacts on the former Balls Head Coal Loader are assessed in Section 14.4 of the environmental impact statement, Section 5.4.5 of Appendix J (Technical working paper: Non-Aboriginal heritage) and Section 8.6 of Appendix K (Technical working paper: Maritime heritage).

State Heritage Register nomination

The nomination of Balls Head Coal Loader to the State Heritage Register is acknowledged.

Section A.5.4 of Appendix J (Technical working paper: Non-Aboriginal heritage) presents the significance assessment for the former Balls Head Coal Loader as per its current listing under the North Sydney Local Environmental Plan 2013. Requests for further information by Transport for NSW regarding the nomination to the State Heritage Register were made during the preparation of Appendix J (Technical working paper: Non-Aboriginal heritage), but no further information was provided on the State level assessment or nomination prior to the technical working paper and environmental impact statement going on public exhibition. Transport for NSW have been advised by the specialist who prepared Appendix J (Technical working paper: Non-Aboriginal heritage) that the impact assessment was carried out with State level significance in mind and that the same guidelines and methodology is applied regardless of whether a place is of State level significance or local level significance (or National significance) to assess the impacts on the particular aspects of heritage significance that a place has. It was also considered that the reasons for which the place was being nominated to be of State level significance would unlikely be different to the reasons it was of local significance (that is the specific significance criteria such as historical significance, aesthetic significance, rarity etc). Further, the assessment of impacts and the management measures would not change whether the former Balls Head Coal Loader was assessed as being of State level or local level.

Section 3.2.3 of Appendix K (Technical working paper: Maritime heritage) does identify that the former Balls Head Coal Loader has been nominated and is currently under consideration for listing on the State Heritage Register. Table 13 of Appendix K (Technical working paper: Maritime heritage) also evaluates the former Balls Head Coal Loader as being of overall State heritage significance; specifically of State heritage significance under Criterion C (aesthetic/technical) and Criterion F (comparative rarity).

Subsequent to the Heritage Council submission, Transport for NSW requested all available information on the State Heritage Register nomination listing for the Balls Head Coal Loader Complex, including the draft curtilage. In May 2020, the Heritage Council provided further advice on this matter and the information provided has now been further considered in this submissions report.

Assessment as a complex

The assessment of the former Balls Head Coal Loader complex was divided into consideration of terrestrial impacts to non-Aboriginal heritage in Appendix J (Technical working paper: Non-Aboriginal heritage) and maritime impacts to non-Aboriginal heritage in Appendix K (Technical working paper: Maritime heritage). The impacts and mitigation measures from Appendix K for maritime heritage were summarised in the Statements of Heritage Impact provided in Appendix J (Technical working paper: Non-Aboriginal heritage).

Section 2.2 and Section 2.3 of Appendix K (Technical working paper: Maritime heritage) do not address the former Balls Head Coal Loader as an overall complex including terrestrial elements, as the maritime study area was specifically limited to areas of the bed of the harbour (known or likely), foreshore reclamation within the proposed development footprint, and components of heritage sites that have a land/water interface such as seawalls, slipways and wharves.

Appendix K (Technical working paper: Maritime heritage) or Appendix J (Technical working paper: Non-Aboriginal heritage) do not specifically address the nominated State Heritage Register curtilage of the former Balls Head Coal Loader. It is understood that the boundaries of the nomination are still under discussion and yet to be finalised. Figure 39 of Appendix K (Technical working paper: Maritime heritage) illustrates the study area (Area A) as covering all of the maritime area potentially impacted by the project, including the nominated draft curtilage for the Balls Head Coal Loader Complex provided in the State Heritage Register nomination papers. Appendix J (Technical working paper: Non-Aboriginal heritage) assesses the land-based impacts within the existing Local Environmental Plan heritage boundary for the former coal loader and summarises the maritime-based impacts. Therefore, the impacts to the whole complex have been assessed.

Impacts to sea wall/former Balls Head Coal Loader

The cofferdam would be located within several metres of the seawall of the former Balls Head Coal Loader (unloading wharf). The top of the tunnel would be around 20 metres below the water surface at this location.

Table 5.12 of Appendix J (Technical working paper: Non-Aboriginal heritage), states there would not be any direct land impacts on the heritage item.

Section 8.1 of Appendix K (Technical working paper: Maritime heritage) advises that the Sydney Harbour north cofferdam (WHT6) would not abut the seawall and unloading wharf of the former Balls Head Coal Loader; rather the project has been designed in a way that the cofferdam would be positioned at an appropriate distance from both the seawall and unloading wharf in order to avoid direct impacts. Section 8.6 of Appendix K (Technical working paper: Maritime heritage) also determined that there does not appear to be any potential remains of maritime infrastructure or cultural deposits on the bed of the harbour within the footprint of the proposed cofferdam. It was assessed as improbable that the installation of, and excavation within, the cofferdam would have any direct impact on the maritime components of the Former coal loader, and that should such an impact occur, the effect on the heritage values of the site would be minor.

Vibration impacts

The vibration impacts to the entire structure of the Balls Head Coal Loader are considered in both Appendix K (Technical working paper: Maritime heritage) and Appendix J (Technical working paper: Non-Aboriginal heritage).

Section 8.6 of Appendix K (Technical working paper: Maritime heritage) addresses the issue of potential vibration impacts to the maritime components of the former Balls Head Coal Loader. The assessment utilises information in Appendix G (Technical working paper: Noise and vibration) in

relation to potential impacts due to construction of the cofferdam at Balls Head (Sydney Harbour north cofferdam (WHT6)) and mainline tunnelling beneath the former Balls Head Coal Loader seawall. The maritime assessment identifies that vibrations associated with the construction of the cofferdam and mainline tunnelling would reach the threshold for possible cosmetic damage to maritime heritage infrastructure at Balls Head Coal Loader (defined as “unsound structure”), which would result in a minor reduction in maritime heritage values through physical loss of integrity.

The maritime assessment determines that the potential risk and level of impact associated with vibration could be reduced to negligible if the mitigation measures recommended in Table 8.6.5 of Appendix K (Technical working paper: Maritime heritage) are carried out. One of these recommended measures, referred to as Mitigation Measure F, was not included in the environmental management measures presented in Section 14.5 of the environmental impact statement due to an omission error. This measure relates to the carrying out of requisite steps to reduce vibration and settlement impacts on sensitive maritime heritage sites and recommends that the actions in Appendix G (Technical working paper: Noise and vibration), as required by environmental management measure CNV6. The assessment of vibration impacts presented in Table 5-12 of Appendix J (Technical working paper: Non-Aboriginal heritage) also identifies that vibration levels at the Former coal loader are predicted to exceed screening criteria. In this circumstance, it was similarly intended that environmental management measure CNV6 (refer to Table D2-1 of this submissions report) would apply, however this link was not included in the environmental management measures presented in Section 14.5 of the environmental impact statement.

These omissions have been corrected with inclusion of an additional environmental management measure NAH22 (refer Table D2-1 of this submissions report) which now links management of non-Aboriginal heritage items with environmental management measure CNV6. The omissions have also been included as clarifications in Section A4.2 of this submissions report.

Further, in response to the Heritage Council submission, a new environmental management measure NAH23 for the former Balls Head Coal Loader and seawall has also been included (refer Table D2-1 of this submissions report) as follows:

> *‘For the former Balls Head Coal Loader and seawall, where vibration levels are predicted to exceed the standard minimum buffer distances to achieve screening levels, a detailed structural assessment will be carried out before construction commences to determine appropriate vibration criteria and site-specific minimum working distances to achieve this criteria. The detailed assessment will specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is protected. During detailed design, the construction methodology will be refined as needed to ensure the adopted criteria and site-specific minimum working distances for all vibration-intensive activities (eg. compaction, rock hammering, piling) can be met. During construction, site-specific buffer distances would be maintained to comply with relevant vibration limits for cosmetic damage, and vibration monitoring will be carried out to ensure vibration levels remain below the appropriate limits for the structure’.*

Environmental management measures

A number of environmental management measures are listed in Table D2-1 of this submissions report that are specific to various elements of the former Balls Head Coal Loader Complex, including:

- A Maritime Heritage Management Plan (NAH16)
- Archival recording prior to works commencement (NAH18)
- An exclusion zone around the Balls Head Coal Loader Wharf (NAH21)
- Management of vibration and settlement impacts on sensitive maritime heritage sites (NAH22) (linking to CNV6 – minimum buffer distances)

- Management of vibration at the former Balls Head Coal Loader and seawall (NAH23).

It should be noted that Mitigation Measure E in Appendix K (Technical working paper: Maritime heritage) refers specifically to the 'Balls Head Coal Loader wharf', however the intention was that it refers to 'all maritime infrastructure associated with the former Balls Head Coal Loader'. This has been amended in the wording of environmental management measure NAH18 (refer to Table D2-1 of this submissions report) and included as a clarification in this submissions report (refer to Section A4.2 of this submissions report).

Further environmental management measures are listed in the environmental impact statement in regard to the control and management of construction vibration both generally and specifically in relation to heritage structures, including:

- Construction Noise and Vibration Management Plan (CNV1)
- Detailed Construction Noise and Vibration Impact Statements (CNV2)
- Construction noise and vibration monitoring (CNV4).

B8.3 Archaeological assessment

Heritage NSW notes an historical archaeological assessment was prepared for the project by Jacobs (Appendix J). It investigated two items which will be directly impacted by the works, these are Yurulbin Park in Birchgrove and the BP site in Waverton.

B8.3.1 Yurulbin Park

Issue raised

In respect of Yurulbin Park, Heritage NSW asserts that:

- The Appendix J archaeological assessment is based on an earlier statement of Heritage Impact (SOHI) prepared in 2017. A SOHI is not an archaeological assessment consistent with Heritage Council guidelines
- The assessment has not addressed how the site retains historical archaeological research potential. The assessment should address current Heritage Council guidelines including *Assessing Significance for Historical Archaeological Sites and Relics 2009*
- The Research Design and Excavation Methodology is unclear in explaining the archaeology of Yurulbin Park, and the research design has not demonstrated that there is a heritage resource to manage
- The research designs should have a consistent approach to managing artefact assemblages, and should be updated to address artefact sampling (where appropriate) and ongoing collection management
- A report template for the project should be produced, to enable preparation of a comprehensive final excavation report for this project which is consistent with Heritage Council requirements for archaeological work.

Response

Statement of heritage impact

In referring to an earlier statement of heritage impact prepared in 2017, Heritage NSW is referring to a report prepared as part of the project for early geotechnical works within Yurulbin Park. This earlier statement of heritage impact was just one of the reports which was used when gathering and synthesising information about the site to prepare the archaeological assessment (refer to Section A.4.6 of Appendix J (Technical working paper: Non-Aboriginal heritage)).

Historical archaeological research potential

Yurulbin Park offers a moderate level of archaeological research potential arising from the use of the site by Morrison and Sinclair for ship building activities from the 1920s to the 1970s. There may be evidence of the shipyard structures, and related deposits or ancillary features such as rubbish deposits and drains. These features have the potential to yield information about the history of the site, the 20th century local shipbuilding industry, and the role of Sydney Harbour in Sydney's maritime history, which are not available through other historical or documentary sources.

The area of archaeological potential is shown in Figure A.4.15 of Appendix J (Technical working paper: Non-Aboriginal heritage).

Further archaeological assessment is provided below, based on the historical background provided in Section A.4.1 of Appendix J (Technical working paper, Non-Aboriginal heritage)), the *Western Harbour Tunnel and Beaches Link, Yurulbin Park: Statement of Heritage Impact* (Geotechnical Works) (Roberts, 2017) and information obtained during a field survey carried out in September 2017. Further details of maritime archaeology, including along the coastline of Yurulbin Park, is provided in Appendix K (Technical working paper: Maritime heritage), prepared in accordance with the guidelines Assessing Significance for Historical Archaeological Sites and Relics (NSW Heritage Branch, 2009).

Research Design and Excavation Methodology

The Heritage NSW submission refers to the Research Design and Excavation Methodology being "unclear in explaining how the archaeology of Yurulbin Park would or could contribute to an understanding of shipbuilding activities and development in NSW from the 1920s to the 1970s". This explanation or assessment would have occurred in the Archaeological Assessment section of the report, not the Research Design and Excavation Methodology, as indicated. In response to this issue raised, the Archaeological Assessment (refer to Section A.4.6 of Appendix J (Technical working paper: Non-Aboriginal heritage)) has been updated and provided below. This should be read in conjunction with the history, description and historical photos and plans provided in Section A.4 of Appendix J (Technical working paper: Non-Aboriginal heritage).

Potential for presence of archaeological remains

There is one area of archaeological potential within Yurulbin Park, the site of the 1920s Morrison and Sinclair shipyard as shown on Figure A.4.15 of Appendix J (Technical working paper: Non-Aboriginal heritage). Established in 1923 at the site, they operated until 1971–72, when the site was acquired by the State Planning Authority and developed into the park which exists today. A historical photograph from 1927 in Figure A.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage) illustrates a timber, two to three storey structure situated beside the slipway. The slipway remains in the park today (Figure A.4.10 of Appendix J (Technical working paper: Non-Aboriginal heritage)). The site was extensively developed, as indicated by the 1943 aerial imagery (Figure A.4.14 of Appendix J (Technical working paper: Non-Aboriginal heritage)), with structures occupying almost the entire waterfront on the eastern and southern sides of what is now Yurulbin Park.

The open grassed area comprising the east half of the park (Figure A.4.9 of Appendix J (Technical working paper: Non-Aboriginal heritage)) does not show surface evidence of any archaeological remains of the 1920s shipyard. However, it appears this area of the park has only been subject to relatively low levels of landscaping. The flat area along the southern section of the park also shows no obvious evidence of subsurface archaeological remains (Figure A.4.11 of Appendix J (Technical working paper: Non-Aboriginal heritage). It is assumed that the shipyard structures shown in the 1943 aerial imagery, including the one shown in Figure A.4.4 of Appendix J (Technical working paper: Non-Aboriginal heritage), were demolished as part of the redevelopment of the site into Yurulbin Park in the 1970s. The history provided as part of the State Heritage Register nomination prepared for Yurulbin Park indicates that "The budget for the park, designed for the State Planning Authority NSW and the Leichhardt Municipal Council was constrained" (page 8). This would suggest that an approach that required less time/effort may have been employed. This could include covering of any remnants of the demolition of the shipyard or any features already within the ground

surface (such as building footings, drains, rubbish pits) with a layer of fill, rather than wholesale excavation of such evidence down to original/early ground surface.

Depending on the extent of demolition and disturbance during the park development, there is some potential for subsurface archaeological evidence of the structures and activities of the 1920s shipyard to still remain. While the structural evidence related to timber buildings may be unobtrusive, there may be some evidence of these structures, such as post pits, concrete flooring, discarded construction materials and demolition refuse. Additionally, there is some potential for other archaeological features including rubbish deposits or pits, or drainage features preserved below former ground levels.

History and significance of shipbuilding in Sydney Harbour

In addition to the history of the site of Yurulbin Park provided in Appendix J (Technical working paper: Non-Aboriginal heritage), some general history related to shipbuilding in Sydney Harbour is provided to support the updated archaeological assessment. The following information is from the Sydney and Middle Harbours Heritage Study (Godden Mackay 1991).

> *The 1870s through to the 1900s were the most active years for shipbuilding in Sydney Harbour. During the depression of the 1890s many smaller shipyards disappeared, but World War I saw an increased demand for ship repairs. By the late 1920s another major downturn saw many shipbuilders forced out of the industry around the Harbour. The demand for new builds continued to wane until World War II. The war brought an increased demand for new vessels large and small, as well as the conversion of boats for wartime service. Post-World War II, new technologies in shipbuilding and the rapid decline of coastal shipping as a preferred transport mode saw many shipyard closures around the Harbour. Additionally, many waterfront shipbuilding businesses moved on due to the changed requirements of new materials like fibreglass and concrete, and increasing demand (and prices) for waterfront land for residential development.*

Godden Mackay (1991:156, 159) assessed the heritage significance of places around the Sydney Harbour foreshores, with the following statements about shipping and maritime industries:

- *'The harbour foreshores are inextricably linked with Australian shipping and maritime industries; for a long time the lifeblood of the colony and the technological basis of Australian society in its early years*
- *The built fabric of the harbour foreshores represents the response of Sydneysiders to different phases of the city's history and economic development*
- *The harbours retain physical evidence of most phases of the colony's history, and the different roles they have played during that period*
- *The foreshores of Sydney and Middle harbours include the sites of innumerable former maritime and industrial enterprises, and other archaeological sites, some of which are now buried beneath reclaimed land. As a result, the harbour foreshores have considerable archaeological value.'*

Archaeological investigations of shipbuilding activity in Sydney Harbour

A number of harbourside archaeological sites with histories of shipbuilding and other maritime industrial activities have been investigated in the vicinity of Yurulbin Park (Casey and Lowe, 2018) and are outlined in Table B8-2. A brief comparison to the history and nature of the potential site at Yurulbin Park is provided, highlighting in particular information of relevance to understanding a shipyard operation dating to the early to mid-20th century.

Table B8-2 Comparative harbourside archaeological sites in proximity to Yurulbin Park (Casey and Lowe 2018)

Archaeological site	Key relevant findings
Balmain East Transport Interchange Upgrade, Artefact Heritage, 2015	Potential for presence of former buildings of Bell and Fenwick boat yards beneath extant retaining wall structure, operating throughout the late 19th century. Test excavation revealed reclamation fills with dressed sandstone blocks and glass and ceramic fragments, but no structural remains or occupation deposits identified in either test trench.
International Conference Centre Hotel, Casey and Lowe, 2014	Archaeological excavation provided evidence of the Darling Harbour Goods Yard which operated on the site during the late 19th and early 20th century, including structural remains related to drainage and reclamation. Evidence for the flooring of the Outward Goods Shed of the Darling Harbour Goods Yard, built in 1902.
2-8 Weston Street, Balmain East, Casey and Lowe, 2012	Archaeological excavation revealed evidence of the maritime industry operating at the site from the 19th century: • 1788-1840: Some topographical features of natural landscape • 1840s-1880s: Hayes' Boatyard and John Bell's shipyard – post holes, sandstone blocks, linear impressions of floor structure, retaining wall, copper alloy boat nails, vessel related artefacts • Late 19th century – 1960s: End of shipyard, Fenwick's Tug and Water Boat business – landscaping and fill events, domestic artefact associated with houses on Weston Street, maritime-related artefacts, mixed nature of fills demonstrate impact of late 19th to mid-20th century development on site.
Barangaroo South, Casey and Lowe, 2012	Evidence of reclamation fill events from 1830s-1840s to extend properties into the harbour and create wharves, jetties and flat spaces for warehouses and stores. Substantial archaeology on top of reclamation fills including wharves, jetties, slipways, yard surfaces, building footings dating from 1830s-1890s, and artefact-rich deposits.
Barangaroo Headland Park, Austral Archaeology, 2012	Associated with Moore's Wharf, and a sequence of wharves, land reclamation and association with 19th century commercial structures. Wharves Site: main feature uncovered included a network of tie irons (c. 1910), series of wooden wharf piles, sandstone surface, early cuts and fill deposits, cobbled surface, and sandstone wall footings. Shipyards Site: Extensive and complex archaeological material related to two shipyards, one built on top of the other. Included seawalls, slipways, wharf remnants, cesspit, working surface of Cuthbert's shipyard, and 20th century warehouse footings, basement floor and demolition fill.
Darling Quarter, Casey and Lowe, 2008	Early 19th century site home to shipbuilders, merchants, and various manufacturers. Archaeological excavation revealed substantial remains of this period including industrial and household waste deposits, slipways, jetties, walls, reclamation deposits, drains, wharves, sheds, warehouses, stables, and office building, dating from 1820s through to 1880s.

Archaeological site	Key relevant findings
63-65 Kirribilli Avenue, Casey and Lowe, 2000	Occupied by two houses from around 1868. Likely impacts from a later 1920s house and terracing of land below 63 Kirribilli Avenue, archaeological investigation not carried out there. Excavations at 65 Kirribilli Avenue inside and in the yard revealed almost no archaeological deposits or artefacts, despite limited evidence of later disturbance.
'Greencliffe', 51-53 Kirribilli Avenue, Casey and Lowe, 1995	Excavation of 1860s building before demolition of the building, under the floor level, and in the corner of the property where an 1860s cottage once stood. Few deposits dating to the 19th century under floorboards; poorly preserved archaeology in location of former cottage.
Neptune Engineering Slipway, Godden Mackay, 1990	Monitoring of excavation for sewer deviation near the 1909 Neptune Engineering site, a general boatbuilding and repair works in Lavender Bay. Slipway still present in 1990, including sandstone masonry, slipway pavement, rails and outer walls. Trench excavation revealed former seawall, but no other significant features or deposits.

As this comparison shows, the majority of harbourside excavations have focused on sites dating to the 19th century, with limited focus on the 20th century. There is variation in the recovery of intact archaeological remains, from limited results through to substantial, complex features and deposits. There has been however, evidence of 20th century activities recovered on a few of the sites, where not destroyed by subsequent occupation or activity. It should be noted that except where later site formation processes favoured preservation in situ, that the archaeological resource was generally heavily impacted, and only latent structural features, such as those preserved within the bedrock tended to survive legibly.

Significance of potential archaeological remains

The significance of the potential archaeological remains present at Yurulbin Park, related to the use of the shipyard is assessed in Table B8-3.

Table B8-3 Assessment of significance for archaeological sites and relics for Yurulbin Park

NSW Heritage Criteria for Assessing Significance related to Archaeological Sites and Relics	Assessment
Archaeological Research Potential (NSW Heritage Criterion E)	It is expected that the site would contain some remains of early to mid-20th century operation of Morrison and Sinclair's shipyard, which operated for a period of almost 50 years from 1923. To date there have been few archaeological excavations of 20th century Sydney Harbour shipyards, with most examples in the vicinity related to 19th century shipping activity. The early to mid-20th century shipyard which was located at the site of Yurulbin Park represents a period of Sydney shipping and maritime industry which was established just before the late 1920s decline in shipbuilding, yet survived through the ups and downs of WWII, and the post-War period until the early 1970s, when many shipyards fell to the rising values of harbourfront properties for residential development. Given Sydney's ongoing property boom well into the 21st century, remaining shipyards that

NSW Heritage Criteria for Assessing Significance related to Archaeological Sites and Relics	Assessment
	potentially date to the 20th (and earlier 19th century) are also likely to succumb to such development. Archaeological evidence of the Morrison and Sinclair shipyard would contribute to an understanding of the history of the site itself, the 20th century local shipbuilding industry, and the role of Sydney Harbour in Sydney's maritime history, which are not available through other historical or documentary sources.
Associations with individuals, events or groups of historical importance (NSW Heritage Criteria A, B & D)	The potential archaeological remains of the Morrison and Sinclair shipyards at Yurulbin Park link to the Australian Historical Theme for 'Developing local, regional and national economies' and associated NSW Historical Theme for 'Industry', demonstrating activities associated with the manufacture, production and distribution of goods. The early to mid-20th century shipyard which was located at the site of Yurulbin Park represents a period of Sydney shipping and maritime industry which was established just before the late 1920s decline in shipbuilding, yet survived through the ups and downs of WWII, and the post-War period until the early 1970s, when many shipyards fell to the rising values of harbourfront properties for residential development. As stated by Godden Mackay (1991) in assessing the Sydney harbour foreshores, they are "*are inextricably linked with Australian shipping and maritime industries."* The archaeological evidence may provide some demonstration of the association of the site to the locally-recognised company of Morrison and Sinclair.
Aesthetic or technical significance (NSW Heritage Criterion C).	The potential archaeological remains of the Morrison and Sinclair shipyard are unlikely to have distinctive characteristics or architectural or engineering value, nor be substantial enough to provide aesthetic value at a local or state level.
Ability to demonstrate the past through archaeological remains (NSW Heritage Criteria A, C, F & G).	The early to mid-20th century shipyard which was located at the site of Yurulbin Park represents a period of Sydney shipping and maritime industry which was established just before the late 1920s decline in shipbuilding, yet survived through the ups and downs of WWII, and the post-War period until the early 1970s, when many shipyards fell to the rising values of harbourfront properties for residential development. Previous archaeological investigations in the vicinity in Sydney Harbour have focused on earlier 19th century maritime and shipping industry. The Morrison and Sinclair shipyard operated for 50 years of the 20th century with little subsequent development on site, providing the opportunity for a snapshot of a single occupation of a maritime industrial operation through a changing period of Sydney's maritime history. The archaeological evidence of the Morrison and Sinclair shipyard has the potential to be used in a comparison against archaeology recovered in 19th century shipping sites in the vicinity, to understand the similarities and differences in the shipbuilding industry as it developed and changed in response to wartime, changing technologies, and changing economies of Sydney harbourfront property. The State Heritage Register nomination for Yurulbin Park identifies the previous industrial history of the site and its influence on the development of the park's design in the 1970s. The nomination assessment states that

NSW Heritage Criteria for Assessing Significance related to Archaeological Sites and Relics	Assessment
	"remnant pre-existing industrial structures provided design inspiration" and that the innovative design approach taken by Bruce MacKenzie *"was a direct response to the place and without denying its industrial past, it brought back native vegetation to the foreshore."* While it is not certain how intact or legible the archaeological remains at the shipyard site may be, information and physical fabric recovered from the site may be valuable in continuing this aspect of Yurulbin Park's significance during its redesign following the site's use as part of the Western Harbour Tunnel project.

Artefact Management

Updates to the Research Design and Methodology (refer to Annexure C of Appendix J (Technical working paper: Non-Aboriginal heritage) are provided in this section in regard to managing artefact assemblages, artefact sampling, ongoing collection management, and production of a final excavation report.

Details of the proposed management, sampling and ongoing collection management have been provided in Section C.3 of Appendix J (Technical working paper: Non-Aboriginal heritage).

Section C.3 of Appendix J (Technical working paper: Non-Aboriginal heritage) states that all artefacts relating to the occupation of the site will be retained, including surface material. The only artefacts to be sampled will be building material such as bricks and stone. Material which is clearly related to the period after closure of the shipyard will not be retained but will be noted on context sheets and in the project report. Artefacts will be bulk bagged in the field according to material type within each feature, context or grid square. NSW Heritage Division, Department of Premier and Cabinet (Heritage) will be contacted immediately if any artefacts with urgent conservation requirements are identified. An artefact conservator would be engaged at the beginning of the excavation to provide advice and to inform the detailed approach to artefact retention and management.

All artefacts recovered in the field will be processed and catalogued. A simple computerised archaeological database or spreadsheet will be used to catalogue the artefacts. Primary artefact processing (sort into material type, preliminary cleaning, and bagging) would be carried out in the field.

The significance of the artefact collection as a whole would be assessed in connection with the other results of the excavation and the research design to develop an archaeological collection management plan for further artefact processing, analysis and management of the collection. Different approaches to retention and processing will depend on the information that the artefacts have the potential to provide and assessment of their heritage significance.

Different methods of processing and cataloguing will be carried out for each type of artefact. For example, glass artefacts would be sorted by colour and component (eg base, rim) to enable minimum number of individual counts for specific contexts or groups of contexts. Where the nature and further research potential of the material justifies it, specialist analysis including fabric, form and function would be carried out following the initial cataloguing. These data would also be added to the database. The archaeological collection management plan will recommend which artefacts or assemblages which have realised their archaeological potential and may be subject to disposal or transfer for permanent retention

In relation to the proposed lodging of artefacts recovered during archaeological investigation, it was stated in Section C.3 of Appendix J (Technical working paper: Non-Aboriginal heritage) that this

would depend on the assessed significance of the site, and any conservation requirements of particular artefacts. This is consistent with the discussion in the guidelines Assessing Significance for Historical Archaeological Sites and Relics (NSW Heritage Branch, 2009) in the section entitled 'Curation Crisis'.

The archaeological collection management plan will be prepared in consultation with NSW Heritage Division and Department of Premier and Cabinet (Heritage).

Report template

Standard Transport for NSW templates would be used, where appropriate. All reports would be reviewed by technical experts to ensure compliance with Heritage Council guidelines and requirements.

B8.3.2 Berry's Bay

Issue raised

In respect of the BP Site, Berrys Bay, Heritage NSW asserts that:

- The site has potential for 1820s remains associated with Edward Wollstonecraft and Alexander Berry and their occupation of the site, and any such evidence is rare in NSW and is likely to be of State heritage significance
- The assessment has relied on existing assessments of significance and does not include a relevant recent comparative analysis to clarify the significance of the resources. A reassessment of significance should be completed ahead of any project approval, along with testing to allow for retention of some of the archaeological resource
- The research design and excavation methodology is generic and potentially limited. The methodology needs to include an appropriate strategy to manage single context recording which also addresses Aboriginal archaeology, if it is identified. The current methodology is directed more towards an Aboriginal investigation program, rather than a typical historical archaeological investigation.

Response

Potential for 1820s remains

Visible surface features or location of historical features from early occupation of the site are described in Table 5-14 of Appendix J (Technical working paper: Non-Aboriginal heritage), along with assessment of potential impact due to the project. These relate to circa-1830s warehouse/store, stone cottage and remnants of Berry's sandstone block wharf. Further assessment of these features is provided below. It is however, acknowledged that there is potential for 1820s remains at the BP Site.

Use of previous significance assessments and issue of comparative analysis

As stated in Appendix A.7.6 of Appendix J (Technical working paper: Non-Aboriginal heritage), the archaeological assessment used information from the Waverton Peninsula Industrial Sites: BP, Caltex, Coal Loader, Conservation Management Plan (Godden Mackay Logan, 2000), and information gathered from a site inspection. The Conservation Management Plan was a well-researched, comprehensive document that reviewed 15 previous heritage assessments and studies of the area, primary historical research, field survey, and community consultation, all following the guidelines in the NSW Heritage Manual. In reviewing and using this information it was considered satisfactory that it was a robust and appropriate assessment of the archaeological potential and significance of the heritage item and further comparative analysis is not considered necessary.

The locations of the two key early features at the site presented in Figure A.7.6 of Appendix J (Technical working paper: Non-Aboriginal heritage), are based on survey plans of the site in 1928 as presented in the Conservation Management Plan, when the stone warehouse (Area A, Feature

1) and stone cottage (Area A, Feature 2) were still standing. Given the reliability of such plans, the certainty of the location of these features is high.

Transport for NSW confirms the proposed use of archaeological potential Area A during the project's construction as a parking area for the Berrys Bay construction support site (WHT7). Given the archaeological potential of the area, this parking area could be constructed by placing clean hardstand material on top of the current ground surface rather than excavating or disturbing the ground in the vicinity of Feature 1 and Feature 2. Car parking over barrier fill is considered unlikely to impact the archaeological potential of the area.

Following further consideration of the site, Transport for NSW confirms that the proposed ground disturbance in the footprint of the proposed three buildings (shown as blue rectangles on Figure 5.12 of Appendix J (Technical working paper: Non-Aboriginal heritage) and as noted in Section B.2.1.1 of Appendix J, would not be required and the locations restricted from construction activity As the project is able to avoid ground disturbance to these specific areas of the site where early archaeological remains are likely to be present, a more detailed comparative analysis has not been provided in this submissions report. As there is little likelihood of these early remains now being disturbed by the project, test excavation is therefore considered to not be required.

Consideration of early archaeological remains in geotechnical/contamination investigations and post-construction remediation activities

While the project would avoid any disturbance to early archaeological remains associated with Feature 1 and Feature 2 as shown on Figure 5-12 of Appendix J (Technical working paper: Non-Aboriginal heritage), subsequent post-construction reinstatement activities would require consideration of the archaeological potential of this area and its features. As this proposed reinstatement is not yet detailed, it is not considered here, but would be flagged for potential future development and change at the BP site. Any geotechnical or contamination investigations at the BP site would also need to take the archaeological potential Area A into consideration and avoid these particular features. Data from any geotechnical investigations at the BP site would also be used to inform any future archaeological investigations at the heritage item.

Research questions and themes

As the early archaeological remains at the site (situated in archaeological potential Area A) referred to in the submission are now to be avoided, and not subject to test excavation, no update to the existing research questions have been made at this time.

<u>Excavation methodology and single context recording</u>

The area targeted for excavation is only those areas that would be disturbed by the Berrys Bay construction support site (WHT7). Areas where ground disturbance is not proposed for the project, would not be subject to unnecessary damage or disturbance through test excavation. This applies in particular given the ability to avoid the early archaeological remains associated with Feature 1 and Feature 2 in archaeological potential Area A.

The updated wording below would replace Section B.2.2.1 of Appendix J (Technical working paper: Non-Aboriginal heritage).

Replacement of Section B.2.2.1: Workshop area and acoustics shed area

Standard archaeological excavation and recording methods are to be adopted during the investigation. These include undertaking the following tasks:

- A survey datum would be established by the site planner to record the levels of extant deposits and features
- The total footprint of the proposed workshop and acoustic shed would be mechanically stripped, firstly removing the grass and topsoil to expose footings, rubbish deposits or other features. This would be done using a smooth-bucket mechanical excavator systematically 'in strips' along a north-south axis

- This initial stage of the excavation would be supervised and directed by the Excavation Director. Spoil from excavation would be placed adjacent to the excavated area to be re-used as backfill where suitable
- After the removal of grass and topsoil, if archaeological features or deposits are noted, manual excavation and recording of deposits would be undertaken by the archaeology team in reverse order of deposition to expose the surface of significant archaeological features or deposits or culturally sterile clay. Manual excavation would be supervised and directed by the Excavation Director at all times
- All deposits will be sieved through a set of nested 10-millimetre, six-millimetre and three-millimetre sieves (or similar arrangement). Artefacts will not be point-provenanced but will be bulk bagged according to type within each feature, context or grid system
- Scaled site plans and profile or cross-section drawings showing the location of all archaeological deposits and features revealed during salvage excavation would be prepared, as required. These would to be keyed to the site datum
- Photographic recording of all phases of the work on site would be undertaken. This would involve recording of archaeological features using an appropriate photographic scale
- A standard context recording system would be employed, namely the location, dimensions and characteristics of all archaeological features and deposits would be recorded on sequentially numbered proforma context recording sheets. This form of written documentation would be supplemented by preparation of a Harris Matrix showing the stratigraphic relationships between features and deposits
- Historical artefacts retained for analysis would be cleaned off site, sorted according to their fabric classes, bagged and boxed with reference to the context from which they were recovered
- Excavation would be conducted until site clearance was achieved to the satisfaction of the Excavation Director.

Artefact Management

The issue raised about artefact management has been addressed in the response regarding Yurulbin Park.

B8.4 Recommended conditions of consent

Issue raised

Heritage NSW recommends that the Department of Planning, Industry and Environment include in any approval given for the project the recommended conditions provided as part of the Heritage NSW submission relating to:

- State Heritage Register listed items
- Historical archaeological management.

Response

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

B8.5 Maritime Heritage - Balls Head Coal Loader and Berrys Bay

Issue raised

Heritage NSW acknowledges the conclusions drawn in the assessment of these two sites in the environmental impact statement and Appendix K (Technical working paper: Maritime heritage), and

supports the mitigation measures recommended, including a project-specific Maritime Heritage Management Plan.

Response

Heritage NSW's support of the proposed environmental management measures for maritime heritage is acknowledged.

B8.6 Maritime Heritage - Recommended conditions of consent

Issue raised

Heritage NSW recommends that the Department of Planning, Industry and Environment include in any approval given for the project the recommended conditions provided as part of the Heritage NSW submission relating to maritime heritage.

Response

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

B8.7 Local Non-Aboriginal heritage items

Issue raised

Heritage NSW notes that as the study area for the project contains 227 heritage items of local heritage significance, advice should be sought from the relevant local councils.

Response

Each of the local councils in the project study area (Inner West Council, City of Sydney, North Sydney Council and Willoughby City Council) have made a submission in regard to the environmental impact statement. These submissions, and Transport for NSW's responses to issues raised, are discussed in detail in Sections B12 to B16 of this submissions report.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B9 – Port Authority of NSW

SEPTEMBER 2020

B9 Port Authority of NSW

Contents

B9.1 General comments

B9.1.1 Project support

Issue raised

Port Authority of New South Wales (Port Authority) is broadly supportive of the project, although has specific concerns as explained below.

Response

Port Authority support for the project is noted.

B9.1.2 Access

Issue raised

Access to the Glebe Island/White Bay port precinct is via the Port Access Road, Sommerville Road, James Craig Road, and the James Craig Road/The Crescent intersection. The Port Access Road and Sommerville Road within the Glebe Island/White Bay port precinct are private roads owned and managed by Port Authority, and whose continuous, safe and efficient operation remain a core pillar of Port Authority's core business.

Response

Transport for NSW recognise and support the continuation of Port Authority operations at White Bay and Glebe Island.

B9.1.3 Land use

Issue raised

The Glebe Island/White Bay port precinct is located within an urban environment surrounded by residential development and other sensitive land uses. The Port Authority is an active member of the community and works with the community to improve environmental performance. It is essential that the port precinct and transport infrastructure projects continue to operate with the highest consideration of the local community and potential impacts on the surrounding locality.

Response

Transport for NSW notes that the Glebe Island/White Bay port precinct is located within an urban environment surrounded by residential development and other sensitive land uses.

Transport for NSW would continue to engage and consult with the community and key stakeholders, including within the White Bay port precinct and respond to feedback received in accordance with Appendix E (Community consultation framework). Should the project be approved, the framework document would be developed into a Community communication strategy that outlines the community consultation and engagement activities that would support the design and construction of the project. This would ensure that community and key stakeholder, including Port Authority, concerns are appropriately managed and teams working on the project would:

- Actively involve stakeholders and the community in the project where opportunities arise
- Arrange engagement activities at times and places convenient for stakeholders
- Respond to reasonable requests from the community and stakeholders for information and/or additional engagement activities
- Acknowledge and understand diverse community and stakeholder views about the project
- Use feedback to positively influence the project design and delivery.

The environmental impact statement has assessed potential environmental impacts for the Glebe Island/White Bay port precinct in the context of several surrounding developments including construction of the M4-M5 Link and Sydney Metro City & Southwest projects. Potential cumulative impacts socio-economic, land use and property impact within the Rozelle and White Bay area primarily relate to:

- Increase in passing trade for local businesses and services around Darling Street and Victoria Road at Rozelle, and around James Craig Drive, Chapman Road and Robert Street at White Bay
- Land use impacts at Rozelle Rail Yards and the Glebe foreshores due to consecutive construction periods
- Amenity impacts for residential receivers near the Rozelle Rail Yards and for industrial and commercial receivers around White Bay and Glebe Island
- Impacts to community perceptions of public health and safety due to increases in construction traffic for residential receivers near the Rozelle Rail Yards and for industrial and commercial receivers around White Bay and Glebe Island
- Increased demand for construction workers, providing benefits for local workers
- Increase in passing trade for local businesses and services around James Craig Drive at White Bay.

The project would continue to coordinate its community and stakeholder engagement activities for the project with Port Authority as well as surrounding developments. Interface management with other surrounding projects is addressed in Chapter 7 (Community consultation) of the environmental impact statement. Environmental management measures CI1 and CI2 (refer to Table D2-1 of this submissions report) require considered and tailored multi-party engagement and cooperation to be established prior to construction to ensure all contributors to impacts are working together to minimise adverse impacts including construction fatigue, or enhance benefits of multiple projects occurring concurrently or consecutively.

Transport for NSW has committed to a range of environmental management measures to ensure that impacts on the surrounding community are minimised. These are listed in Table D2-1 of this submissions report including CTT5 to CTT9, CNV1 to CNV10, AQ1 and AQ2 and CI1 to CI4.

B9.2 Construction traffic and transport

B9.2.1 Base traffic data inputs

Issue raised

In January/February 2020 Port Authority carried out an intersection traffic survey count at the James Craig Road/The Crescent intersection. The traffic survey counts were provided to Transport for NSW to integrate into the VISSIM model. During the five-week survey period in January and February 2020, 15 cruise ship days were surveyed. The survey indicates that traffic volumes are closely correlated to the size of the cruise ships that berth at White Bay Cruise Terminal and White Bay berth 4.

Port Authority compared the data collected with the data in the environmental impact statement to ensure the base model volumes are representative of a typical cruise ship day. This indicates traffic volume generation/attraction varies considerably depending on the cruise ship size, number of passengers, demographic origin and a range of different variabilities. Port Authority notes a single day of traffic data is not appropriate due to the propensity for wide variations in traffic generation as a result of the size of the cruise ship at port, the type of ship visit (turnaround, transit or part exchange) and the potential for both the White Bay Cruise Terminal and White Bay berth 4 to be occupied by cruise ships at any one time.

Typical port related traffic peak is between 8am and 12pm. A comparison can be made for the morning (AM) and evening (PM) peaks (7am-9am and 4pm-6pm), however it is unclear how the intersection would perform during the remainder of the Glebe Island/White Bay port precinct related peak (ie between 9am and 12pm).

Port Authority requested clarification that the base traffic data inputs into the VISSIM model for the environmental impact statement and as provided by Transport for NSW are consistent with the Port Authority's traffic survey counts provided to Transport for NSW, which Port Authority considers to be the norm moving forward to the peak 2023 timeframe of the project.

Response

VISSIM modelling used to inform the environmental impact statement has been developed according to relevant standards and guidelines, as required. This includes ensuring that the base model provides an accurate representation of existing traffic and transport conditions.

Specifically, the VISSIM base year model has been calibrated and validated based on traffic conditions in 2016. Notwithstanding, one of the purposes of base year models which are developed for typical commuter peak periods is to calibrate the general road network settings to develop a road network assessment framework that would be suitable for future year applications, and provide a comparative assessment of expected operating conditions in the future.

While it can be expected that there would be some differences in traffic volumes between the base year model and more recent traffic surveys, it is noted that the traffic demands for the future year scenarios includes forecast traffic growth which would capture a portion of the differences in the volumes if not in full.

Transport for NSW notes that while there may be an increase in cruise ship related road traffic during non-peak periods, there is a substantial reduction in traffic on the remainder of the network.

B9.2.2 James Craig Road/The Crescent intersection performance

Issue raised

Port Authority request clarification whether the discrepancies between the traffic survey data used for the VISSIM model development, and traffic data for alternative surveyed days would influence the assessment of the James Craig Road/The Crescent intersection performance. The traffic survey data varies by five to ten vehicles per hour across hourly intervals during AM and PM peaks, and the AM peak 7am – 8am has a variance between -30 and +25 vehicles per hour across specific inbound/outbound movements. The variance may influence intersection performance, LoS and queue lengths.

The majority of the traffic survey data for the VISSIM traffic model was collated and provided by Transport for NSW (turning movement counts on Tuesday 9 December 2014). The counts are limited to an eight-hour period (6am-10am and 3pm-7pm). As such, existing daily traffic volumes expected daily traffic volume of the base model cannot be compared directly.

Response

The Crescent/James Craig Road intersection is reported in the environmental impact statement as operating well, with spare capacity. The -30 to +25 vehicles per hour variance would not have a material impact on the performance of this intersection, which typically accommodates around 6000 vehicles per hour.

B9.2.3 Modelling outputs

Issue raised

Port Authority identified a discrepancy between the SIDRA and VISSIM construction traffic LoS results for the James Craig Road/The Crescent intersection during the AM and PM peak for the 2022 base and 2022 'with construction' models. The environmental impact statement summarises

the SIDRA intersection performance results as LoS F for both 2022 base and 2022 'with construction' in the AM and LoS D and LoS E in the PM for 2022 base and 2022 'with construction' respectively.

However the Traffic and transport technical working paper summarises the VISSIM intersection performance results as LoS C and LoS B in the AM peak for the 2022 base and 2022 'with construction respectively and LoS B and LoS C in the PM for 2022 base and 2022 'with construction' respectively.

Port Authority also previously requested Transport for NSW to independently provide detailed modelling outputs from the VISSIM construction traffic models for the James Craig Road/The Crescent intersection.

Response

The two sets of results cannot be directly compared as the two modelling packages differ in the way they consider intersection operation, which impacts the calculation of intersection delay. SIDRA considers the operation of single intersections, while VISSIM considers the operation of intersections as part of a network.

VISSIM network modelling reflects upstream and downstream network constraints, and therefore provides a more accurate reflection of absolute performance.

While SIDRA is limited in its ability to reflect adjacent network constraints, it has been used to provide an indication of the relative impact of construction when compared to conditions without the project.

In combination, the VISSIM and SIDRA modelling results can therefore be used to forecast overall network performance, as well as the incremental impact of construction in localised areas.

B9.2.4 AM and PM peak numbers

Issue raised

Port Authority requests Transport for NSW to clarify if the environmental impact statement is reporting the combined AM and PM peak numbers (ie. for two hours in each the AM or PM peak), or only one peak hour, and if so which hour this is in both AM and PM periods (either 7am-8am or 8am-9am for the morning peak, and either 4pm-5pm or 5pm-6pm for the evening peak).

Response

The AM peak hour volumes are an average of the traffic volume for the hours of 7-8am and 8-9am, and the PM peak hour numbers are the average of the volume for the hours of 4-5pm and 5-6pm ie. 20 vehicles during 4pm to 5pm and 30 vehicles during 5pm to 6 pm is an average PM peak of 25 vehicles per hour.

B9.3 Contamination and spoil management

Issue raised

The environmental impact statement indicates that dredged material not suitable for offshore disposal would be transferred by barge to the WHT3 site. The environmental impact statement identifies that sediment in Sydney Harbour is highly polluted and limited sediment sampling was carried out as part of the preliminary site investigation. However geotechnical investigations indicate exceedances of some heavy metals.

The environmental impact statement identifies the extent of contamination is uncertain and further investigations are required before construction. Port Authority is concerned the environmental impact statement does not sufficiently assess the extent and significance of contaminated material to be transferred to and handled at WHT3. Once the extent of sediment contamination is adequately understood, volume estimates, predicted environmental impacts and infrastructure requirements at

WHT3 may differ from what is identified in the environmental impact statement and could be more significant. Port Authority is concerned about potential impacts of handling contaminated materials given the proximity to nearby residential areas and port activities such as odour and volatile emissions at Glebe Island and White Bay.

Port Authority requests further information about the treatment of spoil at WHT3 including:

- Dewatering process
- Management measures to control the release of contaminated water
- Measures to avoid contaminated sediments leaching and contaminating soils/groundwater
- Impermeable surface where dredged material will be placed
- Any enclosure, stockpile coverage or other proposed controls to manage odour, air quality and other volatile releases from potentially contaminated sediments.

Prior to construction, Port Authority requested to review and comment on:

- Reports from the proposed contamination investigations in Sydney Harbour (once complete)
- Revised environmental assessment in White Bay and Glebe Island operational areas and adjacent residential areas
- Revised mitigation measures
- Revised volumes of contaminated sediments to be handled at WHT3.

Port Authority requested a baseline contamination investigation and a post-construction investigation of WHT3 to confirm no further contamination has occurred at the site.

Port Authority requests that an environmental management plan for handling contaminated sediments at WHT3 be prepared in consultation with and to the satisfaction of Port Authority.

Response

Transport for NSW and Port Authority have had further discussions on this topic. Transport for NSW understand that Port Authority is now satisfied with the approach taken with regards to contamination and spoil management. The parties would continue to work together throughout the construction period. Notwithstanding, Transport for NSW's response is as follows.

Sediment characterisation

Characterisation of contamination within Sydney Harbour is provided in Section 16.3.5 of the environmental impact statement and in Section 4.4.2 of Appendix O (Technical working paper: Contamination). Most of the harbour's contamination results from a combination of historical inputs that remain in the sediments and some current sources such as stormwater. Sediment samples in Sydney Harbour were collected as part of the geotechnical investigations carried out for the project. These samples were collected from a range of depths and analysed for a range of contaminant compounds including heavy metals, hydrocarbon compounds (TRH, BTEX and PAH), OCP, PCB, tributyltin (TBT) poly-fluoroalkyl substances (PFAS) and dioxins.

In response to various requests, Transport for NSW has made the *Contamination Factual Report – Marine Investigations Rev B* (Douglas Partners and Golder Associates (DPGA), 2017) and *Contamination Factual Report – Marine Investigations Rev C* (DPGA, 2018) available on the project website *nswroads.work/whtbl*.

Subsequent to the 2017 investigation carried out by Douglas Partners and Golder Associates (2017), Royal HaskoningDHV have been engaged by Transport for NSW to carry out sediment coring, sampling and testing at the harbour crossing to better understand the level and extent of contamination in sediments. Investigations have been carried out and are ongoing. The purpose of these investigations is to assess the suitability of dredged sediments for offshore disposal. Further

information is included in the Royal HaskoningDHV memo in Appendix C.2 of this submissions report.

Estimated sediment volumes

As noted in Section 4.4.3 of the environmental impact statement, the preferred corridor has the shortest harbour crossing, minimising the quantity of dredged material to be treated and disposed of offsite.

Chapter 24 (Resource use and waste management) of the environmental impact statement identifies that about 142,500 cubic metres of dredged material would be unsuitable for offshore disposal. The material would be dredged from the footprint of the immersed tube tunnel and transported to White Bay construction support site (WHT3) for treatment so it is spadeable, prior to disposal to an appropriately licensed facility. It should be noted that there would be no dredging carried out in the White Bay area for the project. A clarification has been included in Section A4.2 of this submissions report with regards to the source of the dredged material quantity not suitable for offshore disposal identified within the first row of Table 24-8 of the environmental impact statement.

As discussed above, subsequent to the 2017 investigation by Golder-Douglas for the environmental impact statement, and at the request of Transport for NSW, RHDHV have been engaged to undertake additional sediment coring, sampling and testing at the harbour crossing to better understand the level and extent of contamination in sediments. As a result of the ongoing RHDHV investigations, the original anticipated quantity of 142,500 cubic metres identified in the environmental impact statement is subject to further work and is likely to be revised by the project. It is expected that the final quantity of dredged material that is not suitable for offshore disposal will be less than this originally anticipated number.

Management of dredged material unsuitable for offshore disposal

Dredged material unsuitable for offshore disposal would be loaded into barges using a closed environmental clamshell bucket and transported to the White Bay construction support site (WHT3) as described in Chapter 6 (Construction work) of the environmental impact statement. Barges may be self-propelled or towed. No overflow from the barges would be permitted during loading operations and during transit to White Bay. Barges would follow the navigation route for construction traffic shown in Map 8 of the Navigation Impact Assessment (refer Appendix F (Technical working paper: Traffic and transport)). It would be a requirement for the barges to be fitted with an automatic identification system (AIS) and for the Sydney Harbour Master to be notified before barges move between construction sites.

After berthing of the barges at White Bay, lime and/or an inorganic polymer would be mixed with the dredged material while in the barge, prior to unloading, for management of acid sulfate soils and odour (as required), and to make the material spadeable. Mixing would take place by means of an excavator located on the adjacent wharf. The dredging process would not add any significant quantities of water to the material (being a mechanical process with closed bucket) and the addition of lime and/or the inorganic polymer would substantially reduce moisture content. Accordingly, management of water/leachate in the dredged material at White Bay would be minimal or may not be required. Following the mixing process, material within the barges would be loaded either directly into trucks for transport to landfill or temporarily stockpiled on the wharf deck within a bunded area prior to loading into trucks for transport to landfill. The bunded area would incorporate a leachate collection and treatment system in the event of any leachate from the temporary stockpile.

Due to the existence of tributyltin in the dredged material proposed for land disposal, the disposal would need to be in accordance with the NSW Environment Protection Authority Organotin Waste Materials Chemical Control Order 1989. As such, the selected landfill would need to be a controlled landfill approved by the NSW Environment Protection Authority.

Odour management

While on barges, dredged material would be wet which would significantly reduce any odour emissions. Any odour impacts from this material would be low, given it would remain wet and would be located at some distance from any sensitive receptor.

An assessment on the potential odour impacts was carried out which used estimates of odour emission rates taken from measurements made for similar dredging operations. The assessment is presented in Section 7.2 of Appendix H (Technical working paper: Air quality). The assessment concluded the predicted 99th percentile odour concentrations at all sensitive receptors are well below the 2 OU (odour unit) criterion and also well below the theoretical level of detection of 1 OU. As predicted impacts are below the level of detection, environmental management measures to manage potential odour from the material are therefore not proposed. It is noted that this finding is consistent with the outcomes of stabilisation and transfer of material dredged from Garden Island at Glebe Island.

Contamination investigations at WHT3

Port Authority have requested a baseline contamination investigation and a post-construction investigation of the White Bay construction support site (WHT3) to confirm no further contamination has occurred at the site. As Port Authority is aware, this would be addressed as a Port Authority requirement in the lease/licence agreement to occupy the construction support site land at White Bay.

Construction environmental management plan

Environmental management measures related to construction would be included in a construction environmental management plan, as described in Section 28.5 of the environmental impact statement.

The construction environmental management plan would be prepared prior to construction of the project and would be reviewed and approved by Transport for NSW and the Department of Planning, Industry and Environment, prior to the commencement of any on-site work. Transport for NSW would continue to consult with Port Authority during the preparation of the construction environmental management plan, and the plan would be made available to Port Authority once approved.

As required by environmental management measure SG10 of Table D2-1 of this submissions report, procedures for the handling and storage of potentially contaminated substances, including at the White Bay construction support site (WHT3), would be included in a construction waste management plan. The waste management plan would form part of the construction environmental management plan and include the management of dredged material not suitable for offshore disposal. The plan would describe how management measures, including containment, stockpiling and leachate management, would be implemented and who would be responsible for their implementation.

The construction environmental management plan would be a working document, subject to ongoing change and updated as necessary, to respond to specific requirements. All handling of contaminated sediments at the White Bay construction support site (WHT3) would be carried out in accordance with the approved construction environmental management plan and an Environment Protection Licence issued by the NSW Environment Protection Authority.

B9.4 Groundwater drawdown

B9.4.1 Groundwater quality

Issue raised

The environmental impact statement identifies the potential for groundwater drawdown in parts of the Glebe Island and White Bay port facility during construction and operation. Groundwater

drawdown can cause impacts such as activation of acid sulfate soils, which can impact the integrity of underground structures, and potentially lead to migration of contamination.

Port Authority requests the proposed groundwater monitoring program be designed to allow any groundwater drawdown at the port facility to be identified. Port Authority also requests to be informed of any actual groundwater drawdown at the port facility during construction or operation based upon continuous monitoring results.

Response

Figure 16-10 of the environmental impact statement identifies that groundwater drawdown levels at the end of tunnel construction would be about one metre at the northern side of the White Bay site. As outlined in Figure 16-11 of the environmental impact statement, by 2126 this would increase to about three metres on the northern side of the site, with one metre of drawdown expected at the shore with White Bay.

Key areas of acid sulfate soil risk are associated with the sediments beneath Rozelle Rail Yards and Birchgrove Park. Groundwater drawdown (and associated acid sulfate risk) beneath Sydney Harbour is not applicable due to the constant head of water in the harbour. There are no groundwater dependent ecosystems, culturally significant sites or groundwater users in the areas of anticipated acid sulfate soils, so these receptors would not be impacted.

As per environmental management measure SG12 in Table D2-1 of this submissions report, prior to ground disturbance in high risk acid sulfate areas 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 Soil Management Advisory Committee, 1998b).

Groundwater drawdown monitoring will be carried out in accordance with environmental management measures SG17 to SG22 (refer to Table D2-1 of this submissions report). This includes the development and implementation of a groundwater quality monitoring program for construction and operation taking into consideration the location of areas subject to medium and high risk of groundwater contamination during construction and operation.

The monitoring program will include a continuation of the existing groundwater monitoring program through construction and into the operational phase. As more information becomes available through ongoing groundwater monitoring, groundwater modelling will be updated. Outcomes of updated groundwater modelling would identify any requirements for further groundwater monitoring, and management of groundwater drawdown and associated impacts. If the groundwater quality monitoring and associated analysis identifies potential impacts to beneficial aquifer use from the migration of contaminated groundwater, or the quality of groundwater tunnel inflows, feasible and reasonable management measures will be identified and implemented. Proposed groundwater monitoring is presented in Appendix E of this submission report.

Requirements regarding groundwater monitoring data and data access will be determined in the project conditions of approval which is a matter for Department of Planning, Industry and Environment to consider during its assessment of the project.

B9.5 Construction air quality

B9.5.1 Adequacy and accuracy

Issue raised

The secretary's environmental assessment requirements required an air quality assessment for construction to be carried out in accordance with the current guidelines, including *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environment Protection Authority, 2016). The Western Harbour Tunnel and Warringah Freeway Upgrade Technical working paper: Air Quality (Appendix H) indicates that in the absence of specific

guidance for road and tunnel projects in NSW, a semi-quantitative construction air quality impact assessment was prepared based on the UK Institute of Air Quality Management (IAQM)'s *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM, 2014).

The air quality assessment for WHT3 construction support site does not assess $PM_{2.5}$ impacts, and does not include a cumulative quantitative assessment of particles and other air pollutants from the project and other nearby infrastructure projects that have the potential to generate emissions to air. Port Authority seeks further clarification and justification for the assessment method used in the environmental impact statement to assess construction air quality impacts at WHT3 and the surrounding locality.

Response

The assessment methodology for construction air quality impacts has included the following key tasks:

- Qualitative assessment of potential dust impacts during construction of the project
- Dispersion modelling to assess the potential odour impacts on sensitive receivers resulting from dredging activities and the transport and treatment of dredge materials at White Bay during construction of the project.

It is difficult to quantify dust emissions from construction activities since it is not possible to predict the weather conditions that would prevail during specific construction activities. The effects of construction on airborne particulate matter would generally be temporary and of relatively short duration, and mitigation should be straightforward since dust suppression measures are routinely employed as good management practice at most construction sites. It is therefore common practice to provide a qualitative assessment of potential construction dust impacts.

The qualitative assessment approach carried out for the project follows the UK Institute of Air Quality Management's *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014). The IAQM guidance has been adapted for use in NSW, taking into account factors such as the assessment criteria for ambient PM_{10} concentrations (being particulate matter less than or equal to 10 micrometre diameter). As outlined in the IAQM guideline, dust generated from construction activities is generally mechanically generated and therefore in the coarser fraction. As a result, the ambient dust relevant to health outcomes is measured as PM_{10} as the fugitive dust emissions of $PM_{2.5}$ from construction sites are low (between 10 to 15 per cent by weight). Therefore, the assessment methodology focusses on issues such as annoyance due to dust settling on surfaces, human and ecological, as well as health effects associated with PM_{10}. The finer $PM_{2.5}$ particles are better assessed in the operation phase of the project as they represent a larger fraction at that stage.

As outlined in Section 27.3.1 of the environmental impact statement, cumulative impacts to air quality resulting from the construction of the various projects surrounding White Bay considered are expected to be negligible.

B9.5.2 Monitoring and mitigation

Issue raised

Port Authority also requests the environmental management plan for WHT3 to include a detailed air quality management plan prepared in consultation with and to the satisfaction of Port Authority. The air quality management plan must include an air quality monitoring program and mitigation measures, which should be developed once investigations, and final construction and logistics details of WHT3 have been completed such as sediment contamination investigations, volumes of contaminated sediments and spoil to WHT3 and final WHT3 site layout.

Response

The project construction environmental management plan would contain details of the site-specific mitigation measures to be applied for each construction site including air quality management at the White Bay construction support site (WHT3). As outlined in Section 28.5 of the environmental impact statement and further detailed in Section D1 of this submissions report, construction environmental management plan documentation would be prepared prior to construction of the project and would be reviewed and approved by Transport for NSW and the Department of Planning, Industry and Environment prior to the commencement of any on-site work. An air quality management plan would form part of the construction environmental management plan.

As outlined in environmental management measure AQ1 (refer to Table D2-1 of this submissions report), the environmental management documentation would detail standard construction air quality mitigation and management measures to be implemented during construction including:

- Reasonable and feasible dust suppression and/or management measures, including the use of water carts, dust sweepers, sprinklers, dust screens, site exit controls (eg wheel washing systems and rumble grids), stabilisation of exposed areas or stockpiles, and surface treatments
- Selection of construction equipment and/or materials handling techniques that minimise the potential for dust generation
- Management measures to minimise dust generation during the transfer, handling and on site storage 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 possible
- Minimisation of exposed areas during construction
- 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
- Management measures for managing unexpected 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
- Site inspections will be carried out to monitor compliance with implemented measures.

To further mitigate potential cumulative impacts, additional measures may include scheduling of construction activities and construction deliveries, coordinated monitoring and data sharing, cooperation in the event of cumulative dust complaints, and coordination of engagement with potentially affected receivers.

Consultation requirements regarding the air quality management plan will be determined in the project conditions of approval which is a matter for Department of Planning, Industry and Environment to consider during its assessment of the project.

B9.6 Construction noise and vibration

B9.6.1 Cumulative noise impacts

Issue raised

There is potential for cumulative airborne construction noise impacts from a wider range or the construction of concurrent projects. Port Authority are concerned about the cumulative construction noise with the M4-M5 Link project White Bay construction site (C11). The M4-M5 Link project initially intended using the eastern end of White Bay as a construction site primarily to support heavy vehicle marshalling and construction workforce parking, but it is Port Authority's

understanding that the White Bay construction site (C11) will now predominantly be used as a heavy vehicle spoil haulage route.

Response

Transport for NSW can confirm that the M4-M5 Link project would not be occupying the same construction support site area at White Bay concurrently with the project. It is understood that Port Authority, as the landowner, is aware that there will not be concurrent use.

Section 27.3.1 of the environmental impact statement considered the cumulative impact of the project construction with construction of the M4-M5 Link and Sydney Metro City & Southwest projects. The assessment was based on publicly available information available at the time. The assessment identified that without mitigation, concurrent construction activities with the M4-M5 Link project would have the potential to result in additional temporary minor increase in construction noise for receivers around the Rozelle Rail Yards, White Bay, Blackwattle Bay and at Rozelle, Lilyfield and Annandale. While the minor increase would be only temporary in nature, it would represent a prolonged duration and frequency of construction noise for receivers around the Rozelle Rail Yards and White Bay.

In response to Port Authority concerns, Transport for NSW carried out a further qualitative review of the status of the current projects proposed within the vicinity of the port precinct to determine potential changes to cumulative impacts associated with construction of the project since exhibition of the environmental impact statement. The following projects were identified:

- Glebe Island concrete batching plant and aggregate handling facility: this project is currently under assessment with the Department of Planning, Industry and Environment
- Glebe Island multiuser facility: the response to submissions report (AECOM, 2019) and determination report for this project were published in 2019. The multiuser project website identifies that construction is expected to commence around mid-2020, and the Sydney Metro West environmental impact statement identifies that construction would be complete by 2021
- Sydney Metro West: the exhibition of the environmental impact statement for this project has concluded and the project is under assessment by the Department of Planning, Industry and Environment. Expected construction period is from 2021 to 2024
- Sydney Metro West Bays Road relocation works: exhibition of the review of environmental factors has been completed and the project is being assessed by Sydney Metro Authority. The review of environmental factors identifies the construction of this project would be from 2020 to 2021
- M4-M5 Link modification (Glebe Island Assembly Area Modification): the modification for this project was recently determined by the Department of Planning, Industry and Environment on 30 July 2020.

The indicative construction programs that may occur concurrent with the project are presented in Table B9-1, based on publicly available information in their respective environmental impact assessment documentation. Current and future major projects around White Bay are shown in Figure B9-1. As shown in Table B9-1, works associated with the Sydney Metro City & Southwest and the M4-M5 Link Glebe Island Assembly Area are not likely to occur concurrently with the White Bay construction support site and so were not considered further in terms of potential cumulative construction noise impacts.

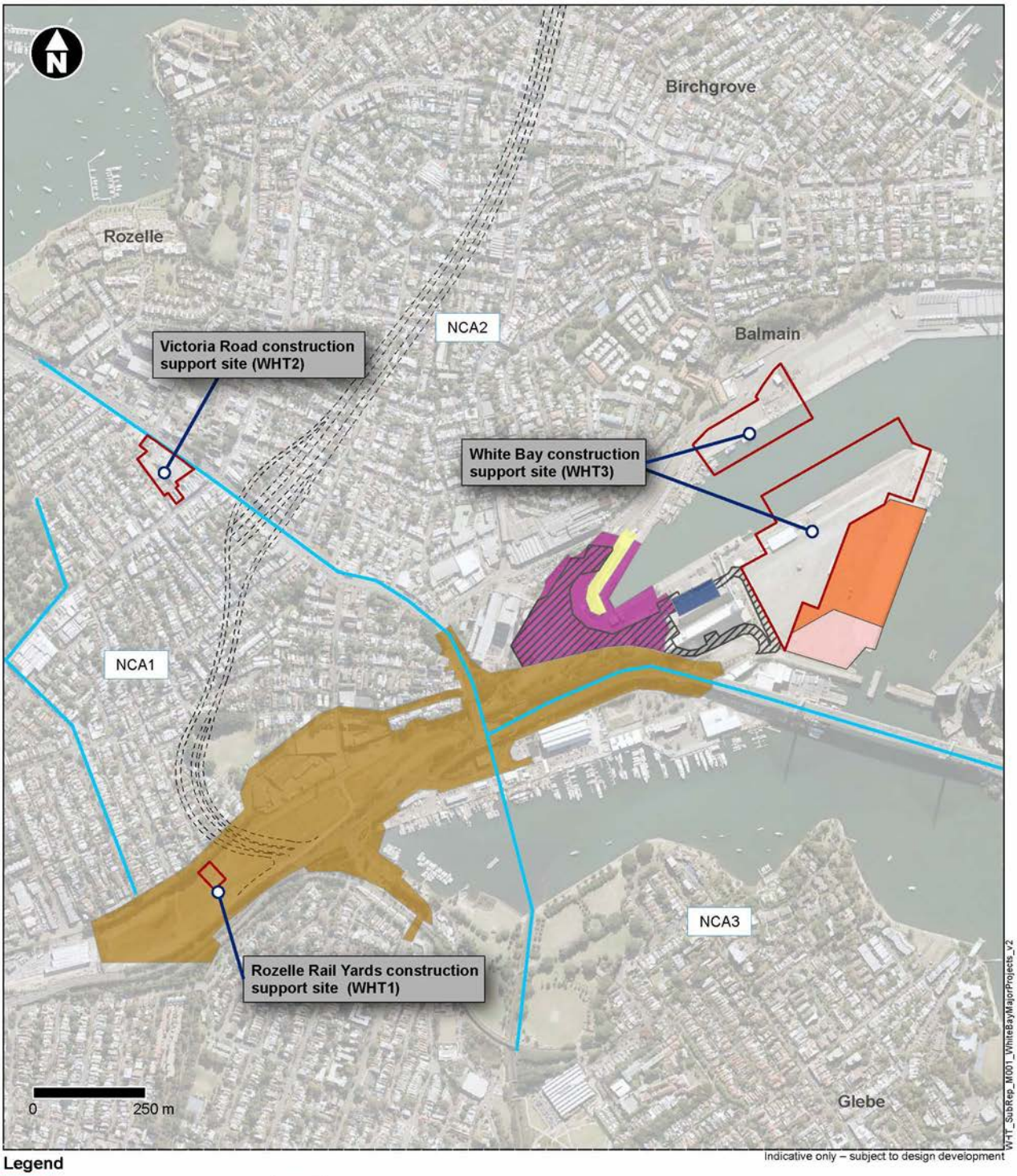
Table B9-1 Concurrent and consecutive construction works near the White Bay construction support site (WHT3) – Indicative construction programs

Project	2019	2020	2021	2022	2023	2024	2025
White Bay construction support site (WHT3)							
White Bay construction support site (M4-M5 Link C11)							
White Bay construction support site (M4-M5 Link – Glebe Island Assembly Area)							
Sydney Metro City & Southwest (Chatswood to Sydenham)							
Sydney Metro West							
The Bays Road Relocation works							
Glebe Island Multi-User Facility	Note 1						
Glebe Island concrete batching plant	Note 2						

Notes:

1. AECOM, 2018, Glebe Island Multi-User Facility – Review of Environmental Factors, project No.: 605519190, Report ref: 180124 REF Final (Revision 2, 24 Jan 2018), Section 4.4 notes ”Construction of the project would be undertaken over a period of approximately nine months…”. Subject to approval, construction could commence during 2020.
2. No construction programs known. Superseded construction program noted an approximate nine month construction duration. Section 1.5, Glebe Island Concrete Batching Plant Noise Impact Assessment (SLR 2018).

Proposed staging of concurrent work and noise impacts at the closest receiver buildings to the White Bay construction support site (WHT3) have been reviewed. For each construction support site, the stages with the highest chance of concurrent construction activities for both standard construction hours and out-of-hours works have been assessed for potential cumulative noise impacts at the nearest receiver buildings.



Note that listed projects would not necessarily occur concurrently. Indicative construction programs are included in Table B9-1

Figure B9-1 Current and future major projects around White Bay

If noise from one site dominates noise levels at the receiver (ie greater than five to 10 dB(A) above noise from other sites), that site would typically control construction noise levels at the receiver. As such, it is not likely to increase the overall $L_{Aeq, 15\ min}$ construction noise level at these receiver buildings. However, where noise levels from each of two sites are similar at a receiver, an increase of a total construction noise of up to three dB(A) is predicted.

At the receiver buildings most affected by noise from the White Bay construction support site (WHT3) in noise catchment area (NCA) 9.1, there is a potential for cumulative construction noise impacts from concurrent major project construction works at these residential receivers. Only a limited number of other construction projects are proposed to include works outside of standard construction hours. Works outside of standard construction hours for the White Bay construction support site (WHT3) are unlikely to increase construction noise levels above the noise management level due to concurrent activities.

The following points are noted for the cumulative and consecutive noise impacts:

- For noise affected receiver buildings, the key difference in construction noise impacts could be an increased overall duration and frequency of impacts, even if they are at the same noise level
- The key noise-generating activities for major projects, such as the connection and relocation of services like electricity, sewerage and water at the White Bay site, are typically intermittent in nature. Therefore, cumulative construction noise increases would occur rarely at nearby receiver buildings, as for construction noise increases to occur, noise-generating activities would need to occur simultaneously from separate projects at the reasonable worst-case locations to the receiver buildings. As such, management measures for each set of works individually are likely sufficient, if coordination takes place.

Receiver buildings located at more distant locations in Rozelle and Balmain and not directly adjacent to the White Bay construction sites may find that no individual construction support site dominates construction noise levels (ie noise generated by each site is within five dB(A) of other sites). Cumulative construction noise levels at these receiver buildings may be up to three dB(A) higher than the noise levels predicted for any one construction support site.

Environmental management measures CNV1 and CNV2 (refer to Table D2-1 of this submissions report) require that a project construction noise and vibration management plan would be prepared and a series of cumulative noise management and mitigation measures would be included in each construction support site's construction noise and vibration impact statement (CNVIS). The CNVIS would be prepared during detailed construction planning and would consider, where relevant, cumulative and consecutive construction noise impacts, taking into consideration all other concurrent construction works in the vicinity that may contribute additional noise (and not only the major infrastructure project which have been specifically reviewed within the environmental impact statement). This information would be used in developing mitigation and management measures based on up to date consecutive construction projects in proximity to each construction support site.

Cumulative airborne construction noise impacts would be mitigated in accordance with environmental management measure CNV10 (refer to Table D2-1 of this submissions report) which includes requirements for:

- Coordinating work between project construction sites and construction works to avoid cumulative noise impacts
- Consideration of additional at source or near source mitigation where construction noise levels may result in cumulative construction noise impacts, where programming is not practical to avoid cumulative noise impacts
- Community consultation throughout the project to gauge construction key noise impacts and issues and any unknown impacts from concurrent or consecutive sets of constructions works

- Incorporating additional noise mitigation and management measures with consideration of cumulative and consecutive construction noise impacts based upon coordination between projects.

Management of potential consecutive construction noise impacts is further outlined in Section 6.5 of Appendix G (Technical working paper: Noise and vibration). Construction fatigue is also addressed in Chapter 27 (Cumulative impacts) of the environmental impact statement. Environmental management measures for construction fatigue are included in Table D2-1 of this submissions report and include the requirement that during construction of the project, the community relations team build a working relationship with the project teams for other major projects to identify stakeholders or community members who may be susceptible to construction fatigue. This is discussed further in Section B9.8.1 of this submissions report.

B9.6.2 Noise and vibration management plan

Issue raised

Port Authority requests the environmental management plan for WHT3 to include a detailed construction noise and vibration management plan that is prepared in consultation with and to the satisfaction of Port Authority. The construction noise and vibration management plan must include:

- A noise monitoring program and mitigation measures that reflect detailed design refinements to construction support site layouts, equipment, construction methods or construction hours
- Any specific mitigation and management measures that are different to those outlined and assessed within the environmental impact statement.

Port Authority expects the construction noise and vibration mitigation and management measures would be reviewed during detailed design to identify what is feasible and reasonable, considering cumulative and consecutive construction impacts such as construction fatigue.

Response

Details on noise and vibration impact management during construction would be included within the construction environmental management plan, as described in Section 28.5 of the environmental impact statement. The plan would be reviewed and approved by Transport for NSW and the Department of Planning, Industry and Environment, prior to the commencement of any on-site work. The construction environmental management plan would be a working document, subject to ongoing change and would be updated as necessary to respond to specific requirements.

As outlined in Section 4.2.2.2 of Appendix G (Technical working paper: Noise and vibration), noise and vibration impacts for each construction support site would be reviewed when more specific detail regarding construction activity is available during further design development. This would be carried out as part of the preparation of site-specific construction noise and vibration impact statements (CNVIS). Each site would be assessed in accordance with the requirements of the construction noise and vibration management plan (CNVMP) developed for the project, which implements project approval requirements.

The CNVMP would be developed in accordance with requirements of the conditions of approval and the Environment Protection Licence issued for the project. The plan would outline the procedures and approach for noise and vibration monitoring to be carried out to confirm construction noise and vibration levels in relation to specified noise and vibration management levels. In addition, the CNVMP would, detail how, where reasonable and feasible, construction noise impacts from concurrent or consecutive nearby construction works associated with the project would be managed.

Management of cumulative noise and vibration impacts would also be managed through the implementation of environmental management measure CI1 (refer to Table D2-1 of this submissions report), which requires considered and tailored multi-party engagement and cooperation 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. Port Authority would be included in this tailored multi-party engagement.

B9.7 Marine navigation

B9.7.1 Navigation impact assessment

Issue raised

Appendix A (Technical working paper: Navigation Impact Assessment) of Appendix F (Technical working paper: Traffic and transport) is generally too brief in nature, specifically relating to mitigation measures.

Response

The Navigation impact assessment, which forms Appendix A of Appendix F (Technical working paper: Traffic and transport) was prepared to specifically address key issue 1 and 8 of the Secretary's environmental assessment requirements that relate to marine safety and navigation.

Port Authority were involved in the development of the Navigation Impact Assessment. Port Authority also had personnel seconded into Transport for NSW during the development of the Reference Design and have developed Harbour Master approval conditions. Vessel simulation was completed at the request of Port Authority and as required by the Secretary's environmental assessment requirements.

The Navigation impact assessment includes:

- Review of background information including site conditions
- Establishment of existing waterway navigation and commercial and recreational usage
- Determination of likely occupation of the waterway during construction including number, type, frequency and duration of marine construction traffic
- Assessment of potential navigation impacts and proposed mitigation measures.

Ongoing maritime construction impacts would be managed through the implementation of environmental management measure CTT18 (refer to Table D2-1 of this submissions report). CTT18 requires that construction vessel movements be managed so that they will not interfere with port operations or the navigation of seagoing ships and ferries unless prior approval has been obtained from the Harbour Master.

Port Authority has developed a document entitled '*Requirements for Western Harbour Tunnel and Associated Works'*. This includes the requirement for development of a marine works management plan, a marine traffic management plan, a communications plan, a weekly marine works schedule and the establishment of a marine consultation group. This agreement is still under negotiation between Transport for NSW and Port Authority but is anticipated to be finalised before construction commences.

B9.7.2 Barge movements

Issue raised

Port Authority requests clarification and assessment of the proposed 100 barge movements between White Bay and the cofferdams per day. This includes vessel interaction, navigation restrictions and more specific details as to where the impacts will take place. This clarification and additional assessment is to be carried out in consultation with and to the satisfaction of Port Authority.

Response

A marine traffic management plan would be developed for the project, as outlined in the document entitled *Requirements for Western Harbour Tunnel and Associated Works* which has been prepared by Port Authority and is anticipated to be finalised before construction commences.

The peak period for marine traffic would be during construction of the interface structures where there may be up to 100 barge movements (ie arriving at a site and leaving a site counts as two movements) between White Bay and the two cofferdams per day. However, the duration of these works would be relatively short. Prolonged periods of high marine construction activity would occur over 12 months of the construction program. A summary of construction activities and marine traffic during these high traffic times is provided in Section 5.2 of the Navigation impact assessment (Appendix A of Appendix F (Technical working paper: Traffic and transport). The route of the vessel movements is shown in Map 8 in Appendix A of the Navigation impact assessment (Appendix A of Appendix F (Technical working paper: Traffic and transport).

B9.7.3 Vessel Traffic Management Plan

Issue raised

Port Authority considers the preparation of a vessel traffic management plan to be an adequate measure to minimise and mitigate potential navigation impacts from the proposed development, however, this has not been stated as a proposed mitigation measure.

Port Authority requests Transport for NSW be required to prepare a vessel traffic management plan in consultation and to the satisfaction of Port Authority. Port Authority will provide guidance on how to enhance marine safety and navigation for all vessels using the wharf facilities and the surrounding waterway area, including cumulative impacts to all maritime users.

Response

A marine traffic management plan would be developed for the project, as outlined in the document titled *Requirements for Western Harbour Tunnel and Associated Works,* which has been prepared by Port Authority and is anticipated to be finalised before construction commences.

B9.7.4 Approval of the Harbour Master

Issue raised

Written approval of the Harbour Master is required for any proposed works (whether carried out in relation to a Port Authority facility or not) that will disturb the bed of a port or otherwise captured by clause 67ZN of the Ports and Maritime Administration Regulation 2012, which states:

> *"A person must not use drags, grapplings, or other apparatus for lifting any object or material from the bed of a port described in Schedule 1, or otherwise disturb any such bed in any way, except with the written permission of the relevant harbour master and in accordance with the conditions attaching to such permission"*

The Harbour Master approval process includes providing Port Authority with all final documentation (assessment reports and plans) for review together with a completed Harbour Master Approval Form. The Harbour Master may impose conditions on any approval to disturb the sea bed.

Response

Transport for NSW note Port Authority's comment that written approval of the Harbour Master is required for any proposed works (whether carried out in relation to a Port Authority facility or not) that will disturb the bed of a port or otherwise captured by clause 67ZN of the Ports and Maritime Administration Regulation 2012.

Section 2.2.1 of the environmental impact statement identifies relevant NSW legislation that would apply to the project and includes the acknowledgement that permission of the Harbour Master would be required prior to the disturbance of the bed of the harbour under Part 6D of the Ports and Maritime Administration Regulation 2012.

The project would comply with this legislated requirement. Prior to the commencement of construction works involving disturbance of the harbour floor, all relevant documentation would be provided to Port Authority for final approval.

B9.8 Ongoing consultation

B9.8.1 Engagement/cooperation group

Issue raised

Port Authority requests to be involved in the engagement cooperation group. Port Authority also note representatives from WestConnex – M4-M5 Link, Sydney Metro West, Hanson Glebe Island Concrete Batching Plant and Aggregate Handling Facility, Sydney Fish market and the Glebe Island Multi-User Facility Projects must be included in the engagement cooperation group to manage cumulative impacts and construction fatigue.

Response

Appendix E (Community consultation framework) identifies key stakeholders and methods for engagement for the project. The framework includes identification of key stakeholders, procedures for distributing information and receiving/responding to feedback and procedures for resolving stakeholder and community complaints during construction and operation. Specific issues management addressed in the community consultation framework include:

- Traffic management (including property access, pedestrian access)
- Landscaping and urban design
- Construction activities including out of hours work
- Noise and vibration mitigation and management.

Should the project be approved, the framework document will be implemented in accordance with environmental management measures SE4 (refer to Table D2-1 of this submissions report). The framework would be developed into a Community communication strategy that outlines the community consultation and engagement activities to support the design and construction of the project.

Port Authority is identified as a key stakeholder in the Community consultation framework. The list of identified stakeholders also includes the Sydney Metro West and the WestConnex Rozelle Interchange project teams. As outlined in the framework, the list of key stakeholders identified would continue to evolve as the project progresses and further issues are identified.

At present there are two formal groups in the project area which meet regularly to manage potential cumulative impacts. This includes:

- The Bays Precinct Working Group consisting of Government agency representatives from Western Harbour Tunnel and Beaches Link, Infrastructure NSW (including Sydney Fish Market) WestConnex Rozelle Interchange, Sydney Metro West, Port Authority of NSW and Transport for NSW teams
- The Glebe Island and White Bay Community Liaison Group, coordinated by Port Authority, consisting of representatives from the local community and the current tenants at Glebe Island and White Bay. Representatives from the project have attended these meetings in the past and will continue to do so on a regular basis during the construction period. Port Authority have recently advised that any future tenants of proposed projects such as

Hanson Glebe Island Concrete Batching Plant and Aggregate Facility and the Glebe Island Multi-User Facility using the area would be invited to this group.

Environmental management measures Cl1 and Cl2 (refer to Table D2-1 of this submissions report) require considered and tailored multi-party engagement and cooperation to be established prior to construction to ensure all contributors to impacts are working together to minimise adverse impacts including construction fatigue or enhance benefits of multiple projects occurring concurrently or consecutively.

Additional coordination groups would be developed as required and Transport for NSW would continue to work closely with its internal departments.

Interface management with other projects is addressed in Chapter 7 (Community consultation) of the environmental impact statement. The project's Communication and Stakeholder Engagement team would work closely with its counterparts in different divisions and adjacent projects. This is to ensure the various State Government projects are releasing and/or consulting on projects in collaboration with each other and to reduce consultation and construction fatigue in local communities.

During construction, the project's Communication and Stakeholder Engagement team would build a working relationship with the project teams for other major projects to identify stakeholders or community members who may be susceptible to cumulative impacts and construction fatigue. The project team would ensure the expectations of these stakeholders or community members are managed for the project.

Project activities which could lead to construction fatigue, potentially impacted groups, and a summary of management measures proposed to address these issues is provided in Chapter 27 (Cumulative impacts) of the environmental impact statement.

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B10 – Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator

SEPTEMBER 2020

B10 Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator

Contents

B10.1 Prior to approval

B10.1.1 Groundwater model

Issue raised

For the purpose of both groundwater flow and groundwater modelling, Department of Planning, Industry and Environment (Water) require a series of detailed geological cross sections and long sections of the underground tunnel and schematic of the hydrogeological conceptual model, these include:

- Schematic sections should reflect the detailed geology as recorded in the geological drill hole logs, relative position of the investigation drill holes, water table intersections, plus the proposed tunnel
- Emphasis on those locations where the tunnel rises to the surface, has connections to immersed tunnel sections, or intersects zones of high concentration of discontinuities
- Both the Western Harbour Tunnel; Rozelle to Birchgrove and for the Balls Head to Warringah Freeway sections for the hydrogeological conceptual model
- These must include the geology units, known geological structures, proposed Western Harbour tunnel alignment, relevant monitoring bores and their relative depths, with groundwater levels.

Response

Transport for NSW will have ongoing discussions with the Department of Planning, Industry and Environment regarding the requirement for geological cross sections and long sections, during which Transport for NSW will present these to the Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator during the assessment period. Transport for NSW would continue to engage with Department of Planning, Industry and Environment regarding this issue.

Schematics of the conceptual hydrogeological model are presented in Attachment B of Appendix E of this submissions report.

B10.2 Post approval

B10.2.1 Tunnel features – grouting and sealing

Issue raised

Department of Planning, Industry and Environment (Water) and Natural Resources Access Regulator request that the following be provided post approval:

- A more detailed explanation of the grouting and sealing extent being proposed to be undertaken to seal the tunnel sections lengths at the connections with the submerged tunnel installations is required to understand the restriction of groundwater ingress and saline water intrusion at these interfaces
- Further explanation of the grouting and sealing extent being proposed at the Warringah Freeway (North Sydney area) tunnel access declines (dives) with respect to reduction in and mitigation of groundwater inflow.

Response

Chapter 6 (Construction work) of the environmental impact statement identifies that ground support for tunnels excavated using road headers would typically consist of cement grouted rock anchors and/or rock bolts and shotcreting. In areas which require control of higher levels of groundwater ingress, the permanent tunnel lining would include a thicker reinforced concrete lining and

waterproofing membrane. Ground support would be installed progressively following tunnel excavation.

As outlined in Section 6.2.3.11 of Appendix N (Technical working paper: Groundwater), the proposed tunnel design for the project is predominantly drained, where groundwater would enter the tunnel and, as such, the tunnel would not represent a physical barrier to flow. As required by environmental management measure SG14 (refer to Table D2-1 of this submissions report), where inflows are enhanced due to highly permeable zones and exceed 1L/sec/km, feasible and reasonable measures (such as grouting) would be applied to manage inflow. Such design measures would be localised and would permit groundwater movement around the barrier.

Details of the grouting and sealing extent for tunnel sections and at the connections with submerged tunnel installations would be provided to Department of Planning, Industry and Environment (Water) upon finalisation of the contractor's tunnelling methodology.

B10.2.2 Model updates for south model

Issue raised

Department of Planning, Industry and Environment (Water) and Natural Resources Access Regulator request the following, post approval:

- More comprehensive uncertainty and sensitivity analysis is required for the south model. This is needed for completeness and to reduce model uncertainty.

Response

An uncertainty analysis was completed for the north model to investigate the sensitivity of model predictions to changes on parameter values assigned to the model and determine changes of impact to groundwater dependent ecosystems and existing licensed groundwater users. The uncertainty analysis is presented in Section 10 of Annexure F of Appendix N (Technical working paper: Groundwater).

The south model does not have any groundwater dependent ecosystems or licensed groundwater users. For this reason, Transport for NSW does not consider that uncertainty analysis for the south model is warranted.

Issue raised

Department of Planning, Industry and Environment (Water) and Natural Resources Access Regulator request the following points to be included in future reports relating to saline water intrusion:

- In future reports, alternative methods to model saline water intrusion should be considered, explaining pros and cons for each and the basis for selecting a preferred approach
- If the selected 2D modelling approach to assess saline water intrusion is to be continued, additional cross-sectional models are required to improve saline water intrusion assessment, particularly near the coastline.

Response

The requests for consideration of alternative methods to model saline water intrusion in future reports are noted. The need for additional cross sectional models near the coastline would be assessed during further design development and construction planning.

B10.2.3 Monitoring for salt water intrusion

Issue raised

Additional monitoring bores should be installed prior to construction to monitor the impacts of potential for salt-water intrusion to the tunnel from salt-water sources such as Sydney Harbour. This is to be reviewed by Department of Planning, Industry and Environment (Water).

Response

The groundwater modelling presented in Appendix N (Technical working paper: Groundwater) predicts that migration of the saline interface is negligible to minor. Impacts to groundwater users and groundwater dependent ecosystems are not expected. However, the beneficial use of the aquifer could be impacted.

Transport for NSW will carry out a groundwater monitoring program in accordance with environmental management measures SG19 and SG20 (refer to Table D2-1 of this submissions report). The groundwater monitoring program will be developed as described in Section 2.2.1 of Appendix E of this submissions report.

B10.2.4 Groundwater model

Issue raised

Department of Planning, Industry and Environment (Water) and Natural Resources Access Regulator request that the following be provided post approval of the project:

- Future revision of the groundwater model will require the following to be updated:
  - More data is required to better constrain evapotranspiration values in the conceptual and numerical models.
  - Collection of additional data to enhance characterisation and modelling of vertical groundwater gradients and flows.
  - Collection of additional surface water data to enhance characterisation and modelling of groundwater-surface water interaction.
- Future hydrogeological and groundwater modelling work and reports must include more information on geological structures as they relate to the groundwater system.

Response

The requests from Department of Planning, Industry and Environment (Water) and Natural Resources Access Regulator are noted.

As required by environmental management measure SG22 (refer to Table D2-1 of this submissions report), as more information becomes available through ongoing groundwater monitoring, the groundwater model will be updated. Construction and operational inflow predictions will be updated prior to construction, and operational inflow and impact predictions will be updated at the end of the construction period.

Additional groundwater monitoring data would be collected as described in Section 2.2.1 of Appendix E of this submissions report. This data would be used for any groundwater model revision or update.

Information on geological structures such as faults and dykes and their relationship to the groundwater systems relevant to the project are documented in Section 5.3 of Appendix N (Technical working paper: Groundwater).

B10.2.5 Review of management plans

Issue raised

With respect to water impacts the following documents should be provided for review and consultation with Department of Planning, Industry and Environment (Water) prior to finalisation:

- Construction soil and water management plan
- Erosion and sediment control plan
- Groundwater monitoring and management plan
- Operational environmental monitoring plan.

Response

As noted in Section D1 of this submissions report, a construction environmental management plan would be prepared to provide a framework for establishing how construction environmental management measures would be implemented and who would be responsible for their implementation. The construction environmental management plan would detail the management of soil and water quality during construction. The construction environmental management plan would be reviewed and approved by Transport for NSW and the Department of Planning, Industry and Environment prior to the commencement of any on-site work. Further review and consultation on the construction environmental management plan would be carried out as per the project conditions of approval.

B10.2.6 Groundwater monitoring and mitigation

Issue raised

During construction and operation should monitoring indicate there is an impact to local groundwater bores make good provisions will need to be applied.

Response

Environmental management measure SG2 (refer to Table D2-1 of this submissions report) requires that the viability of domestic bores GW109209, GW107764 and GW108991 be confirmed prior to construction. If drawdown at the bores exceeds two metres (in accordance with the *Aquifer Interference Policy*), measures will be taken to 'make good' the impact by restoring the water supply to pre-development levels. The measures taken will be determined in consultation with the affected licence holder but could include, deepening the bore, providing a new bore or providing an alternative water supply.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B11 – Sydney Harbour Federation Trust

SEPTEMBER 2020

B11 Sydney Harbour Federation Trust

Contents

B11.1 Cockatoo Island

B11.1.1 Access

Issue raised

The Sydney Harbour Federation Trust's (Harbour Trust) primary concern is the potential for the project works to impact on access to, and the operation of, Cockatoo Island which relies entirely on water access for the transportation of goods and people. The Harbour Trust requests that consideration be given to:

- Providing stakeholders with a further opportunity to provide feedback on the proposed timing of harbour closures, once these are known
- Coordinating with the Harbour Trust to allow private ferries through the works zone during harbour closures – as these may potentially be needed to supplement public ferries during occasional events on the island, such as the Biennale or concerts
- Coordinating with the Harbour Trust regarding the annual Sail GP event which has its operational base on Cockatoo Island, and requires daily access to the main harbour near Clark Island for racing.

Response

The Harbour Trust is identified as a key stakeholder in Table 6-1 of Appendix E (Community consultation framework). During project construction, communication tools and activities for informing and consulting with stakeholders would be employed flexibly, to suit the nature and scale of each stakeholder's interests and issues. Timing for consultation would be determined and included in the Community communication strategy.

As described in Table 6-1 of Appendix E (Community consultation framework), consultation with the Harbour Trust would include meetings and briefings, phone calls, emails, letters, community update distribution and provision of information from the project team at key project milestones.

Construction of the project would have no direct impact on the Cockatoo Island ferry wharf. As outlined in Section 8.4.2 of the environmental impact statement, the partial closure of the harbour between Birchgrove and Berrys Bay would impact ferry services, specifically the F8 Cockatoo Island line. Ferries would be able to pass during the 48 hour partial closure of the harbour with controls including escorts and speed restrictions. Impacts would include altered routes and an increase in travel time due to speed restrictions within the vicinity of construction plant and equipment in the inner harbour. The increase in travel time is anticipated to be minor (less than a five minute increase compared to normal travel times).

Transport for NSW is aware that in January 2019 Cockatoo Island was named as an Official Venue and Technical Area for the inaugural event of the international sailing league Sail GP (Harbour Trust Annual Report 2018-2019, SHFT 2019), which was hosted from Cockatoo Island in January 2019 and February 2020. It is recognised that this is a major sailing event within the harbour and consultation would be carried out with the Harbour Trust to maintain access to the main harbour from Cockatoo Island during the event period(s).

In response to this submission, Transport for NSW have revised environmental management measure CTT17 so that consultation with regard to harbour closures also includes the Harbour Trust (see Table D2-1 of this submissions report):

- CTT17– Harbour closures scheduling will be carried out in consultation with Port Authority of NSW, other divisions of Transport for NSW and other relevant stakeholders, **including Sydney Harbour Federation Trust.**

Environmental management measures CTT16 and CTT18 (see Table D2-1 of this submissions report) would also be implemented to further minimise impacts on marine traffic and harbour closures. These measures require that:

- Construction marine traffic activities will be scheduled to avoid times and locations of high recreational marine traffic where feasible and reasonable
- Construction vessel movements will be managed so that they will not interfere with port operations or the navigation of seagoing ships and ferries, unless prior approval has been obtained from the Harbour Master.

B11.2 (Balmain) Birchgrove Colliery

B11.2.1 Investigation

Issue raised

The Harbour Trust notes that tunnels and shafts of the former (Balmain) Birchgrove coal mine site may be in the vicinity of the proposed Western Harbour Tunnel route, and that it would be prudent to investigate this further in the design phase of the tunnel.

Response

Transport for NSW investigations show that there would be no tunnels or shafts from the former (Balmain) Birchgrove Colliery directly in the project tunnel alignment.

B11.3 Sub Base Platypus

B11.3.1 Parking and access

Issue raised

The Harbour Trust manages Sub Base Platypus (118 - 120 High Street, North Sydney), which may be impacted by the proposed works. As part of its ongoing renewal of the site, the Harbour Trust is planning to undertake civil works at Sub Base Platypus, commencing in 2021. Noting this, the Harbour Trust requests that consideration be given to the potential need to accommodate construction vehicles along High Street in the planning of the WFU2 and WFU3 works.

The Harbour Trust also notes that Transport for NSW is proposing to upgrade North Sydney Wharf (the timing of which is not yet known by the Harbour Trust), which may also require access for construction vehicles along High Street.

Response

The North Sydney Wharf upgrade is a separate Transport for NSW project. *The North Sydney Wharf Upgrade Concept Design: Community Consultation Report* (NSW Government, 2020) states that construction of the North Sydney Wharf upgrade is expected to start in 2021, subject to approval.

Section 6.8.2 of the environmental impact statement includes details of traffic management and access for the project. The High Street south (WFU2) and High Street north (WFU3) construction support sites would have peak construction vehicle movements and access points as shown in Table 6-37 of the environmental impact statement. As access to these sites would only require minimal use of High Street and the expected peak construction vehicle movements are relatively low, cumulative construction impacts with the North Sydney Wharf Upgrade project and Sub Base Platypus civil works are expected to be low.

Several environmental management measures would be implemented to minimise the potential for cumulative construction traffic impacts as outlined in Table D2-1 of this submissions report. These measures include the following, noting that Transport for NSW have revised the wording of

environmental management measure CTT17 as discussed above in Section B11.1.1 (see Table D2-1 of this submissions report):

- CI1 – 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 Transport Coordination within Transport for NSW
- CTT17– Harbour closures scheduling will be carried out in consultation with Port Authority of NSW, other divisions of Transport for NSW and other relevant stakeholders, **including Sydney Harbour Federation Trust**
- CTT6 – Construction road traffic will be managed to minimise movements during peak periods
- CTT11 – Truck marshalling areas will be identified and used where feasible and reasonable, to minimise potential queueing and traffic and access disruptions in the vicinity of construction support sites.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B12 – Inner West Council

SEPTEMBER 2020

B12 Inner West Council

Contents

B12.1 Assessment process

B12.1.1 Adequacy and accuracy

Issue raised

Pages 2 and 31

While the summary of key project impacts presented in the environmental impact statement are considered comprehensive in its coverage of issues, Council is of the view that the benefits of the project are exaggerated, and the negative impacts underestimated.

Response

The environmental impact statement was prepared by a team of qualified professionals, including technical specialists, and was reviewed by subject matter experts from Transport for NSW and independent peer reviewers (as required) to provide a balanced, merit-based environmental impact assessment. The environmental assessment was carried out in consultation with key stakeholders and relevant statutory and agency requirements.

The environmental impact statement included the preparation of a range of comprehensive technical studies prepared in accordance with the key issues identified in the secretary's environmental assessment requirements which included requirements issued by key government regulatory agencies as well as industry standards and guidelines. The environmental impact statement, including detailed technical studies, was reviewed by Department of Planning, Industry and Environment and relevant agencies against the secretary's environmental assessment requirements prior to being placed on public exhibition. The Department of Planning, Industry and Environment has also commissioned independent technical peer reviews of key technical studies presented in the environmental impact statement to inform its assessment including air quality and human health.

The environmental impact statement was prepared using a conservative approach, which included assessing the worst-case impacts and scenarios across study areas directly or indirectly affected by construction and operation of the project, as relevant to the methodology of each assessment. The assessment was carried out using an environmental risk analysis process utilising a likelihood and consequence approach (refer to Appendix A (Environmental risk analysis) of this submissions report), the best available technical information and adopted good practice environmental standards, goals and measures to minimise environmental risks. The environmental risk analysis:

- Identifies environmental issues, including key issues in the secretary's environmental assessment requirements, and any other issues
- Examines potential impacts and proposed management and mitigation measures in relation to the identified issues
- Identifies the impacts likely to remain after management and mitigation measures are applied (ie the residual impacts).

Mitigation measures have been developed to address the risks and impacts identified through the assessment and environmental risk analysis process. Additional mitigation measures, where required, would be confirmed during detailed design and would employ best practice environmental management measures in accordance with industry standards and the conditions of approval. See Table D2-1 of this submissions report for a summary of the proposed environmental management measures.

B12.1.2 Assessment of cumulative impacts

Issue raised

Page 31

General support is expressed regarding the environmental impact assessment process. As required by the secretary's environmental assessment requirements a cumulative impacts chapter has been included in the environmental impact assessment, relieving concerns Inner West Council has had regarding significant cumulative impacts of several large projects including the WestConnex M4-M5 Link and Sydney Metro construction.

Response

Transport for NSW acknowledges the Inner West Council comment that agrees with the inclusion of a cumulative impacts chapter in the environmental impact statement.

B12.1.3 Clarifications

Issue raised

Page 31

Page 23 of Chapter 20 (Land use and property) of the environmental impact statement identifies the current land use zoning of 138-172 Victoria Road as 'Deferred Matter'. This is incorrect - the site is zoned Business under *Leichhardt Local Environmental Plan 2000*.

Response

Clause 1.8 of the *Leichhardt Local Environmental Plan 2013* states that the *Leichhardt Local Environmental Plan 2000* continues to apply to the land identified as "Deferred matter" under clause 1.3 (1A). The zoning of the site as 'Business' under the *Leichhardt Local Environmental Plan 2000* is noted and added as a clarification in Section A4.2 of this submissions report.

A further discussion regarding the context of local planning controls including the *Leichhardt Local Environmental Plan 2000* and *Leichhardt Local Environmental Plan 2013* is provided in Section B12.12.1.

B12.2 Strategic context and project need

B12.2.1 Benefits, costs, and funding

Issue raised

Pages 3 and 4

While it is agreed that harbour crossings are critical in this area, the overall stated operational benefits are insufficient to justify the project. The need for the project appears to be based on the additional traffic volumes created from the completion of WestConnex and the conclusion that unless reduced, the resulting congestion would divert traffic to local roads. This is not supported by the supposed traffic benefits which are not significant enough to make a substantial change with Table 8-10 of Appendix F (Technical working paper: Traffic and transport) indicating an average vehicle travel time difference through the network in 2027 of 1.8 minutes per vehicle when comparing the 'Do minimum' and 'Do something cumulative' scenarios (Do minimum = 09:24, while Do Something Cumulative = 07:26). For 2037 the environmental impact statement predicts a difference of 2.3 minutes per vehicle (10:23 against 07:46). The validity of spending substantial funding to achieve relatively small travel time improvements, without solving long term congestion, when consistency and predictability of travel times should be a more valid priority is questioned.

In addition, justification of the project relating to improving the efficiency of moving freight is not valid as freight traffic is only a minor percentage of total traffic volumes (less than five per cent) and as

such increasing capacity will increase general traffic which will eventually slow freight movement. The most effective way to move road freight more efficiently is to reduce general traffic.

Response

The Western Harbour Tunnel and Beaches Link program of works would create a connected and integrated road and public transport network, taking the pressure off local roads with more public transport options. The objectives of the project are listed in Section 3.3 of the environmental impact statement. These include:

- Reduce congestion on distributor roads around the Harbour CBD, including the Sydney Harbour Bridge, Western Distributor and ANZAC Bridge
- Create faster, safer and more reliable journeys across Sydney Harbour, particularly for traffic bypassing the Harbour CBD to the west
- Improve productivity by allowing commuters and freight to reach their destination faster, safer and more reliably
- Increase the ability for the Harbour CBD road network to cope with traffic incidents
- Reduce travel times, delays and queuing on the Warringah Freeway by improving cross harbour capacity and reducing merges and weaves, supporting long-term increased demand
- Improve streetscapes, sustainability and liveability across the Eastern City and North Districts by reducing congestion.

Through meeting these objectives, the project would substantially improve accessibility, travel times and travel reliability across Sydney Harbour. This includes improved vehicle travel times along key traffic routes through Rozelle, resulting from changes in traffic demands and patterns with trips using the Western Harbour Tunnel in preference to existing surface routes including City West Link, ANZAC Bridge, and the Western Distributor.

While traffic demand is predicted to increase in both the 'Do something' and 'Do something cumulative' scenarios, average travel speeds through the Rozelle area would improve by up to 60 per cent as a result of the project, despite the increase in demand (refer to Section 8.4.2 of Appendix F (Technical working paper: Traffic and transport)). In addition, much of the demand for the Western Harbour Tunnel would connect via WestConnex and therefore not use the surface network or impact on the amenity of the local road network at Rozelle. It is also important to note that the 'Do minimum' case includes the M4-M5 Link and the 60 per cent improvement created by the Western Harbour Tunnel is a beneficial outcome compared to conditions with the M4-M5 Link only (ie there is actually significant benefit as a result of the project rather than producing a cumulative impact in this regard).

The travel time improvements outlined in Rozelle by Inner West Council in their submission represent a micro-level analysis which does not reflect the additional strategic benefits beyond the Rozelle area. At a strategic level, due to the journey time and reliability benefits provided to transport customers, the project would enable more customers to travel as desired and at an improved level of service. Additional discussion regarding traffic and transport concerns raised by Inner West Council are addressed in Section B12.7 of this submissions report.

Beyond the movement of people between places, roads serve an important role in moving freight between the source and end markets, including the intermediary destinations in the supply chain. These sources, intermediary locations and end markets are geographically dispersed across the Sydney metropolitan area. As outlined in Section 3.6 of the environmental impact statement, the project would address key priority areas in the *NSW Freight and Port Strategy* (Transport for NSW 2013) including strengthening the freight industry, increasing access for freight across the road and rail network, protecting existing freight precincts and ensuring safe, efficient and suitable freight access would meet the needs of Greater Sydney.

B12.2.2 General objection to motorways

Issue raised

Pages 2 and 3

Inner West Council state that they have a long-standing position of opposing inner-urban motorways including WestConnex and the Western Harbour Tunnel, instead supporting projects to reduce demand including public and active transportation. Specific objections have been included in Councils submission to the NSW Legislative Council's Inquiry into WestConnex (Submission Number 379) which included a review of the WestConnex business case by SGS Economics and Planning which concluded that the business case is poor and that WestConnex is not justified.

Response

Inner West Council's position opposing inner-urban motorways is noted.

The NSW Government is proposing to deliver a range of transport infrastructure projects including road, public transport and active transport projects to address the transport challenges associated with a growing Sydney and to provide a range of transport alternatives to support the variety of trips being made across the city including in the Inner West. *Future Transport Strategy 2056* (NSW Government, 2018) promotes the development of integrated multi-modal network solutions, identifying that investment in motorways is needed in addition to investment in public transport such as Sydney Metro, Light Rail, and bus projects being rolled out throughout Sydney. The project is one part of a complementary integrated multi-modal strategy being implemented by the NSW Government. The Western Harbour Tunnel and Beaches Link program of works is identified in the strategy as a 'Committed' project forming part of the vision for the future strategic road network for Greater Sydney that will support key movements by road, including public transport, private vehicles and freight. Additionally, the NSW Government is proceeding with the development of Sydney Metro West to complement the investment in the project, both of which will directly benefit the Inner West community.

The WestConnex Updated Strategic Business Case is considered out of scope for this project. The Western Harbour Tunnel and Beaches Link Program has followed the Infrastructure NSW processes to achieve investment decision. Through this process the program has demonstrated its economic merit and successfully passed 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. As part of this governance and rigorous review process, the Western Harbour Tunnel and Warringah Freeway Upgrade project has undergone extensive scrutiny throughout its development.

The base of the Final Business Case for the Western Harbour Tunnel and Beaches Link program of works was developed in 2016. This analysis 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. 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:

http://www.infrastructure.nsw.gov.au/media/2528/western-harbour-tunnel_bc-summary-may-2020.pdf

An overview of the development process and options considered as part of this process are provided in Chapter 4 (Project development and alternatives) of the environmental impact statement. An overview of the strategic context and project need are provided in Chapter 3 (Strategic context and project need).

The project would deliver the opportunity to relocate a significant volume of through traffic on surface arterial roads underground. In addition to the direct benefit of moving bypass traffic underground, reduced congestion on the arterial network offers flow-on benefits to the adjoining

local network, reducing the impact of queuing on local high streets and local roads. Reduced congestion on the arterial road network would result in further improvements in amenity related to physical safety, air quality and noise levels.

B12.2.3 Policy alignment

Issue raised

Page 16

The project is not consistent with the *Greater Sydney Region Plan and Future Transport 2056* strategic plans to support net zero emissions by 2050 including encouraging public transport use and low emission vehicles and energy supply to transition to a cost effective, low emission energy supply, mitigating climate change.

Response

The *Greater Sydney Region Plan – A Metropolis of Three Cities* (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 Section 3.5.6 of the environmental impact statement. To meet the needs of a growing and changing population, the vision seeks to transform Greater Sydney into a metropolis of three cities: the Western Parkland City, the Central River City and the Eastern Harbour City.

The project, as part of an integrated multi-modal transport solution being implemented by the NSW Government, would increase the number of people and places that are able to be reached within 30 minutes. The project fulfils the strategic vision presented for the future strategic road network for Greater Sydney by supporting key movements by road for public transport, private vehicles and freight. Figure 3-11 of the environmental impact statement outlines the change in the percentage of jobs accessible within 30 minutes in the AM peak as a result of the project by 2037.

One of the key roles of the 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.

Future Transport Strategy 2056 (Future Transport) (NSW Government, 2018) promotes the development of integrated multi-modal network solutions 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. The Western Harbour Tunnel and Beaches Link program of works is identified in the strategy as a ‘Committed’ project forming part of the vision for the future strategic road network for Greater Sydney that will support key movements by road, including public transport, private vehicles and freight.

The project supports the objectives of Future Transport as it would facilitate improvements to urban amenity by reducing through-traffic movements and relieving pressure on arterial roads connecting the broader Eastern City and North Districts to the Harbour CBD (refer to Section 3.5.6 of the environmental impact statement). Future Transport is a 40-year strategy for mobility for Sydney and regional NSW. It sets out a vision, strategic directions and customer outcomes with a focus on technology and innovation across the transport system to transform the customer experience, improve communities and boost economic performance.

As noted in Section 2.1.3 of the environmental impact statement, in addition to “improving communities” (ie placemaking), Future Transport seeks to “transform customer experience” (ie improve journey times and reliability) and “boost economic performance” (ie enable and

accommodate growth). The project contributes heavily to all three objectives. The project would deliver the opportunity to relocate a significant volume of through traffic on surface arterial roads underground. In addition to the direct benefit of moving bypass traffic underground, reduced congestion on the motorway and arterial network offers flow-on benefits to the adjoining local network, reducing the impact of queuing on local high streets and local roads. Reduced congestion on the arterial road network would result in further improvements in amenity related to physical safety, air quality and noise levels.

Greenhouse gas emissions are projected to increase as traffic numbers across the road network grow (irrespective of the minor increase in induced demand expected to result from the project). However, the expected reduction in congestion as a result of the project, in addition to expected improvements in fuel efficiency and increases in electric vehicles, in line with the Net Zero Plan Stage 1, are 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 assist in reducing emissions. This is discussed in Section 26.2.4 of the environmental impact statement.

Additionally, the objectives of the Net Zero Plan Stage 1 would be met through the implementation of the Western Harbour Tunnel and Warringah Freeway Upgrade 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 summary of the strategic planning and policy framework is provided in Section 3.6, Table 3-2 of the environmental impact statement and provides an overview of how the project aligns with the objectives of State and national strategies for transport, freight and city planning.

As outlined in Section 26.2.5 of the environmental impact statement, greenhouse gas emissions would 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 of Australia rating scheme. This commitment is generally aligned with the NSW Government stated intention to reduce net greenhouse gas emissions.

B12.2.4 Master planning

Issue raised

Page 10

The NSW government should develop an integrated master plan for the White Bay/Glebe Island site that considers opportunities to develop social and recreational opportunities and draws on the bay’s rich and diverse history. This master plan should align with the future Sydney Metro West and facilitate accessible active transport links around the foreshore to and from the Balmain Peninsula.

Response

The Bays Precinct Urban Transformation Plan was developed by UrbanGrowth (now Infrastructure NSW) in 2015. The Bays was declared a Growth Centre by the NSW Government in 2017.

Development of The Bays Precinct is outside the scope of the project however, Transport for NSW has referred this issue to Infrastructure NSW for their consideration. It should be noted that the project regularly meets with the Port Authority of NSW and Sydney Metro to ensure that the projects are aligned and considered from a broader perspective.

B12.3 Project development and alternatives

B12.3.1 Consideration of alternatives

Issue raised

Page 31

Alternative approaches to reducing congestion should be examined that focus on traffic reduction and travel time consistency, not increased road capacity, and vehicle speed should be examined to ensure sustainable development. The decision to proceed with a motorway occurred too early and without genuine consideration of alternatives including public and active transport, travel demand management and transit-oriented development and modest and targeted road improvements.

As a consequence the conclusion of the environmental impact statement *"The merits of the project were considered in the context of a range of other alternatives including do-nothing, based on the extent to which they could meet the project objectives and how well they performed with reference to other transport, environmental, engineering, social and economic factors. No other alternative would satisfy the need and objectives as effectively as the project"* is incorrect.

Response

The project forms part of an integrated multi-modal network solution being delivered by the NSW Government. Specifically, in addition to the project, Sydney Metro City and Southwest will provide parallel north-south cross harbour public transport capacity (in advance of the project), and Sydney Metro West will provide additional east-west capacity. In addition, through reducing overall demand and congestion on the ANZAC Bridge, the project would directly benefit one of the most critical strategic bus corridors serving the Inner West community.

Reducing congestion is one of several objectives identified for the project in Section 3.3 of the environmental impact statement, which include:

- Reduce congestion on distributor roads around the Harbour CBD, including the Sydney Harbour Bridge, Western Distributor and ANZAC Bridge
- Create faster, safer and more reliable journeys across Sydney Harbour, particularly for traffic bypassing the Harbour CBD to the west
- Improve productivity by allowing commuters and freight to reach their destination faster, safer and more reliably
- Increase the ability for the Harbour CBD road network to cope with traffic incidents
- Reduce travel times, delays and queuing on the Warringah Freeway by improving cross harbour capacity and reducing merges and weaves, supporting long-term increased demand
- Improve streetscapes, sustainability and liveability across the Eastern City and North Districts by reducing congestion.

Section 4.3 of the environmental impact statement outlines several key strategic alternatives to provide additional transport capacity, to relieve pressure on existing crossings and to improve the efficiency and reliability for journeys across Sydney Harbour. This included:

- Do nothing: this option was discounted as none of the project objectives would be achieved impacting on the future economy and amenity of Sydney
- Travel demand management: demand management measures require considerable changes in social attitudes, behaviour and government policy and can take years to achieve and would be unlikely to cater for the population growth projected for Sydney over the next 40 years

- Improvements to the existing harbour crossing capacities and road network: this option was discounted as substantial new improvements to existing harbour capacities are not feasible and the impacts of substantial capacity increases to either connection are unlikely to be acceptable
- A new motorway crossing of Sydney Harbour (the project): this option would address the project need of providing additional transport capacity across Sydney Harbour to relieve congestion and improve reliability on existing crossings and was therefore considered further
- Improvements to alternative transport modes including:
  - The Sydney bus network: this option was discounted as improved bus services alone would not be sufficient to provide the level of additional cross-harbour capacity that is required
  - The rail network: this option was discounted as modelling completed by Transport for NSW indicates that there will still be need for additional road transport capacity at the crossing of Sydney Harbour to cater for future demands post Sydney Metro City & Southwest.
  - 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 project footprint that are best met by road infrastructure. As part of an overarching integrated transport network, the project includes the development of new or improved 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.

Giving consideration to future land use, population density and transport requirements, Future Transport (NSW Government, 2018) identified road based transport, including improvements to bus services, as important modes to support the development of the 30 minute city. Furthermore, the need for additional core motorway capacity at the crossings of Middle and Sydney Harbour was identified as key to development of an appropriate multi-modal Sydney transport network – and specifically identified the Western Harbour Tunnel and Beaches Link program of works as transport projects required to support the plan.

When considering the strategic alternatives and complementary projects, it was concluded that the construction and operation of a new tunnelled motorway crossing of Sydney Harbour (the project) was the preferred solution to achieve the project objectives.

B12.3.2 Road based alternatives

Issue raised

Page 3

While the problem of congestion on and around the Sydney Harbour Bridge due in part to limited crossings is acknowledged, traffic reduction solutions are more effective than motorways at meeting the transport challenges and project objectives listed in the environmental impact statement. Any benefits of the project, including travel times and traffic noise reductions will be only realised in the short term and eroded by induced traffic in the long term.

By focussing on alternatives including public transport, transit-oriented development and travel demand management, the road network does not need to be significantly expanded and that modest and targeted road network improvements can efficiently accommodate population growth.

Response

Inner West Council's view that traffic reduction solutions are more effective at meeting transport challenges is noted. The project is being delivered as part of an integrated multi-modal transport solution which includes public transport such as Sydney Metro City and Southwest, Sydney Metro West, Light Rail, and bus projects being rolled out throughout Sydney to support the diverse needs of Sydney's transport customers, as per the objectives of Future Transport (outlined in Section B12.2.3 above). Buses, as a public transport mode, are anticipated to utilise the project and benefit from reduced congestion on the Sydney Harbour Bridge and ANZAC Bridge, and therefore have improved travel times and reliability.

Future Transport identifies that boosting economic performance through enabling and accommodating growth is itself a significant strategic benefit. Through enabling more travel, the project would accommodate and enable future economic growth and this is a significant benefit of the project.

Traffic modelling carried out, and presented in Appendix F (Technical working paper: Traffic and transport), acknowledges that new roads can induce changes in trip patterns and includes the forecasting of induced demand as a result of the project. Even with induced demand accounted for, the project is forecast to substantially reduce traffic demands and improve travel times and reliability on the Sydney Harbour Bridge, the Sydney Harbour Tunnel, ANZAC Bridge, and connecting road corridors.

B12.3.3 Public transport alternatives

Issue raised

Pages 2, 20, 21, 23, 24 and 31

While it is acknowledged that the project contributes to improving bus travel times, rail is a more effective form of public transport for congested corridors. There is an overall lack of consideration of how congestion problems could be solved through improved public transport including metros and heavy rail projects. All levels of government should be implementing demand management policies in conjunction with improving and expanding public transport to encourage a change in social attitudes, behaviour and policy from vehicles to public transport.

The strategic justification underestimates the project costs compared to public transport and the beneficial outcomes and objectives listed could be better achieved through improved public transport and traffic reduction. While development of public transport projects also leads to impacts, these impacts are generally less and result in improved urban design outcomes in operation. Impacts are therefore more likely to be willingly endured by the community due to longer term benefits. Motorway funding and transport planning should therefore be redirected to improvements to public transport including bus priority improvements to ensure the long term viability of bus services along the Victoria Road corridor.

Response

Transport for NSW note the Inner West Council comment on demand management policies. Transport networks are utilised for a diverse range of purposes including commuting, freight, business travel, trades servicing, etc. Public transport modes are not deemed to be practical for many of these purposes. The NSW Government supports demand management strategies and acknowledges that it can be successful in suppressing road transport growth for certain uses (eg commuting), however continued growth for many other road transport purposes requires increased road capacity to meet future demand.

Sydney Harbour crossing capacity is a major transport constraint for all modes. Sydney Metro City & Southwest will deliver much needed cross harbour capacity for commuters, connect new nodes, and deliver faster and more reliable train journeys to and from the north-west of Sydney. It would integrate with the proposed Sydney Metro West which would include a station at The Bays and provide improved public transport connections in the Inner West. While the Sydney Metro City & Southwest project will contribute to reducing congestion on the existing cross-harbour road connections, it is only one part of an integrated transport network that is required to service the needs of a very diverse range of origins, destinations and journey purposes.

Sydney's Bus Future (Transport for NSW, 2013b) acknowledges that improvements to the bus network are essential to meet changing customer needs. However, it is also recognised that improvements to the bus network are limited by the capacity of the road network hence improvements to bus services alone would not be sufficient to provide the level of additional service required to cater for future population.

While bus, rail and ferry transport modes could be considered as strategic alternatives to the project, they are in fact complementary to the project and form part of a broader integrated transport network, and therefore do not negate the need to provide additional cross-harbour motorway capacity.

Project costs are not included in the environmental impact statement.

B12.4 Project description

B12.4.1 Design changes

Issue raised

Page 31

Design refinements during further design development should not be so significant as to create unforeseen negative impacts or a general lack of trust in the community that the project will proceed as approved. In general, objectives relating to project changes outlined in Section 28.3 of the environmental impact statement are supported and should be followed for all design refinements, particularly regarding impacts from utility works.

Response

Transport for NSW note Council's support and acceptance of the process presented for managing project uncertainties in Section 28.3 of the environmental impact statement.

The Community communication strategy would provide further details about community involvement during design, construction and the project opening phase. The Community communication strategy would guide the project team's interactions with the community and stakeholders and set standards for proactive engagement and ensure that community feedback is used to positively influence the project design and delivery.

The detailed design would be prepared based on the project approval, including the environmental impact statement, this Submissions report and conditions of approval, to determine whether the detailed design is consistent with the approved project. Where the detailed design is inconsistent with the approved project, further assessment and approval would be required under the *Environmental Planning and Assessment Act 1979*. If further assessment/approval is required due to project design changes, the applicable statutory process will 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.

B12.5 Construction work

B12.5.1 Methodology

Issue raised

Pages 2 and 30

Concern is raised over the risk of construction of cofferdams at Yurulbin Point. There are inherent construction risks involved in constructing and decommissioning the cofferdam and joining the driven tunnel to the immersed tube.

Response

All construction work for the project would be carried out by experienced, professional teams. The project team would ensure that cofferdam construction and decommissioning is carried out using industry safety practices that complies will all requirements.

The use of cofferdams and immersed tube tunnel construction methodologies has been applied to many road and rail tunnels around the world to overcome similar combinations of geology, topography and cross-sectional challenges, including the existing Sydney Harbour Tunnel.

The construction process for immersed tube tunnels is outlined in Section 6.4.4 of the environmental impact statement.

B12.5.2 Construction program

Issue raised

Page 2

Confirmation is requested that construction of the project will not delay the delivery of the WestConnex Rozelle Rail Yards recreation area.

Response

The Rozelle Rail Yards construction support site (WHT1) is required to support the construction of the Western Harbour Tunnel component of the project. It is noted that the NSW Government is proposing to develop the former Rozelle Rail Yards into a new open green space for the benefit of the community. The proposed new open green space would potentially overlap with the area described for the Rozelle Rail Yards construction support site (WHT1) in the environmental impact statement. To facilitate the earlier provision of this new open green space to the community, Transport for NSW is investigating alternative layouts or potential alternative locations for the proposed Rozelle Rail Yard construction support site (WHT1). This would be finalised during further design development and detailed construction planning to minimise any potential conflicts with the new open green space. Refer to Section A4.1.1 of this submissions report for further details.

B12.5.3 Clarification of community issues raised

Issue raised

Page 29

Clarification regarding community concerns about risks of property damage is requested. Page 21-29 of the environmental impact statement states:

> *"Concerns were raised during community and stakeholder engagement about potential for property damage, including to basement car parks, unit developments and pools, due to vibration from tunnelling activities … The excavation of tunnels also has potential to result in settlement at the ground surface, potentially impacting properties above or near the project. Some properties near the project may experience very slight to slight cosmetic damage due to settlement, although this is not expected to impact on the serviceability or stability of buildings …"*

Response

All questions, comments and issues raised by the community in the 2017 and 2018 consultation periods have been recorded in the project's database. Feedback received has been considered and addressed as part of the environmental assessment and, wherever possible, has been incorporated into the design. These included issues raised regarding potential damage to property as a result of tunnelling and underground blasting activities, potential impacts to property due to tunnel depth and a reduction in property values.

Ground movement may occur as a result of:

- Tunnel induced movement caused by the relief of stress from tunnelling through intact rock
- Settlement induced from groundwater drawdown.

The risk to individual structures would be dependent on the geotechnical conditions, the depth of the tunnel, the number of storeys of the building, and the position, condition, and masonry of the structure itself.

No buildings along the project alignment were found to be in the 'slight' to 'very severe' damage categories, while approximately 106 buildings along the project alignment were categorised within the 'very slight' damage category. 'Very slight' damage (fine cracks) are easily treated during normal decoration. Damage is generally restricted to internal wall finishes, with small cracks visible on external brickwork or masonry. Refer to Chapter 16 (Geology, soils and groundwater) of the environmental impact statement for further information on settlement impacts.

Environmental management measures outlined in Table D2-1 of this submissions report will ensure that property impacts of settlement are minimised. This includes:

- SG1 - 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.
- SG3 - 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 and vibration monitoring requirements
- SG4 - Pre-construction building/structure condition surveys will be offered and prepared for properties (and heritage assets) within the zone of influence of tunnel settlement (for example within the 5 millimetre predicted surface settlement contour and within 50 metres of surface works) and within the minimum working distances for cosmetic and structural damage due to vibration. 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/structure. Within three (3) months of the completion of construction activities that have the potential to impact on 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, post-construction building condition surveys will be carried out by a suitably qualified person. The results of the surveys 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 (1) month of the survey being completed. Any property damage caused by the project will be rectified.

Vibration generating construction activities would be reviewed as the construction methodology develops to determine the risk of cosmetic damage to nearby structures or vibration sensitive items, as outlined in Section 6.8.1 of the environmental impact statement. Environmental management measures outlined in Table D2-1 of this submissions report will ensure that property impacts of vibration and ground-borne noise are minimised. This includes:

- CNV6 – Vibration generating activities will be managed through the establishment of minimum buffer distances to achieve screening levels. 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. Any damage caused by the project will be rectified
- CNV7 – Feasible and reasonable measures will be implemented to minimise ground-borne noise where exceedances are predicted.

B12.5.4 Management of concurrent projects

Issue raised

Pages 26 and 27

Council supports the establishment of the cumulative traffic working group to investigate the potential cumulative traffic impacts associated with the concurrent traffic generating activities in the Glebe Island and White Bay area due to construction of the Rozelle Interchange, Western Harbour Tunnel and Sydney Metro West, along with an expansion of existing operations at Glebe Island by the Port Authority of NSW. Inner West Council would like to be represented on this working group.

Similarly, Council supports the assessment of complaint and construction fatigue in the environmental impact statement and consultation undertaken to date with utility providers to minimise cumulative impacts.

Response

Inner West Council's support is acknowledged regarding the formation of the Cumulative Traffic Working Group and inclusion of measures to manage complaint and construction fatigue in the environmental impact statement.

Transport for NSW would consult with Inner West Council regarding road closures on local roads. The project team would also provide Council with updates throughout the project as they are a key stakeholder.

During construction of the project, the communication and stakeholder engagement team would build on its existing working relationships with the project teams for other major projects (eg WestConnex Rozelle Interchange project and Sydney Metro) to support identified stakeholders and community members who may be susceptible to construction fatigue. The project team would ensure the expectations of these stakeholders or community members are managed for the project.

An assessment was completed to identify areas where the project would potentially have sustained impacts to stakeholders and community members who may be susceptible to construction fatigue. Project activities which could lead to construction fatigue, potentially impacted groups, and management measures proposed to address these issues is provided in Table D2-1 of this submissions report.

The project's communication and stakeholder engagement team would work closely with its counterparts in different divisions and adjacent projects. This is to ensure the various State Government projects are releasing and/or consulting on projects in collaboration with each other and to reduce consultation and construction fatigue in local communities.

At present there are two formal groups in the project area which meet regularly to manage potential cumulative impacts. This includes:

- The Bays Precinct Working Group consisting of Government agency representatives from the Western Harbour Tunnel and Beaches Link, WestConnex Rozelle Interchange, Sydney Metro West, Port Authority of NSW and Transport for NSW teams

- Glebe Island and White Bay Community Liaison Group, coordinated by Port Authority of NSW, consisting of representatives from the local community and the current tenants at Glebe Island and White Bay. Representatives from the project attend these meetings and will continue to do so on a regular basis during the construction period. Port Authority of NSW have recently advised that any future tenants and projects using the area would be invited to this group.

Additional coordination groups would be developed as required and Transport for NSW would continue to work closely with its internal departments.

B12.5.5 Community engagement during construction

Issue raised

Pages 22 and 25

Community engagement and complaints handling improvements realised as WestConnex has progressed should continue during construction of the project to minimise impacts on the community and reduce the need for Council to take on complaints handling and community advocacy roles.

Response

A comprehensive Community consultation framework has been prepared and was included in the environmental impact statement, to guide the planning and delivery of communication and stakeholder engagement activities across the project. Refer to Appendix E (Community consultation framework). New environmental management measure SE4 advises that the consultation for the project will be in accordance with the Community consultation framework (refer to Table D2-1 of this submissions report).

As outlined in the Community consultation framework, a complaints management system would be developed and implemented before the start of construction activities for the project. This would include ensuring the following mechanisms are established and available for 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
- A postal address to which written complaints and enquires may be sent
- An email address to which electronic complaints and enquiries may be transmitted
- A mediation system for complaints unable to be resolved
- A mechanism for community members to make enquiries in common community languages of the area.

Where required, design and construction refinements identified during further design development would be communicated to the community as identified in Section 28.3 of the environmental impact statement. This would include ongoing community and stakeholder engagement to assist in informing and determining appropriate noise mitigation would be carried out throughout project development and construction.

The complaints management system would be maintained during construction and operation and would be made available to the Secretary of the Department of Planning, Industry and Environment.

Details of how to make a complaint would be included in all communication 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.

B12.6 Construction traffic and transport

B12.6.1 Active transport

Issue raised

Page 2

Significant impacts on the shared path along the western side of Victoria Road have already been imposed by WestConnex Stage 3B and the project will result in the entire shared path along this side of Victoria Road between Darling Street and the Iron Cove Bridge being dominated by motorway construction sites. Construction activities should not sever walking or cycling access or create unacceptable diversions (even temporarily) particularly at the Victoria Road construction support site (WHT2) whereby a large number of heavy vehicles would cross the Victoria Road shared path. It is essential that traffic controllers are permanently located at entry and exit points during all periods of operation of this site.

Inner West Council note that walking and cycling safety is such an important issue that Council would like it to be addressed in detail at environmental impact statement stage rather than in construction management plans. The kind of measures that can improve safety include a requirement for the contractor to provide traffic controllers at all locations where vehicles entering construction sites cross footpaths or shared paths. Contractors should also adopt heavy vehicles with cabin designs that have a high degree of visibility of the surrounding road environment.

Inner West Council believe that construction trucks would create an unacceptable road risk for students and parents walking, cycling and travelling in cars to access local schools. The schools most affected would be Rozelle Primary School and the Balmain Campus of Sydney Secondary College. The highest risk areas would be at the Victoria Road frontage of the Victoria Road construction support site (WHT2) and at the signalised crossings of Victoria Road at Darling and Wellington Streets. Proposed traffic signal changes in these locations must therefore prioritise pedestrian safety.

It is further requested that Inner West Council be informed of all local road, footpath and park closures along with any diversions for construction activities within the local government area. All repairs and restoration of council infrastructure should be of a high standard.

Response

Council's concern regarding the cumulative impacts of the operation of multiple construction support sites on Victoria Road and surrounds is acknowledged.

The WestConnex M4-M5 Link – Iron Cove Link civil site (C8) is located approximately 120 metres north east of the Victoria Road construction support site (WHT2) along the southern side of Victoria Road at Rozelle between Byrnes Street and Springside Street. Construction activities at the Iron Cove Link civil site (C8) are scheduled to be completed in Q3 2023. This overlaps with the indicative construction program for the Victoria Road construction support site which identifies construction activities at the site from Q3 2021 to Q3 2025. Potential cumulative impacts of the M4-M5 Link Iron Cove Link civil site (C8) and the Victoria Road construction support site (WHT2) would be managed through the implementation of environmental management measures CI1 and CI2 (refer to Table D2-1 of this submissions report) which will include tailored multi-party engagement and cooperation to coordinate with the M4-M5 Link project team to minimise impacts.

The shared user paths on Victoria Road within the vicinity of the Victoria Road construction support site (WHT2) would be maintained throughout construction. These shared user paths would not be subject to long-term closures. Any closures would be for short durations only. A new environmental management measure, CTT19, has been included to further clarify the requirements to manage changes to shared user paths (refer to Table D2-1 of this submissions report):

Direct impacts to existing shared user paths will be minimised where reasonable and feasible. Any detours and adjustments will be designed with consideration of user safety and convenience.

Pedestrian and cyclist safety is a priority for Transport for NSW. Vehicle access to and from the Victoria Road construction support site (WHT2) will be managed to ensure pedestrian, cyclist and motorist safety as per environmental management measure CTT7 (refer to Table D2-1 of this submissions report). Traffic controls may include manual supervision, signage and physical barriers among others.

Construction traffic would not pose an unacceptable road risk for students and parents walking, cycling and travelling in cars to access local schools. Environmental management measures outlined in Table D2-1 of this submissions report, including CTT7 and CTT19, will manage vehicle movements to and from construction sites to ensure pedestrian, cyclist and motorist safety. This may include the location specific inclusion of manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence. This would also ensure safety for pedestrians accessing nearby schools, including the Rozelle Primary School and the Balmain Campus of Sydney Secondary College, is maintained.

Inner West Council's request that construction contractors adopt heavy vehicles with cabin designs that have a high degree of visibility of the surrounding road environment is noted. All construction vehicles would comply with all regulatory requirements and safety standards.

Potential impacts from road closures would be very short term and localised and would only be required as worksites are established. All permanent surface works at Rozelle would be carried out as part of the approved M4-M5 Link project.

To manage ongoing local road, footpath and park closures along with any diversions for construction activities a traffic and transport liaison group would be established, including representatives from appropriate councils, as well as motorist, cyclist and pedestrian stakeholders to discuss traffic management and road safety. As required by environmental management measure LP2 (refer to Table D2-1 of this submissions report), land subject to temporary use, including areas of public open space and other council infrastructure, will be rehabilitated as soon as practicable. This will be carried out in consultation with the relevant council and/or the landowner.

B12.6.2 Public transport – Birchgrove Ferry Wharf

Issue raised

Page 4

Inner West Council believe that the relocation of the Birchgrove Ferry Wharf will potentially result in negative impacts. A strategic review of transport services to and from the area should be undertaken and consideration should be given to options to relocate the existing ferry wharf based on patronage data. The F8 ferry route between Cockatoo Island and Circular Quay utilises the wharf and operates 23 times a day Monday to Friday in each direction, 17 to 18 times a day on Saturdays in each direction, and 12 to 13 times a day on Sundays and public holidays in each direction. Patronage for the Birchgrove Wharf in the financial year 16/17 was approximately 65 customers per day. A more suitable and/or supplementary ferry wharf site could be the Miklouho-Maclay Park at the end of Grove Street in Birchgrove. This location is practical, as DDA compliant access could be readily achieved and this site is serviced by the 441 bus.

Response

Transport for NSW is committed to providing a replacement service for commuters impacted by the Birchgrove Ferry Wharf closure and ensuring that the temporary closure (around two years) of the Birchgrove Wharf will not occur until the replacement service is operational. Since the environmental impact statement exhibition period, Transport for NSW has been considering various options for a replacement service and the preferred option will be finalised during construction planning.

As discussed in Section A3.3 of this submissions report, environmental management measure CTT3 has been amended to reflect this as follows:

> *A replacement service for commuters impacted by the temporary closure of Birchgrove Ferry Wharf will be determined during construction planning. The temporary closure of the Birchgrove Wharf will not occur until the replacement service is operational.*

It is also noted by Transport for NSW that ferry customers have other alternatives available such as the Balmain Ferry Wharf which serves the same ferry lines, as well as bus route 441, accessible from Grove Street and providing connections to Sydney CBD, and other bus services operating along Victoria Road.

B12.6.3 Public transport – bus services

Issue raised

Pages 9 and 26

Concern has been raised that due to the addition of additional construction vehicles, construction of the project would negatively impact bus services. Specifically, construction vehicles queuing to access the Victoria Road construction support site (WHT2) will affect the viability of numerous bus services in operation along Victoria Road. Careful co-ordination using radio communication and GPS tracking will be needed to avoid queuing.

Response

Construction of the project would result in additional construction vehicles travelling on the road network around Rozelle, North Sydney and Artarmon, which would increase bus travel times given the congested nature of networks in these areas, as outlined in Section 8.4.1 of the environmental impact statement. When compared to forecast 2022 peak period base conditions, peak cumulative construction activities in the Rozelle and surrounds area has the potential to impact northbound bus travel times on ANZAC Bridge-Victoria Road by up to 2.5 minutes during the AM peak while northbound volumes are low. In the PM peak, cumulative impacts are expected to be up to 1.5 minutes.

Overall, the assessment of the impact of construction activities on the land-based public transport network indicates acceptable performance, with minor adjustments to some bus stops in North Sydney and a minor increase in bus travel times for some customers.

Potential construction impacts on bus services would be minimised through the implementation of environmental management measure CTT4 (refer to Table D2-1 of this submissions report) which requires that consultation be carried out with bus operators to minimise traffic and transport impacts.

Heavy vehicle haulage during construction would be in line with industry practice and comply with all regulations and legal requirements, including *National Heavy Vehicle Law and Chain of Responsibility* requirements.

B12.6.4 Parking – Yurulbin Point

Issue raised

Pages 2, 4, 5 and 13

While Inner West Council is relieved that worker access to the Yurulbin Point construction support site (WHT4) and Sydney Harbour south cofferdam (WHT5) would be by boat from White Bay, in practice preventing all access by workers to these sites by car is not possible. Even a moderate level of light vehicle congestion and increased parking demand along Louisa Road and around Birchgrove Oval would have a major impact, as all streets in the area are narrow and already subject to strong parking demand. The removal of ten parking spaces at Yurulbin Point can already not be accommodated on the surrounding road network. Strict measures are therefore needed to

prevent any worker parking in this area, and these measures should be implemented prior to the start of construction.

Further concerns are raised regarding the ability of White Bay/Glebe Island to cater for the full construction workforce. Procedures should be in place to ensure all workers only park in parking provided and do not park on local streets. This should include parking demand reduction measures including encouragement of public transport to be enforced. It is requested that parking arrangements be assessed in the environmental impact statement and not later during the construction management plan stage.

Response

Transport for NSW understands the importance of minimising impacts on local communities, including impacts of worker parking in streets. Locating construction support sites to support large scale infrastructure projects in urban environments is a complex issue, and requires consideration of a variety of aspects, including:

- Minimising property acquisitions, especially private residential dwellings
- Connectivity of the site with arterial roads to minimise haulage through local streets
- Ensuring the sites are of a size to accommodate all of the work requirements, including worker parking.

In urban environments, it is difficult to achieve all of these requirements. As outlined throughout Appendix F (Technical paper: Traffic and transport), most construction support sites would provide sufficient onsite parking to accommodate the construction workforce. Exceptions to this include the Yurulbin Point construction support site (WHT4) as Louisa Road is not suitable for landside access. As such, this site will be supported from White Bay, with worker access and egress to the Yurulbin Point construction support site (WHT4) being only allowed by water.

As outlined in Section 5.2.4 of Appendix F (Technical working paper: Traffic and transport), the Yurulbin Park car park would be temporarily closed for about four years due to the Yurulbin Point construction support site (WHT4), resulting in the loss of about 10 parking spaces. A subsequent inspection of the parking area at Yurulbin Park indicates that there are five to six car parking spaces in the parking area, not 10 as stated in the environmental impact statement. This error has been included as a clarification in Section A4.2 of this submissions report. As Yurulbin Park would be closed for the duration of construction, and Birchgrove Ferry would be temporarily closed for around two years, the demand for this carpark would be reduced. The surrounding local road network including Louisa Road could accommodate these lost parking spaces for other users and therefore parking impacts would be minor and manageable.

A car parking area would be provided at the White Bay construction support site (WHT3). Where required, shuttle bus transfers between construction support sites would also be provided. Transport for NSW will, as far as reasonably practical, minimise parking in local streets. It is however unlikely that a workable solution can be found which completely eliminates the requirement for parking on local streets.

Where on-site parking for project works is not provided or where provision of on-site parking cannot accommodate the full construction workforce, the workforce would be required to park on the surrounding road network. Impacts on these roads would be detailed in the construction traffic management plan. To minimise the potential parking impacts on the road network, the construction workforce would be encouraged to use public transport where feasible, with key bus corridors including Victoria Road and ANZAC Bridge. In addition, the L1 Dulwich Hill Line is accessible from the Rozelle Bay light rail stop.

B12.6.5 Parking – Victoria Road

Issue raised

Pages 2 and 9

The removal of the existing car park on the Balmain Leagues Club site in conjunction with additional demand for workers accessing the Victoria Road construction support site will result in parking demand pressures.

Response

It is acknowledged that the car park on Waterloo Street, which was introduced around mid-2018 on privately owned property and operated by Inner West Council, would be removed.

The survey carried out to inform the business impact assessment determined a high dependency on convenient customer parking and on-street parking and a lack of available parking in the area.

A review of historical aerial photography since the opening of the car park identifies that the car park is well utilised with spaces being over 50 per cent occupied in the majority of the images. It is considered that the introduction and then subsequent removal of the car park spaces would represent a moderate magnitude of change for nearby businesses. However, as the car park has only been in operation for a relatively short time and is temporary, it is considered that local businesses would generally retain an ability to adapt to the change as historically demonstrated.

Transport for NSW has investigated options to minimise worker parking in streets surrounding the Victoria Road construction support site (WHT2) to discourage private vehicle usage and encourage use of public transport. These measures would be further investigated once a contractor is engaged. These solutions will be tailored to suit the requirements and geographical spread of the workforce to ensure maximum take up. Refer to Section A4.1.1 for further discussion of this issue.

B12.6.6 Traffic changes

Issue raised

Pages 11, 12, 26 and 27

Cumulative project impacts on travel times, level of service and congestion along key corridors and intersections including City West Link and Victoria Road are not acceptable to Council, in particular:

- Travel times on City West Link westbound slowed by up to five minutes during AM peaks
- Travel times on Victoria Road northbound slowed by up to 3.5 minutes during AM peaks
- Travel times in the PM peak slowed by up to two minutes on City West Link and Victoria Road.

These impacts will increase the likelihood of traffic diverting onto local streets and making it more difficult for people to access local businesses and homes. Particular concern is raised for residents of Rozelle and Lilyfield who have already been subject to a multitude of impacts from WestConnex. Furthermore in 2022/23 impacts will be increased when the project, the Bays Precinct redevelopment and the Metro West Project are in construction and the Cruise Passenger Terminal is operational.

Additional assessments should be undertaken for cumulative traffic impacts of the Metro West project and the increased capacity of the operational cruise passenger terminal.

While slow average vehicle travel speeds are not necessarily negative as fast traffic creates safety and liveability impacts and increases sprawl, consistency of speed should also be considered.

Response

Traffic modelling carried out for the environmental impact statement included the available information at the time and includes predicted growth through the Sydney Motorway Planning Model (SMPM). As outlined in Section 5.6.2 of Appendix F (Technical working paper: Traffic and transport), to assess worst-case cumulative construction impacts, network simulation modelling was carried out for the Rozelle and surrounds study area, to quantify the performance of the road network with and without construction traffic due to combined construction traffic from the project in

conjunction with M4-M5 Link and Sydney Metro City & Southwest. Modelling assumes that the cruise terminal is operational, ie that base counts for the model were taken on a cruise day. It is also noted that construction of the Rozelle Interchange as part of the approved M4-M5 Link would be approaching completion and construction traffic volumes for this project would be well below peak levels.

The results indicate that when compared to forecast 2022 peak period base conditions, cumulative construction activities in the Rozelle and surrounds area has the potential to:

- Increase traffic demand by up to three per cent
- Create up to three additional stops per trip
- Reduce average trip speeds by between five per cent (morning peak) and 14 per cent (evening peak).

The impacts identified by Inner West Council in their submission represent microsimulation level analysis and do not reflect the fact that the majority of trips during peak times of day on this part of the network travel are well beyond the boundaries of the microsimulation model meaning a two to five minute delay would be a relatively small percentage of overall end to end trip times. The overall network impacts are considered relatively minor and manageable.

The Sydney Metro West environmental impact statement is consistent in its findings in that the magnitude of impact to network performance is not materially different to the assessment presented in the environmental impact statement with impacts considered relatively minor and manageable.

B12.6.7 Maritime traffic

Issue raised

Pages 26 and 27

The project, through the use of construction barges, tugboats and transport vessels will increase boat congestion on the harbour, impacting a large number of activities, including marina, boat ramp and dry dock uses.

Response

Impacts to maritime movements and activities are discussed in Section 5.5.3 of Appendix F (Technical working paper: Traffic and transport) and Section 8.4.2 of the environmental impact statement.

The impact on navigation in the Inner Sydney Harbour during construction would be relatively minor. Although a relatively high number of construction vessel movements are expected, the Inner Sydney Harbour would be maintained as a working harbour. Waterway users would need to abide by any navigational restrictions imposed as part of the Marine Traffic Management Plan or as required by the Port Authority of NSW.

Navigational restrictions would temporarily prohibit larger vessels such as oil tankers crossing the Harbour between Birchgrove and Berrys Bay while the tunnel units are being immersed. Operators of these vessels would be consulted and notified of the planned closures to ensure that these vessels avoid the area and complete their journey before or after any closure periods. Small vessels including ferries would be able to travel through Birchgrove and Berrys Bay during partial closure of the Harbour, with speed restrictions imposed and movements to be carried out under escort as appropriate. Consultation would be carried out to notify recreational users of the scheduled closures and exclusion zones.

Moorings within the vicinity of the Berrys Bay construction support site (WHT7) would require temporary relocation and necessary arrangements would be determined in consultation with the vessel owners. Impacts on any relocated moorings are expected to be relatively minor.

No marinas, boat ramps or dry docks would be used or directly impacted by the project.

Potential impacts of marine construction would be minimised through the implementation of the following environmental management measures (refer to Table D2-1 of this submissions report):

- CTT2 – Moorings impacted during construction will be relocated elsewhere in Sydney Harbour in consultation with the lease holders
- CTT16 – Construction marine traffic activities will be scheduled to avoid times and locations of high recreational marine traffic where feasible and reasonable
- CTT17 – Harbour closures scheduling will be carried out in consultation with Port Authority of NSW, other divisions of Transport for NSW and other relevant stakeholders, including Sydney Harbour Federation Trust
- CTT18 – Construction vessel movements will be managed so that they will not interfere with port operations or the navigation of seagoing ships and ferries, unless prior approval has been obtained from the Harbour Master.

B12.6.8 Vehicle movements

Issue raised

Pages 2, 9, 10, 11, 12, 21 and 25

Construction traffic, including a large number of heavy and light vehicles will result in cumulative congestion and road safety impact on Victoria Road, City West Link, The Crescent and adjoining roads from construction traffic associated with the project and other projects in the area. Particular concern is raised regarding the Victoria Road construction support site (WHT2) where there will be a significant number of truck movements that would potentially be subject to queueing as they await their entry slot on Victoria Road and/or narrow residential streets surrounding the site. Additional congestion will increase delays and potentially encourage diversion of traffic to local roads that have not been assessed in the environmental impact statement.

Significant impacts are likely for pedestrians along with residents at the rear of the site on Moodie, Waterloo and Darling Streets due to the traffic congestion created by construction traffic including spoil trucks. Impacts would be increased by the proposed partial closure of Moodie Street as part of WestConnex Stage 3B, as traffic would not be able to avoid the Darling Street/Victoria Road intersection.

While Inner West Council support the decision not to use Robert Street, other concerns relate to the sheer number of trucks accessing the White Bay construction support site (WHT3) will exacerbate existing congestion at major intersections at the area including the intersection of James Craig Road, City West Link, The Crescent and Victoria Road. It is requested that Robert Street should be restricted for all future projects at White Bay as it is already heavily congested, and due to the number of small businesses is not suitable for large trucks. Other impacts are possible from vehicles using Johnston and Booth Streets to access the site and having a negative impact on the community and the business environment of the Annandale village, including the elderly and children from the local schools.

Construction traffic must avoid peak periods to the greatest extent possible and use only main (State) roads to minimise impacts of vehicle movements and contribution to congestion. The use of barges for spoil movement should also be used to mitigate the need for spoil haulage on roads through Birchgrove and Balmain. Based on experience from construction of WestConnex, the Westgate Tunnel and similar infrastructure projects overseas, Council suggested several mitigation measures to mitigate impacts from construction traffic.

Response

The contribution of construction related heavy and light vehicle traffic would be relatively minor compared to existing background traffic flows along the majority of construction haulage routes. In general, access routes are proposed to be from major arterial roads rather than local roads where reasonable and feasible.

Where there is the potential for queueing and traffic and access disruptions in the vicinity of construction support sites, truck marshalling areas will be identified and used where feasible and reasonable as outlined in environmental management measure CTT11 (refer to Table D2-1 of this submissions report). Furthermore, as required by environmental management measure CTT6 (refer to Table D2-1 of this submissions report), construction traffic will be managed to minimise movements during peak periods where reasonable and feasible.

As outlined in Table 5-5 and Figure 5-11 of Appendix F (Technical working paper: Traffic and transport), the proposed access route to the Victoria Road construction support site (WHT2) would be on Victoria Road. Construction heavy vehicles would not use Johnston Street or Booth Street to access construction support sites. It is not anticipated construction traffic would be required to access Moodie, Waterloo or Darling Streets in the vicinity of the Victoria Road site. The approved partial closing of Moodie Street as part of the M4-M5 Link project was assessed in the respective environmental impact statement and is considered out of scope for the project.

The use of Robert Street for access to future projects at White Bay is considered out of scope for the project. Existing Cruise ship and other port related traffic, including heavy traffic, use James Craig Road to access/exit the port facilities of Glebe Island and White Bay. It is noted that the alternative access point to White Bay and Glebe Island, via Victoria Road and Robert Street, Rozelle, is not allowed to be used for the vast majority of traffic generated at the Port. Robert Street only functions as an access and egress point for the marine fuelling and boat storage facility at White Bay

As outlined in Section 5.2.4 of Appendix F (Technical working paper: Traffic and transport), with construction traffic included on the road network City West Link/The Crescent would continue to operate at a comparable Level of Service (LoS) during both peak periods. The intersection is already operating at capacity during the morning peak and this would not substantially change with the addition of the forecast construction traffic. This is also the case at The Crescent/James Craig Road which would operate at capacity with and without construction vehicles during the morning peak. In the evening peak, the intersection operation would deteriorate from LoS D to LoS E with an increase in average vehicle delay of 13 seconds. Similar to the morning peak, the intersection is already at capacity without construction vehicles and this would not substantially change with additional construction traffic.

The measures listed in relation to the operation of construction vehicles and their drivers are acknowledged and would generally be implemented as part of standard construction site practices, including inductions and toolbox talks as appropriate. This is discussed further in Section C8.1 (Construction traffic and transport) of this submissions report.

Management measures would be implemented as outlined in Section 8.5 of the environmental impact statement to minimise impacts of construction traffic, including the haulage of spoil by barge as an alternative to road based haulage where possible.

Appropriate conditions of approval are a matter for the Department of Planning, Industry and Environment to consider during their assessment of the project.

B12.6.9 Cumulative construction traffic impacts

Issue raised

Pages 9, 11, 22, 26 and 27

The project will result in cumulative impacts with the nearby WestConnex Stage 3B including noise, vibration, dust, truck traffic impacts and worker parking pressures for residents and businesses from both projects. Additional heavy vehicles from the project will result in a greater impact to traffic flow due to their size and slow acceleration and encourage an increase in risk taking behaviour as drivers seek to avoid delays, resulting in danger for pedestrians and road users.

Detailed cumulative analysis has not been undertaken that considers the Bays Precinct redevelopment, Metro West project and increased capacity of the cruise passenger terminal for the 2022/23 period when the largest cumulative impacts are anticipated.

Inner West Council support the environmental management measures proposed for cumulative impacts, including multi-party engagement and coordination along with travel mitigation measures for construction workers, however based on experience with WestConnex, concern is raised with compliance with environmental management measures and other requirements. The establishment of the Cumulative Traffic Working Group to oversee and coordinate the cumulative growth of construction traffic in the area is also supported. To ensure that the interests of the Inner West community be provided with appropriate representation and to assist in better facilitating the coordination of construction activity, it is requested that Inner West Council be included in the working group or that a similar coordination group be established specifically for the Inner West local government area (with Council included in its membership).

Response

The potential cumulative impacts during construction of the project have been determined through engagement with the various projects and stakeholders surrounding the project footprint. It is anticipated that potential cumulative impacts would be concentrated around Rozelle and White Bay in the south of the project footprint, generated by interactions between the project, M4-M5 Link and various other major projects at White Bay including Sydney Metro West.

Without mitigation, key potential cumulative impacts in the vicinity of Rozelle would likely include minor to moderate temporary increases in traffic volume, construction noise and vibration, decreased visual amenity and land use impacts. There is also potential for construction fatigue and complaint fatigue to be experienced by surrounding receivers at these locations as a result of concurrent and consecutive construction programs.

Overall, with the implementation of environmental management measures described in Table D2-1 of this submissions report, the cumulative impacts in Rozelle and surrounds are expected to be manageable. The potential impacts would be mitigated by considered and tailored cumulative construction traffic planning, based on confirmed cumulative activities at the time of construction.

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, as outlined in 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 Transport Coordination within Transport for NSW.

Potential cumulative impacts of the project are presented in Chapter 27 (Cumulative impacts) of the environmental impact statement, which addresses the relevant secretary's environmental assessment requirements.

The *Sydney Metro West Stage 1 environmental impact statement* was placed on exhibition on 30 April 2020 and includes an assessment of cumulative construction and operation impacts associated with the Sydney Metro West, M4-M5 Link and Western Harbour Tunnel and Warringah Freeway Upgrade projects. Cumulative construction movements as identified in the *Sydney Metro West Stage 1 environmental impact statement* are identified in Table B12-1.

Table B12-1 Number of cumulative construction vehicle movements (as identified in the Sydney Metro West Stage 1 environmental impact statement)

Project	Construction site	Morning peak hour		Evening peak hour	
		Light vehicle movements	Heavy vehicle movements	Light vehicle movements	Heavy vehicle movements
Sydney Metro West Stage 1	The Bays Station construction site	2	8	60	8
WestConnex M4-M5 Link	Rozelle civil and tunnel site	100	46	350	46
	Iron Cove Link civil site	15	4	140	4
Western Harbour Tunnel and Warringah Freeway Upgrade	Rozelle Rail yards construction support site	45	14	30	14
	Victoria Road construction support site	41	37	71	37
	White Bay construction support site	40	63	140	63

Overall cumulative impacts presented in the *Sydney Metro West Stage 1 environmental impact statement* are consistent with those identified for the project and are considered manageable.

As Council is already aware, a Cumulative Traffic Working Group was established in July 2018 to investigate the potential cumulative traffic impacts associated with the concurrent traffic generating activities in the Glebe Island and White Bay area due to construction of the of Rozelle Interchange, Western Harbour Tunnel and Sydney Metro West, along with an expansion of existing operations at Glebe Island by the Port Authority of NSW. The working group includes the following stakeholders:

- Transport for NSW
- Urban Growth (now Infrastructure NSW)
- Sydney Coordination Office
- Transport for NSW (Greater Sydney Division)
- Transport for NSW (Rozelle Interchange project)
- Transport for NSW (Western Harbour Tunnel project)
- Transport for NSW (Sydney Metro West project)
- Port Authority of NSW.

Transport for NSW will consult with Inner West Council regarding road closures on local roads and provide Council with updates throughout the project.

Transport for NSW recognises the importance of engaging and consulting with Inner West Council on the various transport infrastructure projects occurring within the Local Government Area. As a result, Transport for NSW is proposing to establish a separate Transport Working Group with Inner

West Council to provide improved oversight and coordination of key projects, which would include traffic and active transport impacts.

B12.6.10 Construction management plans

Issue description

Page 13

Construction management plans should include an assessment to compare the use of single trucks and truck and dog combinations to assess safety and construction implications. This assessment should be publicly exhibited prior to approval.

Response

Generally, single trucks (bogies) are not planned to be used for the haulage of spoil as they would substantially increase the number of truck movements presented in the environmental impact statement.

A Construction Traffic Management Plan (CTMP) would be prepared by the construction contractor, in consultation with councils and relevant transport stakeholders, as part of the Construction Environmental Management Plan (CEMP) and would be made publicly available. The CTMP would include the relevant environmental management measures detailed in Table D2-1 of this submissions report.

Heavy vehicles used on the project would comply with relevant legislative requirements, including *Heavy Vehicle National Law and Chain of Responsibility* legislation.

B12.7 Operational traffic and transport

B12.7.1 Public transport

Issue raised

Pages 3, 23 and 24

Rather than focusing on reduced travel times for private vehicles, the NSW Government should focus reducing travel times for public transport. The claimed benefit of ‘faster, more reliable journeys’, will lead to mode shifting and induced traffic which will ultimately erode this benefit for both private vehicles and busses. Public transport would also result in increased travel time benefits as parking constraints do not need to be considered at the destination.

A more detailed analysis of increasing active transport and ferry utilisation as a means of reducing traffic demand should be provided. These modes of transport may also provide benefits for health and liveability.

Response

Future Transport promotes the development of integrated multi-modal network solutions, 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, as outlined in Section B12.2.3. The project is one part of a complementary integrated multi-modal strategy being implemented by the NSW Government. The NSW Government is proposing to deliver a range of transport infrastructure projects including road, public transport and active transport projects to address the transport challenges associated with a growing Sydney and to provide a range of transport alternatives to support the variety of trips being made across the city including in the Inner West.

Chapter 4 (Project development and alternatives) of the environmental impact statement includes a discussion of the project development and alternatives including improvements to active transport and improvements to the ferry network. These modes are considered complementary to the project

as part of a broader integrated transport network and would not negate the need to provide additional cross-harbour motorway capacity.

Traffic growth on new or upgraded roads is generally a result of the following influences:

- 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.

Even with no growth in regional population and economic activity, a new or substantially upgraded road can induce changes in trip patterns, which then appear as induced traffic demand. The SMPM includes the changes in traffic associated with all three of the above sources of traffic, with induced demand equating to about 0.3 per cent additional daily trips in the Sydney metropolitan area in 2037.

B12.7.2 Active transport

Issue raised

Pages 24 and 27

At a strategic level, because motorways increase traffic and create the need for widening of surrounding roads and intersections, they inhibit the movement of pedestrians and cyclists and result in less reliable journeys. While the environmental impact statement does not propose any specific roadway or intersection changes that would permanently affect active transport connections, the additional traffic it creates will nonetheless have a negative impact.

While it is noted and supported that the project includes new active transport infrastructure within council areas north of the harbour, Inner West Council request the project includes measures to result in a substantial positive impact to the active transport network within Rozelle and surrounds.

Response

The Rozelle Interchange is designed to safeguard future connections to the project, and as a result, the project would not have any direct or indirect impacts on the active transport network within Rozelle during operation. Key active transport corridors in the Rozelle area are Victoria Road and City West Link/ANZAC Bridge which include dedicated, off road active transport corridors that would not be impacted by the project.

The M4-M5 Link project includes several upgrades to active transport infrastructure resulting in an overall improvement and net increase in active transport connections surrounding the Rozelle Interchange. These improvements include providing new and upgraded east–west connections linking Lilyfield and Rozelle with ANZAC Bridge, the future Bays Precinct and Balmain, and north–south connections linking Lilyfield and Rozelle with Annandale and Glebe. These improvements once completed would not be impacted by the project.

B12.7.3 Traffic changes

Issue raised

Pages 2, 3, 23 and 27

Increases on local road traffic particularly on Johnston Street and The Crescent as a result of reduced through traffic could impact network efficiency and travel times. Any increase in traffic on Johnston Street is not acceptable as it is surrounded by residential uses such as shops, childcare centres, two schools and churches.

The project will increase travel demand through Rozelle of up to 14 per cent by 2037 resulting in a further lack of travel time benefits. Stated travel time savings are predominantly in the North Shore and Northern Beaches areas, with less savings in the Inner West. It is requested that Transport for NSW do not reduce road capacity on streets within the Inner West local government area to minimise this impact.

The traffic forecasts presented do not support the argument that the project will in fact solve congestion in the long term and will only result in minimal travel time savings and intersection performance improvements. The project would contribute to the phenomenon of induced demand which will erode Sydney's liveability, air quality, transport affordability and economic productivity. The NSW Government should focus reducing travel times for public transport. By reducing traffic this would be the most effective means of improving the consistency and reliability of private vehicle travel.

Response

The project forms part of an integrated multi-modal network solution being delivered by the NSW Government. Specifically, in addition to the project, City and Southwest Metro will provide parallel north-south cross harbour public transport capacity (in advance of the project), and West Metro will provide parallel east-west capacity. Additionally, through the reduction in demand and congestion on the ANZAC Bridge and Western Distributor due to the Western Harbour Tunnel the project would directly benefit one of the most critical strategic bus corridors serving the Inner West Council Area.

The project does not propose any direct changes to local roads within the Inner West Council local government area. As outlined in Section 7.4 of Appendix F (Technical working paper: Traffic and transport), in the 'Do something' scenario, traffic demand through the Rozelle and surrounds study area is forecast to increase by up to 14 per cent as a result of the project. This is primarily due to the reduction in congestion along both the ANZAC Bridge and the Western Distributor, resulting in improved travel times and future delays. As such, while the project would lead to an increase in traffic demand it would also result in a greater amount of forecast demand being able to travel as desired during peak periods. The majority of additional demand would be underground, connecting via WestConnex and as a result, despite the increase in demand, average travel speeds through the Rozelle area would increase by up to 60 per cent as a result of the project. At a strategic level, due to the journey time and reliability benefits provided to transport customers, the project would enable more customers to travel as desired and at an improved level of service. The reduction in congestion and queuing on this critical corridor would also improve conditions on connecting regional and local roads within Sydney CBD. This increase in demand is therefore not anticipated to impact upon the amenity of local centres including Annandale.

As outlined in Section 3.3.2 of Appendix F (Technical working paper: Traffic and transport), a new or substantially upgraded road can induce changes in trip patterns, which then appear as induced traffic demand. This induced demand is included in the strategic traffic forecasts for the project. Induced demand in the future 2037 scenario, which equates to about 0.3 per cent additional daily trips in the Sydney metropolitan area, would result in a negligible impact to the traffic network.

B12.7.4 Integration with other transport projects

Issue raised

Page 15

Differences in toll regimes between WestConnex and the project could encourage drivers to cross the harbour in the tunnel, then divert onto the toll-free surface road network. This would result in increased traffic on the City West Link, The Crescent, Johnston Street and several local roads. Consideration should be given to incentivising drivers to continue in the tunnels to the south and west using WestConnex, as this would reduce volumes on the surface road network and minimise the likelihood of rat-running on local streets.

Tolling should be introduced for all private vehicle harbour crossing to compare harbour crossing and WestConnex to reduce demand for private traffic, increase public transport and traffic not to exit to use surface roads.

Response

Construction works for Western Harbour Tunnel and Warringah Freeway Upgrade include provision for tolling gantries for northbound traffic should the government elect to introduce a northbound toll. The decision to apply a toll to a road is a NSW Government decision and is not made at the project level.

Tolling scenarios, assumptions and implications used for the project transport modelling are detailed in Section 7.2.4 of Appendix F (Technical working paper: Traffic and transport). The assessment assumptions include equalised tolling (toll parity) between Sydney Harbour Bridge/Sydney Harbour Tunnel and Western Harbour tunnel.

The modelling analysis carried out for the project has factored in potential toll avoidance behaviour. While drivers may choose to avoid tolls, the Sydney Motorway Planning Model (SMPM) toll choice assignment model was developed to model the range of driver behaviour and was adjusted to match the observed patronage on existing toll facilities. As outlined in Section 7.2.1 of Appendix F (Technical working paper: Traffic and transport), forecast demands across Sydney Harbour show that the project would allow for growth in cross harbour trips while also reducing traffic demands and consequent congestion on the existing crossings without any substantial impacts from toll avoidance behaviour. This shows that traffic volumes are not sensitive to the toll regime.

Strategic traffic modelling indicates that the project would deliver substantial benefits to traffic travelling on the strategic road network, as discussed in Section 7.1 of Appendix F (Technical working paper: traffic and transport). Due to the significant travel time savings, it is expected that motorists with longer trips would stay on the WestConnex network and those who have a more local destination around City West Link would exit at the City West Link. If adopted, toll parity across the harbour would ensure that motorists can choose the crossing best suited to their trip. Traffic forecasting carried out using SMPM indicates that the combined tolling regimes assumed for WestConnex and Western Harbour Tunnel are not expected to result in significant toll avoidance on local streets within the Inner West. The majority of traffic with an origin or destination beyond the local catchment of the City West Link on and off ramps to and from Western Harbour Tunnel are expected to use the WestConnex network to access alternative ramps due to the significant time savings provided by the future motorway network.

B12.7.5 Shifting bottlenecks

Issue raised

Page 3

Inner West Council believes that the project will increase traffic volumes on Parramatta Road and City West Link which conflicts with State and local government plans and will put additional strain on these roads which are already beyond capacity.

In responding to earlier stages of WestConnex, Council had raised concerns that WestConnex would add congestion to City West Link and the ANZAC Bridge. Now that the project is being justified at relieving congestion at those points on the network, concern is raised that the NSW Government will use congestion created by the project to justify the next section of motorway.

Response

One of the key objectives of the project is to provide a viable alternative harbour crossing, thereby improving traffic conditions on the road network. Ongoing network improvement strategies and other key motorway connections would be required to address the pressures of Sydney's growing population over the longer term.

Traffic modelling carried out for the environmental impact statement does not indicate an increase in traffic on Parramatta Road. The opening of various stages of WestConnex have resulted, and will continue to result, in traffic volumes on Parramatta Road reducing. Some localised demand increases on City West Link around The Crescent intersection are predicted; however, the traffic modelling indicates significant improvement to conditions on this corridor in the AM peak as a result of regional traffic redirecting to Western Harbour Tunnel, and reduced demand on surrounding bottlenecks. In the PM peak potential localised impacts on the City West Link corridor as a result of project are limited to two minutes or less, and offset by travel time savings on the broader network.

Capacity constraints on City West Link and Parramatta Road would be partially addressed by the approved M4-M5 Link project as well as complementary public transport projects such as Sydney Metro West. Following the completion of the M4-M5 Link project and as a result of the additional road network capacity provided by the M4-M5 Link project, the two-way future year average weekday traffic demand is predicted to decrease on City West Link and Parramatta Road at Haberfield, east of the M4 East Wattle Street and Parramatta Road ramps respectively, by about 25 per cent in the 2023 and 2033.

B12.7.6 Modelling and planning

Issue raised

Pages 3, 4 and 27

Clarification is requested on the assumptions input into the operational traffic model, particularly in relation to:

- Opportunities for public transport enhancements in combination with demand management, changes to regional strategic land use patterns (reduce travel demand particularly in relation to harbour crossing demand), or at the very least conversion of existing cross-harbour trips from private vehicles to public transport
- Mode shifting from public transport to private vehicles
- The environmental and social implications of the project's induced traffic demand
- The likely conversion of trips across the harbour to public transport if there was increased frequency/capacity of public transport and a higher-priced tolling regime, particularly in peak periods
- Links between traffic reduction from public transport and demand management - in particular, weekday peak spreading.

The environmental impact statement indicates that operational traffic forecasts will increase in and around Rozelle and the Balmain Road/City West Link intersection will perform worse with the project than without. With the exception of a simple set of maps appended to the Traffic and transport: Technical working paper, there is no assessment of traffic increases on local roads as a result of the project. The maps provided indicate traffic increases on local roads but does not provide traffic numbers.

Response

The project environmental impact statement is informed by the NSW Government's standard integrated land use and multi-modal transport forecasting approach. This is a typical 4-stage transport forecasting approach which accounts for the trip generation, trip distribution, mode choice, and route assignment factors noted. It also accounts for other key factors including the potential for induced demand.

The environmental, social, and other potential effects and impacts of the project's induced demand are assessed in detail throughout the environmental impact statement.

The land use, transport forecasting, and traffic modelling assumptions used for the environmental impact statement were the latest available for the purpose of the assessment. The additional cross-

harbour (and broader strategic) public transport capacity which will be provided in the future by Sydney Metro City and Southwest is explicitly reflected in the outcomes of the project environmental impact assessment transport forecasting process.

The environmental impact statement addresses peak spreading (and other transport demand effects) as appropriate to the technical discipline. As an example, to ensure a conservative assessment, most disciplines (eg traffic, noise, air quality) adopt forecast traffic demand directly to assess the maximum potential project impacts.

Urban areas such as those in the Western Harbour Tunnel project area are not expected to be materially influenced by peak spreading as the traffic profile is already relatively flat during peak periods.

An overview of the methodology approach and model inputs for the project traffic modelling is provided in Section 3 of Appendix F (Technical working paper: Traffic and transport).

B12.7.7 Adequacy and accuracy

Issue raised

Pages 11 and 15

Noting that Transport for NSW is now addressing intersection congestion at several key intersections resulting from WestConnex, congestion issues at key intersection affected by the project should be assessed as part of the environmental impact statement and not later.

The environmental impact statement is deficient and should not be approved as it does not include an assessment of these key intersection upgrades along with an assessment of traffic volumes on local and regional streets. These assessments should be provided, and the community permitted to provide feedback and any local area improvement schemes identified during consultation included as part of the project.

Response

The extent of the operational traffic modelling is shown on Figure 3-2 of Appendix F (Technical working paper: Traffic and transport) and is considered sufficient to identify operational traffic impacts of the project on the surrounding road network.

As with the various stages of WestConnex, and as required by environmental management measure OT1 (refer to Table D2-1 of this submissions report), Transport for NSW will carry out a Road Network Performance Review, in consultation with relevant councils. This would confirm the operational traffic impacts of the Western Harbour Tunnel and Warringah Freeway Upgrade on surrounding arterial roads and major intersections at 12 months and five years after opening of the project. The assessment would be based on future updated traffic surveys taken during operation, utilising an appropriate methodology following the relevant and industry accepted guidelines current at the time. Regardless, those areas that have been identified as being potentially impacted by the project have been identified in Appendix F (Technical working paper: Traffic and transport) and would be addressed prior to these operational reviews, or as needed.

The planning and design of the project has adopted a holistic network traffic performance approach, focussed on maximising benefits for the majority of customer's overall journeys. The planning and design process including proposed interchange and intersection works are also cognisant of broader aspects and constraints, for example:

- Considering the effects that major intersection works can introduce on upstream and downstream network elements
- Adopting a Movement and Place philosophy, minimising the potential to induce traffic on lower order roads by focussing on upgrades to strategic routes
- Avoiding property impacts where possible.

Transport for NSW believes that the environmental impact statement provides an appropriate level of detail for areas and locations with the potential for material project effects and impacts.

The general reduction in traffic and congestion with the Inner West Council local government area will provide the opportunity for Transport for NSW and other stakeholders including Inner West Council to investigate upgraded and/or alternate uses for road space. Transport for NSW will continue to work with Inner West Council and other stakeholders through agreed cross-organisational governance structures to investigate options to improve movement and place outcomes and leverage the strategic benefits of the program of works.

B12.7.8 Management of impacts

Issue raised

Page 22

Although the contractor may strive for full compliance, Inner West Council has found with WestConnex that even with full compliance there have been unacceptable impacts, along with doubts about whether compliance has been achieved.

Response

The conditions of approval placed on the project by Department of Planning, Industry and Environment would be legally enforceable and compliance would be checked and reported throughout delivery of the project by Department of Planning, Industry and Environment and the NSW Environment Protection Authority.

The contractor would be responsible for the implementation of the conditions of approval, overseen by the proponent (Transport for NSW). Transport for NSW would ensure conditions of approval are followed through by the implementation of a compliance tracking program to track and monitor compliance. The Department of Planning, Industry and Environment compliance team carries out inspections to ensure projects meet the strict conditions included in their approvals. This team works closely with the community, local councils and other state and federal government agencies to investigate potential breaches and carry out enforcement where necessary. Enforcement can range from negotiating practical solutions to issuing penalty notices and, in serious cases, criminal prosecutions.

The contractor would be required to obtain the required Environment Protection Licences for the project and would be directly responsible for compliance with the conditions of the licence(s).

B12.7.9 Hazards and risks

Issue raised

Page 30

Inner West Council note that the environmental impact assessment states that the transport of dangerous goods in prohibited areas, including the mainline tunnels, would be prohibited. Signage would be provided near tunnel entry portals advising of applicable restrictions to ensure compliance with Regulation 300-2.

Response

Inner West Council's comment regarding the prohibition of dangerous goods in the mainline tunnels and associated signage is acknowledged and would be implemented as outlined in the environmental impact statement.

B12.8 Construction noise and vibration

B12.8.1 After hours construction noise

Issue raised

Page 21

Out of hours construction works should be minimised, in particular night works for utilities of which the full extent is not known and can have a profound impact.

Response

Construction work hours for the project have been developed based on a balanced consideration of the need to minimise noise and traffic related impacts, reducing the overall length of the construction program and ensuring tunnelling activities are carried out in a safe working environment. For surface works the preference is to work within standard construction hours. However, there would be limitations to this, such as ensuring the critical function of the Warringah Freeway in the Sydney road network is not significantly impacted by construction work.

Activities outside standard construction hours have been minimised where possible and are detailed in Section 6.8 of the environmental impact statement. An out-of-hours works protocol will be developed for the construction of the project in accordance with environmental management measure CNV3 (refer to Table D2-1 of this submissions report). The protocol will be prepared in consultation with the Department of Planning, Industry and Environment and the NSW Environment Protection Authority, and independently endorsed. The protocol will be implemented during the duration of the construction of the project.

With respect to utilities adjustments or relocation, the timing for such works would be informed by the requirements of the utility provider and would be carried out during standard construction hours where feasible. Activities requiring the temporary possession of roads, or to accommodate road network requirements, or to ensure public or worker safety would at times need to be carried out outside of standard construction hours.

Appendix D (Utilities management strategy) identifies utilities that would need to be relocated or adjusted, details how community and stakeholder coordination would be carried out and the environmental impact objectives for the works that seek to minimise the potential disruption of these activities to surrounding community and environment.

As stated in Section 5.10.1 of Appendix G (Technical working paper: Noise and vibration) any impacts due to utility works would typically be short in duration, temporary and progressive works that move along. All feasible and reasonable mitigation and management measures would be implemented in an effort to meet noise management levels, and residual impacts would be managed in accordance with the Construction Noise and Vibration Management Plan.

B12.8.2 Construction activity

Issue raised

Pages 2, 5, 9, 21, 25 and 28

All four construction sites within the Inner West Council LGA will result in noise impacts. Although the construction support sites at Yurulbin Point (WHT4) and Victoria Road (WHT2) would be within an acoustic shed, the sheds will not (and cannot) fully shield residents from all noise and vibration impacts, particularly given their close proximity and activities occurring outside of the shed including barge movements and immersed tube tunnel construction at Yurulbin Point and truck movements at Victoria Road. Additional noise generation would occur from the fabrication of immersed tube tunnel at the White Bay construction support site (WHT3). Inner West Council raised concern that many properties are potentially affected with exceedances of noise management levels during construction for the reasonable worst-case noise intensity scenario at the following locations:

- Sydney Harbour – high number of properties (600) with six being highly affected
- White Bay – moderate number of properties, particularly during the site establishment stage
- Victoria Road – Substantial number of properties at all stages

Response

The noise modelling carried out as part of the environmental impact statement is conservative and provides reasonable worst-case scenario results in terms of types of plant and equipment used and activities that would be carried out.

Construction noise and vibration impacts would be managed using reasonable and feasible mitigation and management measures including scheduling of works, noise reduction measures for plant and equipment, and provision of respite periods or offers of alternative accommodation for sensitive receivers if appropriate. Temporary noise barriers or solid hoarding would be used at construction support sites where required to minimise noise impacts on residential receivers.

Acoustic sheds would be provided at tunnelling sites to reduce the impact of noise-generating activities, including activities conducted outside standard construction hours, with a view to comply with relevant noise goals where reasonable and feasible. Acoustic sheds would be designed with consideration of the activities that would occur within them and the relevant noise management levels in adjacent areas, while ensuring the functionality of the respective construction support facilities.

Noise monitoring will be carried out to confirm that the actual acoustic performance of the sheds is consistent with predicted acoustic performance (see environmental management measure CNV4 in Table D2-1 of this submissions report). Additional temporary noise mitigation measures may include noise barriers and other temporary structures such as site buildings, which would be positioned to minimise effects from noise on surrounding properties would be considered if required and feasible and reasonable.

Chapter 10 (Construction noise and vibration) of the environmental impact statement notes that airborne noise from the project construction support sites would be generally within the noise management levels, with the exception of early works, site establishment and site restoration works, when noise management levels may be exceeded at some receivers for short periods.

B12.8.3 Construction traffic

Issue raised

Pages 9, 11 and 25

Noise and vibration impacts would occur from trucks accessing and queuing for the Victoria Road construction support site (WHT2). This will be in conjunction with an overall increase in ambient noise levels affecting residential areas in Rozelle, Balmain, Lilyfield and suburbs along main trucking routes to the west, which has increased due to the sheer number of trucks from multiple projects.

It is noted that although the use of barges at Yurulbin Point would reduce haulage on roads at Birchgrove and Balmain, the use of barges would have noise impacts for residents on the harbour.

Response

Cumulative construction road traffic management and vehicle movements associated with the project and other surrounding projects are unlikely to increase road traffic noise levels by more than 2 dB(A). According to the NSW Environment Protection Authority's *NSW Road Noise Policy*, this change represents a minor impact that is likely to be barely perceptible. The number of maximum noise events from construction traffic that could disturb sleep are not likely to substantially increase, because the maximum number of truck movements generated by the project at night would be small

compared to existing truck movements along the proposed haulage routes on Victoria Road and City West Link. Further information on the cumulative impact of the project and the M4-M5 Link is provided in Section 5.4.3.1 of Appendix G (Technical working paper: Noise and vibration).

Barges would be operated and maintained to comply with the Protection of the Environment Operations (Noise Control) Regulation 2017, particularly clauses 37 and 38 which require vessels to have properly maintained noise controls. Barge movements outside standard construction hours are expected to occur infrequently and for limited activities (such as delivery of concrete and during dredging). It is expected that noise from project barges would not cause substantial amenity or sleep distance impacts when travelling between construction support sites. Further detail is provided in Section 4.2.7 of Appendix G (Technical working paper: Noise and vibration).

B12.8.4 Tunnelling

Issue raised

Pages 15, 21, 24, 28 and 30

In general, given the widespread vibration impacts resulting from WestConnex, vibration impacts appear to be downplayed in the environmental impact statement. Ground borne noise and vibration generated from tunnelling will have potential risks for a large number of properties with construction vibration screening criteria exceeded at 87 properties in Birchgrove. Vibration impacts and property damage from ground settlement is particularly likely where the tunnels are at shallow depths around Easton Park in Rozelle. There are concerns also for settlement at Yurulbin Park in Birchgrove.

The environmental impact statement incorrectly states that no properties will be affected by ground-borne noise in the Rozelle area by road header tunnelling given that rock hammer tunnelling will affect many properties in Inner West, particularly Balmain and Birchgrove.

Further concerns are raised regarding noise and vibration impacts of pile driving and excavation of vertical access shafts at the Yurulbin Point construction support site (WHT4) and Victoria Road construction support site (WHT2) respectively, particularly given the proximity of nearby residents.

Further details are also requested regarding controlled blasting as this is likely to have impacts to residents.

Response

Vibration

Mainline tunnelling would be carried by roadheader and rock hammer. The use of rock hammers for tunnelling is associated with the excavating the bench and trenches within the tunnel and would follow behind the roadheader. Chapter 10 (Construction noise and vibration) of the environmental impact statement and Section 5.11 of Appendix G (Technical working paper: Noise and vibration) details the results of vibration and ground borne noise impacts to properties in proximity to mainline tunnelling activities.

The assessment for vibration considers both impacts to human comfort and the potential risk to structures. To assess the potential risk to structures due to vibration, two conservative screening criteria have been applied:

- 7.5 millimetres per second for sound structures
- 2.5 millimetres per second for heritage items, on the assumption these structures are unsound.

As identified in Table 10-8 and Table 10-9 of the environmental impact statement:

- No receiver buildings would exceed 7.5 millimetres per second screening level during mainline tunnelling by roadheader or by rock hammer
- Five heritage structures would exceed the 2.5 millimetres per second screening level (all of which are located in areas outside the Inner West local government area)

- 87 receiver buildings in Birchgrove would exceed the human comfort criterion when rock hammers are operating nearby
- No receivers would be above ground borne noise management levels due to roadheader tunnelling
- Numerous receivers would be above ground borne noise management levels due to rock hammer tunnelling.

Section 10.6 of the environmental impact statement also considers the potential for impacts associated with the construction of tunnel declines, access shafts or cofferdams at construction support sites. These assessments acknowledge the potential for exceedances at certain receivers in the Inner West local government area for relevant airborne, ground borne noise management levels and vibration screening levels, including heritage items. Exceedances are typically associated with activities that would be restricted to standard construction hours (such as piling) and prior to the construction of acoustic sheds.

Where vibration screening criteria are exceeded, further investigation of the structure and construction methodology would be carried out to determine the applicable safe vibration level, and monitoring conducted (as per environmental management measure CNV6 (refer to Table D2-1 of this submissions report)). This would include building inspections. Any damage caused by the project will be rectified.

Feasible and reasonable measures will be implemented to minimise ground-borne noise where exceedances are predicted (as per environmental management measure CNV7 (refer to Table D2-1 of this submissions report)). In the case of impacts due to the use of rock hammers, work would be programmed outside evening and night time periods to avoid or reduce ground-borne noise level exceedances on sensitive receivers' buildings where feasible and reasonable.

Settlement

The tunnel depth below Yurulbin Park is between 30 and 40 metres (Annexure G of Appendix G (Technical working paper: Noise and vibration)), with high quality sandstone between ground level and the top of the tunnel.

Ground movement from the project may occur as a result of:

- Tunnel induced movement caused by the relief of stress from tunnelling through intact rock
- Settlement induced from groundwater drawdown.

Ground movement caused by excavation of rock for the tunnels would most likely occur during construction, whereas ground movement caused by groundwater drawdown would be gradual and generally occurs at a slower rate (possibly over years). The risk to individual structures would be dependent on the localised geotechnical conditions, the depth of the tunnel, the number of storeys of the building, and the position, condition, and masonry of the structure itself.

The assessment of potential construction impacts due to ground movement is presented in Section 16.4.2 of the environmental impact statement. Table 16-8 of the environmental impact statement outlines the maximum predicted surface settlement for various locations along the project alignment. Settlement contours for the project alignment are provided in Figure 16-7 and Figure 16-8 of the environmental impact statement. As discussed in Section 16.4.2 of the environmental impact statement, all project components are expected to experience ground surface settlement impacts of over 10 millimetres. As shown in Table 16-8 of the environmental impact statement, maximum predicted total settlement above the mainline tunnels between Rozelle and the Western Harbour crossing at Yurulbin Point is expected to be 20-25mm which would fall within the 'slight' damage category. Building/structure condition surveys would be carried out in accordance with environmental management measure SG4 and any impacts from settlement caused by the project would be rectified.

Controlled blasting

As detailed in Section 6.4.2 of the environmental impact statement, controlled blasting may be occasionally required during mainline tunnelling or excavation works. Where controlled blasting is proposed, potential impacts would be managed through site and blast specific assessments. Overpressure and vibration would be predicted during blast design which would include test blasts to establish appropriate blast charges and configurations to ensure the objectives and criteria identified in *AS 2187.2-2006 Explosives - Storage and use - Part 2 Use of explosives* are achieved. In accordance with environmental management measure CNV9 (refer to Table D2-1 of this submissions report), a blast management strategy will be prepared in consultation with the NSW Environment Protection Authority to demonstrate that all blasting and associated activities will 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.

B12.8.5 Health and wellbeing

Issue raised

Pages 4 and 10

The extended duration over several years of noise and vibration impacts at Yurulbin Point have the potential to result in negative health impacts.

In addition, construction activities at the Victoria Road construction support site would impact upon children's learning and wellbeing at the Rozelle Public School.

Response

Consideration of health outcomes relevant to noise and an assessment of noise related health impacts are described in Sections 7.5 and 7.6 of Appendix I (Technical working paper: Human health)). This includes an assessment of noise and vibration impacts in relation to sleep disturbance, annoyance, hearing impairment, interference with speech and other daily activities, children's cognitive function, and cardiovascular health.

During construction, the noise impacts would not occur continuously over the long-term and hence the potential for health impacts would be lower. In reality, exceedances of the noise management level and the number of impacted residential receiver buildings would vary over the duration of construction. The noise impact assessment is conservative and a reasonable worst case scenario has been applied. The assessment scenarios assume that all equipment expected to be used at a given site would be operating simultaneously, at a worst case intensity, and with a worst case orientation during a 15 minute period. This would not typically occur and so actual construction noise levels are likely to be lower than predicted.

Reasonable and feasible mitigation measures would be implemented to minimise construction noise impacts; however, it would not always be possible for the noise impacts to achieve the recommended noise management levels at all impacted receivers. In this case, additional mitigation measures would be implemented (such as respite and alternative accommodation) (refer to Section 6.10 of Appendix G (Technical working paper: Noise and vibration). These measures would be detailed in site-specific Construction Noise and Vibration Impact Statements (CNVISs). Refer to Table D2-1 of this submissions report for the mitigation and management measures that would be implemented to minimise potential health-related impacts on the surrounding community.

Monitoring would also be carried out periodically throughout all stages of construction to ensure that noise and vibration impacts are being appropriately managed, and the effectiveness of implemented mitigation and management measures.

Some potential disruption to Rozelle Public School is acknowledged In Appendix U (Technical working paper: Socio-economics) as a result of construction activity at the Victoria Road construction support site (WH2), primarily to outdoor areas and classrooms along Victoria Road. This is likely to be related to the worst case noise and vibration impacts, such as during site

establishment, demolition works and site rehabilitation. Impacts would be substantially mitigated through the various noise and vibration environmental management measures identified in Table D2-1 of this submissions report.

B12.8.6 Property impacts

Issue raised

Pages 2, 4, 24 and 28

Construction works have the potential to result in property damage due to vibration, particularly for areas such as Yurulbin Point, and in areas where tunnels are at a shallow depth. It is noted that Table 10-17 of the environmental impact statement identifies 14 properties within the minimum working distances for vibration intensive work for the Sydney Harbour cofferdam construction support site. In addition, Table 10-15 identifies four heritage buildings within minimum working distances for vibration intensive work for the Yurulbin Point construction support site and potentially affected. A moderate number of properties are identified as exceeding the minimum working distances for the Victoria Road construction support site.

Response

The tunnel depth below Yurulbin Park is between 30 and 40 metres (refer to Annexure G of Appendix G (Technical working paper: Noise and vibration)), with high quality sandstone between ground level and the top of the tunnel. The most vibration intensive activity at the Yurulbin Point construction support site (WHT4) is likely to occur during early works and site establishment, piling for the acoustic shed and during shaft construction. The most vibration intensive activity for the Sydney Harbour crossing would be during building of the cofferdams and excavation of the cofferdams. For the Victoria Road construction support site, the major stages that would include vibration-intensive works would be during early works and establishment of construction facilities, piling for the acoustic shed and decline excavation and construction.

The various heritage items located within the cosmetic damage minimum working distance of construction support sites are identified in Section 5 of Appendix G (Technical working paper: Noise and vibration).

Where vibration intensive works occur within the minimum working distances, the risk of structural damage (or human discomfort) would be mitigated in accordance with the environmental management measures outlined in Table D2-1 of this submissions report including:

- Establishment of minimum buffer distances to achieve screening levels
- 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.

Environmental management measures CNV2, CNV4, CNV6 and NAH22 will be implemented to manage vibration impacts for the project. For Aboriginal heritage items at AHIMS sites, environmental management measures AH2, AH3, AH4 and AH10 will be implemented (refer to Table D2-1 of this submissions report).

B12.8.7 Cumulative noise and vibration impacts

Issue raised

Page 25

Cumulative noise and vibration impacts are anticipated from the operation of the Victoria Road construction support site (WHT2) and nearby WestConnex Stage 3B Victoria Road construction

site. Residents and remaining businesses on or near Victoria Road from Darling Street to the Iron Cove Bridge would endure noise and vibration impacts from both projects. Other cumulative impacts with WestConnex would occur where construction works overlap with construction at the Rozelle Rail Yards, where residents will have already endured years of impacts from WestConnex.

Cumulative impacts are also anticipated at the White Bay construction support site (WHT3) where the proximity to the cruise terminal and other activities has the potential to impose significant noise and other impacts on Balmain and Pyrmont residential areas over several years.

Response

The potential for cumulative noise impact associated with M4-M5 Link construction activities in proximity to the Victoria Road construction support site (WHT2) has been considered and is discussed in Section 5.3.2.7 of Appendix G (Technical working paper: Noise and vibration). The assessment of the cumulative construction noise from the projects has shown it to be below the noise management levels.

Cumulative airborne construction noise at the White Bay may similarly occur from concurrent works with the M4–M5 Link project White Bay construction site. However, changes in potential construction noise levels as a result of cumulative activities are expected to be minor (refer to Section 5.2.2.7 of Appendix G (Technical working paper: Noise and vibration).

Cumulative construction noise has the potential to increase overall duration and frequency of construction noise impacts in the same receivers. The key noise generating activities during early works such as utility connection works are typically intermittent in nature.

Cumulative airborne construction noise impacts would be mitigated in accordance with the environmental management measure CNV10 as outlined in Table D2-1 of this submissions report, which includes:

- Coordinating work between project construction sites and construction works to avoid cumulative noise impacts
- Consideration of additional at source or near source mitigation where construction noise levels may result in cumulative construction noise impacts, where programming is not practical to avoid cumulative noise impacts
- Community consultation throughout the project to gauge construction key noise impacts and issues and any unknown impacts from concurrent or consecutive sets of constructions works
- Incorporating additional noise mitigation and management measures with consideration of cumulative and consecutive construction noise impacts based upon coordination between projects.

B12.9 Operational noise and vibration

B12.9.1 Operational noise and vibration

Issue raised

Page 23

Claims made in the environmental impact statement that increased road capacity will reduce traffic noise and improve local amenity are disputed.

Response

As outlined in Section 11.5.3 of the environmental impact statement, the operational noise assessment indicates that:

- The project is predicted to reduce traffic noise for about 57 per cent of receiver buildings within noise catchment areas surrounding the project surface works as traffic is removed from surface roads and into the tunnels
- Forty-two per cent of receiver buildings are predicted to experience traffic noise level increases of less than 2 dB(A), which is a minor impact and likely to be barely perceptible
- One per cent of receivers within the noise catchment areas are predicted to experience increases in traffic noise of more than 2 dB(A) as a result of the project.

The environmental impact statement acknowledges that the project is predicted to increase the number of receiver buildings exceeding the relevant noise criteria when compared to the 'Do minimum' scenario (without the project) during the day and night periods at noise catchment areas surrounding the surface connection to City West Link at Rozelle. This is due to an anticipated increase in traffic volumes on some surface roads in the area leading to and from the tunnels as motorists travel to and from surrounding areas to utilise the tunnels.

Detailed predicted operational noise levels without mitigation and operational road traffic noise contour maps are available in Annexure O and Annexure P of Appendix G (Technical working paper: Noise and vibration).

Receivers identified as being eligible for at-property treatment within noise catchment areas surrounding the surface connection to City West Link at Rozelle would be mitigated either:

- Under the M4-M5 Link project Minister's Conditions of Approval (Condition E87), or
- When predicted operational road traffic noise increases greater than 2 dB(A) due to multiple projects.

Properties that are eligible for treatment would be confirmed during detailed design (environmental management measure CNV1). Receiver buildings potentially eligible for consideration of additional noise mitigation are included in Annexure R of Appendix G (Technical working paper: Noise and vibration). Further, the operational noise performance of the project would be reviewed, and additional reasonable and feasible mitigation measures would be considered (environmental management measure CNV2). Environmental management measures are listed in Table D2-1 of this submissions report.

B12.10 Air quality

B12.10.1 Dust

Issue raised

Pages 2, 5, 9, 13, 16 and 21

Concerns relate to the project's air pollution impacts, including widespread dust and diesel emission impacts on sensitive uses such as schools and businesses. This is of particular concern where there will be a significant number of truck movements accessing the Victoria Road construction support site (WHT2), impacting upon the Rozelle Public School and where trucks pass through the Annandale village, reducing foot traffic and affecting business sustainability.

Although construction activities at the sites themselves would be within acoustic sheds, the sheds will not (and cannot) fully shield residents from dust particularly given their close proximity.

Response

The proposed access routes to the construction support sites in the Rozelle area and surrounds would be on major arterial roads including Victoria Road, City West Link and James Craig Road, as outlined in Table 5-5 and Figure 5-11 of Appendix F (Technical working paper: Traffic and transport). Construction vehicles would therefore not use Johnston Street to access construction support sites and would therefore not impact upon the Annandale Village.

The assessment presented in Section 7 of Appendix H (Technical working paper: Air quality) for potential dust related impacts identifies the level of risk *prior* to mitigation. Overall, construction dust is unlikely to represent a significant impact, following the implementation of standard mitigation measures which would include regular site inspections at construction support sites to monitor and record dust levels.

Standard construction air quality mitigation and management measures will be detailed in construction management documentation and implemented during construction as stated in environmental management measure AQ1 (refer to Table D2-1 of this submissions report). This will include the identification of site-specific mitigation measures and requirements for site inspections to monitor compliance with implemented measures.

B12.10.2 Odour

Issue raised

Page 21

Due to the presence of contaminated sediments and despite the use of acoustic sheds, construction support sites at Yurulbin Point and White Bay have a high risk of imposing odour and other health impacts on residents near these sites.

It is noted that odour impacts are not expected, however experience with WestConnex Stage 2 is that odour can have a major impact such as leachate odour from the St Peters Interchange site. Concern is raised about possible odour from dredged harbour sediments.

Response

Dredged material would not be handled or stored at the Yurulbin Point construction support site (WHT4).

While the project is separate to WestConnex Stage 2, the site for St Peters Interchange was a former landfill. Excavation works in any landfill are not anticipated for the project.

As part of the harbour construction activities for the project, a large amount of material would be dredged from the harbour bed, bringing potentially odorous material to the surface. Material that is suitable for offshore disposal would be excavated from the Sydney Harbour crossing and barged directly to the offshore disposal site. Material that is not suitable for offshore disposal would be barged directly to the White Bay construction support site (WHT3).

Dredged material on the barges would be wet, which would reduce the potential for odour emissions. Any odour impacts from the dredged material would be low, given it would remain wet and located at some distance from any sensitive receivers.

Odour from the handling and storage of dredged material at WHT3 has been assessed in accordance with the *Technical framework for the assessment and management of odour from stationary sources in NSW* (DEC, 2006) (refer to Section 7.2 of Appendix H (Technical working paper: Air quality)). This framework introduces a system that protects the environment and the community from the impacts of odour emissions, while promoting fair and equitable outcomes for the operators of activities that emit odour.

Dispersion modelling has been carried out to assess the potential odour impacts at nearby sensitive receivers to the White Bay construction support site (WHT3). This modelling was informed by sediment samples collected from harbour sediments in Birchgrove.

The dispersion modelling has taken a conservative approach and assumes that the total treatment area would be exposed, with odorous material present for every day of the year. In reality, the exposure of odorous material would be much less in terms of both area and duration.

The results of odour modelling (refer to Figure 12-5 of the environmental impact statement) show that the predicted 99th percentile odour concentrations at all of the nearest receivers are below one OU (odour unit), the theoretical level of detection. The highest concentration across the domain is

0.1 OU, which is well below the theoretical level of detection. Odour impacts would therefore be expected to be undetectable for all sensitive receivers near the site.

B12.10.3 Ambient air quality

Issue raised

Page 16, 21 and 22

Concern is raised about growing vehicle emissions from surface traffic growth resulting in air pollution impacts to sensitive uses such as schools. It is noted that operational air quality impacts would be small in comparison to WestConnex, however vehicle emissions are a concern for the community. Inner West Council would prefer public transport powered by renewable energy.

Increase in traffic growth created by motorways leads to an inevitable increase in vehicle emissions at both the local and regional scale and is a particular concern of the community. The environmental impact statement states that due to technology improvements, emissions from vehicles will decline over the next 20 years, whether or not the tunnels are built. Emissions are slightly higher for the 'with tunnels' scenario because they are expected to increase the distances people travel in cars and trucks.

The project would redistribute vehicle emissions through ventilation stacks and would change ground-level air pollutions concentrations. For example, the environmental impact statement assesses an increase of $PM_{2.5}$ by 2.2 per cent at St Basils Annandale and other small increases at surface feeder roads.

Response

The modelling of the project takes into account induced demand of the project and program of works, as well as expected emission reductions due to improvements in vehicle standards. However, it does not consider other potential improvements to vehicle emissions, such as the continued transition to alternatively fuelled low emission vehicles and battery electric vehicles.

There would be noticeable reductions in pollutant concentrations along some major roads as a result of the project (or program of works) and some increases on other roads, as discussed in Section 8.4 of Appendix H (Technical working paper: Air quality). However:

- Where there are increases in pollutant concentrations at sensitive receivers as a result of the project (or program of works), these were mostly small. A small proportion of residential, workplace and recreational receivers were predicted to have larger increases, however, the predictions at these locations were overly conservative
- There would be no marked redistribution of air quality impacts. Where increases are predicted, these would not be significant and would occur at residential, workplace and recreational receivers locations which would already have a relatively high concentration in the 'Do minimum' scenarios (ie without the project).

Further, the assessment found that the potential regional impacts of the project would be negligible (refer to Section 12.6.5 of the environmental impact statement).ratio

B12.10.4 Ventilation outlets

Issue raised

Pages 2, 16, 17 and 24

Ventilation outlets should be filtered to be consistent world best practice and Recommendation 13 from the 2018 WestConnex Parliamentary Inquiry that the NSW Government install on all current and future motorway tunnels, filtration systems in order to reduce the level of pollutants emitted from ventilation stacks.

The environmental impact statement assesses that emissions from ventilation facilities would add little to existing pollution levels when compared to existing background levels, however the assessment does not consider this against an improved public transport scenario powered by renewables. Inner West Council has strong concerns about unfiltered emissions from ventilation facilities and notes that the three stacks within the Rozelle Rail Yards will serve both WestConnex Stage 3B and the project. Previous concerns have been raised about ventilation facilities at the Rozelle Rail Yards in its submission to the WestConnex Stage 3 environmental impact statement and the Western Harbour Tunnel Reference Design. The community has raised concerns about emissions affecting surrounding Lilyfield and Rozelle, including two primary schools in Rozelle.

Inner West Council continues to argue that, as emissions have a negative health impact at any level, all ventilation facilities must be filtered.

Response

The independent NSW Chief Scientist and Engineer has recently released a report in relation to road tunnel air quality. The report 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 discussion on tunnel ventilation and filtration in the environmental impact statement reflects the outcomes of the review completed by the Advisory Committee on Tunnel Air Quality (ACTAQ, 2018b). The ACTAQ assessment reviewed options for treating road tunnel emissions (ACTAQ 2018b).

The review concluded that:

- Decisions on how to best manage tunnel air can only be made at the project level. Health-based air quality standards must be a priority; however, engineering and economic factors also need to be taken into account
- Air filtration systems in tunnels are rare around the world. They have high infrastructure, operating and maintenance costs
- Although filtration for particulates or NO_2 is technically feasible, the available technologies will not lower concentrations of other air pollutants
- Alternatives such as portal air extraction (ie no portal emissions) and dispersion via ventilation outlets may achieve the same outcomes as filtration at a lower cost.

It is further noted that due to the reduction in surface road traffic caused by diversion to the tunnels, the project would generally result in a better outcome for ambient air quality than conditions without the project.

It has been shown that control of pollutants at the source, such as vehicle emissions controls, is significantly more effective in improving local and regional air quality (ACTAQ, 2014 and NHMRC, 2008). The NSW Government is committed to continuing to work with the Australian Government to implement cleaner fuels and cleaner vehicles including renewables, hence reducing emissions at source.

As discussed in Chapter 13 (Human health) of the environmental impact statement and Appendix I (Technical working paper: Health impact assessment), the assessment indicates changes in the incidence of relevant health impacts in the community for certain pollutants (such as $PM_{2.5}$), with changes being both positive and negative. For much of the community, there would be no change or a small improvement. However, for some areas located near key surface roads, a small increase in pollutant concentrations may occur. However, the potential health impacts associated with this change in air quality within the local community would not be significant.

The Western Harbour 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. Further, the monitoring of ventilation outlet emissions during operation would be regulated under an Environment Protection Licence prescribed under the POEO Act.

B12.10.5 Adequacy and accuracy

Issue raised

Pages 16 and 17

Inner West Council notes from the environmental impact statement that independent experts from ACTAQ reviewed the methodology of the air quality assessments and concludes that it is sound and represents best practice.

However, the environmental impact statement does not compare increases in air pollution to an improved public transport scenario and accepts the status quo as being acceptable.

Response

Inner West Council's comment regarding the review of the air quality assessment by ACTAQ is noted.

As discussed in Section B12.3 of this report, the project is the preferred transport solution to achieve the project objectives. A comparison between the project and an alternative public transport solution is considered out of scope for the environmental impact assessment.

B12.10.6 Cumulative impacts

Issue raised

Pages 9 and 10

Construction works at the Victoria Road construction support site will result in cumulative dust and diesel emission impacts with the nearby WestConnex Stage 3B Victoria Road construction site and existing surface traffic emissions leading to additional impacts for the Rozelle Public School, residents and remaining businesses on or near Victoria Road from Darling Street to the Iron Cove Bridge.

Cumulative air quality impacts would also occur for these receivers during operation from the WestConnex Stage 3B ventilation outlet on Victoria Road.

Response

The assessment presented in Section 7 of Appendix H (Technical working paper: Air quality) for potential dust related impacts identifies the level of risk prior to mitigation. Overall, construction dust is unlikely to represent a significant impact, following the implementation of standard mitigation measures. Due to the separation of activities, and the different stages of construction activity, the potential for significant cumulative dust impacts due to nearby M4-M5 Link construction activity is unlikely.

The M4-M5 Link ventilation outlets, including the Iron Cove Link ventilation outlet on Victoria Road, were included in the dispersion modelling carried out for the air quality impact assessment for the project within the 'Do minimum' and both 'Do something' scenarios in 2027 and 2037.

B12.11 Aboriginal cultural heritage

B12.11.1 Council report on AHIMS sites

Issue raised

Page 6

Inner West Council identified a further AHIMS site in Birchgrove recorded as Birchgrove 45-6-1809 which is not mentioned or recorded in the environmental impact statement.

In addition, the environmental impact statement does not include condition assessment data or cultural significance data identified Aboriginal sites at Birchgrove. Council has produced a report with relevant information on the Long Nose Point (45-6-1901), Yerroulbin Cave (45-6-2287) and Shed Cave (45-6-2672) sites. Council's report has not yet been cited by local Aboriginal people and has not been endorsed for release by Council. It would be appropriate to convey some of what is in the Council report to ensure a public record is created ahead of construction commencing.

Response

Birchgrove 45-6-1809 (shelter, rock engraving and midden) is identified in Table 3-1 of Appendix L (Technical working paper: Cultural heritage assessment report). As this site was not located within 300 meters of the study area it was not further assessed.

The additional information contained in the Council report is unable to be included in this submissions report as the referenced report has not yet been endorsed for release by Council.

Appendix L (Technical working paper: Cultural heritage assessment report) utilised AHIMS (Aboriginal Heritage Information Management System) site cards, which is considered to be appropriate and adequate for characterising the background and location of identified Aboriginal cultural heritage sites.

Since completion of Appendix L (Technical working paper: Cultural heritage assessment report), additional inspections were completed for the following known AHIMS sites that could not be previously accessed due to private property access constraints:

- Shed Cave (45-6-2672): shelter with midden and art
- Yerroulbin Cave (45-6-2287): shelter with midden and art
- 5 Hands Shelter (45-6-2967): shelter with midden and art
- Long Nose Point (45-6-1901): shelter with midden and art.

Further information on the additional inspections and a project impact assessment is provided in Section A4.1.7 and Appendix B of this submissions report.

B12.12 Non-Aboriginal heritage

B12.12.1 Victoria Road

Issue raised

Page 8

Appendix J (Technical working paper: Non-Aboriginal heritage) (p103-103) discusses impacts on The Valley Heritage Conservation Area (HCA) and identifies three properties within the Victoria Road construction site (WHT2) to be demolished – Lots 101 and 102 DP 629133 and Lot 104 DP733658 (No. 1 Waterloo Street and 697 Darling Street). Appendix J states that *"the buildings to be demolished, while previously included within the heritage conservation area, have been excluded from the current heritage boundary, therefore suggesting their limited contribution to the overall significance of the conservation area. Direct impact on the heritage conservation area is considered to be negligible"*. Council believes this is incorrect, as the buildings have not been specifically excluded from the current Heritage Conservation Area (HCA). Furthermore, given the prominent location of the properties on Darling Street, the impact of their demolition will undoubtedly be significant.

The entire Balmain Leagues Club Precinct has been deferred from Leichhardt LEP 2013 and as such Leichhardt LEP 2000 applies to this site. The Leichhardt DCP 2000 confirms that the subject properties are within a HCA under Leichhardt LEP 2000. Inner West Council note the amended Part D of Leichhardt DCP 2000 strived to achieve a balance between improving the precinct's accessibility from Darling Street while retaining as much of the continuous shop-frontage as

possible and minimising impacts on the HCA. The DCP achieves this by requiring retention of the street frontage of No. 697 Darling Street (Lot 104 DP733658) and allowing demolition of No.1 Waterloo Street (Lots 101 and 102 DP 629133). There is no evidence that No. 697 Darling Street and No.1 Waterloo Street do not contribute to the HCA and streetscape - therefore demolition of the properties to facilitate the construction site is not supported.

Response

Context of local planning controls

The validity of the Leichhardt LEP 2000 and Leichhardt LEP 2013 is not clearly articulated on the NSW Legislation website where these were accessed during the assessment; it was assumed that the 2013 version had replaced the 2000 version as is the usual case with local environmental plans. The Inner West Council website for the associated Development Control Plans, does currently make this clear (*https://www.innerwest.nsw.gov.au/develop/planning-controls/current-development-control-plans-dcp/leichhardt-dcp*). The Inner West Council website states the following in relation to the Leichhardt DCP:

Amendment 4: Balmain Leagues Club site (amendment to Part A)

This DCP amendment, which applied from 22 September 2015, confirmed that the Leichhardt DCP 2000 applies to the Balmain Leagues Club site, which comprises the following properties:

- 138-152 Victoria Road, Rozelle (Lot 1 DP 528045)
- 154-156 Victoria Road, Rozelle (Lot 1 DP 109047)
- 697 Darling Street, Rozelle (Lot 104 DP 733658)
- 1-7 Waterloo Street, Rozelle (Lots 101 and 102, DP 629133, Lots 37 and 38, DP 421 and Lot 36 DP 190866)
- 168-172 Victoria Road, Rozelle (Lot 2 DP 323480 and Lots A and B, DP 436153)

The Inner West Council website, in referring to the Leichhardt DCP 2000 states that:

> *The Leichhardt DCP 2013 replaced all of the former DCPs [listed below], except for the Balmain Leagues Club site. This Balmain Leagues Club site was deferred from the Leichhardt DCP 2013 by the Department of Planning and Infrastructure until such time as the current project application is finalised.*

The current status of the project application referenced is not known.

As indicated in Part D.1 (Site Specific Controls: Balmain Leagues Club site) of the Leichhardt DCP 2000, Figure B12-1 indicates the boundary of The Valley Heritage Conservation Area (C7). Figure B12-1 shows three lots (grey hatched) which are situated within The Valley Heritage Conservation Area in the 2000 LEP; consisting of Lot 101 DP 629133, Lot 104 DP 733658, and Lot 102 DP 629133.

Figure B12-1 Balmain Leagues Club site and Valley Heritage Conservation Area

Victoria Road property acquisitions

Figure 6-27 of the environmental impact statement shows the indicative layout of the Victoria Road construction support site (WHT2), including where the site abuts Darling Street. Establishment works for this site would involve demolition of existing structures and earthworks to level the site in preparation for site work and installation of site facilities. During further design development and detailed construction planning, Transport for NSW will investigate opportunities to retain the building façade fronting Darling Street. It would be Transport for NSW's preference to retain the building façade if feasible and it does not constrain use of the site.

The Victoria Road construction support site (WHT2), 138-172 Victoria Road in Rozelle (the former Balmain Leagues Club site) currently has private owners. As identified in Table 20-3 of the environmental impact statement the site may be acquired by Transport for NSW or leased depending on ongoing property negotiations. If the property is leased, the site would be rehabilitated and returned to the landowner at the completion of construction. Any proposed redevelopment of the remaining land would be subject to development assessment and approval from the relevant planning authority.

The temporary occupation of this land should not affect the existing land use zoning or development controls that are applicable to the site as per Table 20-4 of the environmental impact statement. If the site is leased, it would be returned to the landowners upon completion of construction, for development in accordance with land use zoning and planning controls.

The privately owned residential property on Victoria Road to the north of the former Balmain League's club site would be acquired for use as part of the construction support site for the duration of construction. The land acquired for the project should not impact on the long term viability of the site to continue to be used for private residential purposes.

Significance of The Valley Heritage Conservation Area

Key aspects of the significance of The Valley Heritage Conservation Area include the following:

- One of a number of conservation areas which collectively illustrate the nature of Sydney's early suburbs and Leichhardt's suburban growth particularly between 1871 and 1891, with pockets of infill up to the end of the 1930s (ie before World War II)
- Through the mixture of shops, pubs and industrial buildings it demonstrates the nature of a Victorian suburb, and the close physical relationship between industry and housing in 19th century cities before the advent of the urban reform movement and the separation of land uses.

Assessment of direct impacts

Given the clarification of inclusion of Lot 101 DP 629133, Lot 104 DP733658, and Lot 102 DP 629133 within The Valley Heritage Conservation Area, the consideration of direct impacts which was provided in Table 5-9 of Appendix J (Technical working paper: Non-Aboriginal heritage), is updated with the following:

> *The direct impacts associated with the project would involve the demolition of buildings within Lot 101 DP 629133, Lot 104 DP 733658, and Lot 102 DP 629133 of the heritage conservation area, and the adjacent Balmain Leagues Club for use of the site as for the WHT2 construction support site. Following completion of construction, the construction support site would be removed, including in the location of the two demolished buildings in the current Heritage Conservation Area. This would enable this part of the site to be incorporated into the development proposed in Part D.1 of the Leichhardt DCP 2000.*
>
> *The two buildings on Lot 102 and 104 both face Darling Street and are both shopfronts which form part of the mixture of shops, pubs and industrial buildings along Darling Street which demonstrate the nature of a Victorian suburb. Lot 102 is a single storey shop with a simple roof pediment. Formerly occupied by Bayer Meats, it is boarded up, and in poor condition with tiles missing from the front façade, substantial masonry cracking across the pediment and down to the front awning, vegetation growing out of the cracked masonry, and substantial graffiti. Lot 104 is a two-storey shop, which appears to have a residential dwelling above. Images indicate it has been occupied by the Rozelle Village Information Centre. The building has substantial masonry cracking across the entire frontage. It appears that the shopfront windows and the second storey windows may not be original. The building appears to be in fair condition. The building on Lot 101 faces Waterloo Street and is a modern brick building associated with Bayer Meats. It is boarded up and in poor condition. Lot 101 does not contribute to the significance of The Valley Heritage Conservation Area.*
>
> *The two buildings facing Darling Street do make a contribution to the part of the significance of The Valley Conservation Area in that they contribute to the mix of shops, pubs and industrial buildings, they are certainly not the only ones that do this. Further, these two buildings are on the very margin of a narrow part of the very large Heritage Conservation Area (which comprises approximately one square kilometre) and have previously been considered to be removed from the Heritage Conservation Area as part of the Leichhardt LEP 2013, although the rationale for this is not clear from the information publicly available.*
>
> *As detailed in Chapter 4 (Project development and alternatives) of the environmental impact statement, construction support sites are required to support tunnelling across the project alignment. Where possible, construction support sites have been located to minimise overall property acquisition requirements, as well as minimising impact on heritage items and ecologically sensitive areas. There are limited areas of open space for construction*

compounds in the vicinity of the project. Therefore, this option minimises heritage impacts as much as possible given the other constraints in this area of the project.

An archival photographic recording of the buildings to be demolished would be carried out, in accordance with the guidelines Photographic Recording of Heritage Items Using Film or Digital Capture (Heritage Council of NSW, 2006).

Conclusion

The conclusion provided in Section 5.4.2.4 of Appendix J (Technical working paper: Non-Aboriginal heritage) is replaced with the following:

The proposed works would be of small/localised scale in terms of the overall Heritage Conservation Area and of low intensity, but part of the works would be permanent/irreversible (in the case of the buildings to be demolished within Lot 101 DP 629133, Lot 104 DP 733658, and Lot 102 DP 629133). However, these buildings are on the margin of a large Heritage Conservation Area and the aspect of significance that they represent is well-represented by a large stock of other similar and better buildings, and there are limited areas of open space for construction compounds in the vicinity of the project. As such, with the implementation of the management measures described, the level of impact on the heritage conservation area would be minor.

B12.12.2 Non-Aboriginal – Yurulbin Point

Issue raised

Pages 5, 22 and 28

Inner West Council note that four heritage buildings are within the minimum working distances for vibration intensive works for the Yurulbin Point construction support site and would be potentially affected.

Council is satisfied that the environmental impact statement has acknowledged the heritage impact on Yurulbin Park as “major” and is pleased the park will be reinstated with the assistance of its original landscape architect. Inner West Council would like its parks staff to be involved in the restoration.

Response

Four heritage items are located within the minimum working distances for vibration intensive work near the Yurulbin Point construction support site (WHT4), as outlined in Table 10-15 of the environmental impact statement. The most vibration intensive activity at this site is likely to occur during early works and site establishment, piling for acoustic shed and shaft construction.

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, as outlined in environmental management measure CNV6 (refer to Table D2-1 of this submissions report). 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. Any damage caused by the project will be rectified.

Inner West Council’s support of the reinstatement of Yurulbin Park is acknowledged. The design of the project works at Yurulbin Park have been developed in consultation with Bruce Mackenzie AM, the original designer of the park. This has resulted in a design that minimises impacts to significant features and changes to the permanent landform at Yurulbin Park. Reinstatement works following the completion of construction would also be designed in consultation with Bruce Mackenzie and would seek to retain and enhance the existing character and the original design intent as much as possible. These works would also improve the quality and long-term viability of landscaping and useability of the park.

B12.13 Geology, soils and groundwater

B12.13.1 Settlement and subsidence

Issue raised

Pages 4, 19, 28 and 29

The excavation of tunnels has the potential to result in settlement at the ground surface, potentially impacting properties above or near the project. Table 16-8 of the environmental impact statement shows maximum predicted surface settlement from Rozelle ventilation tunnels as being 10-15 millimetres and the Victoria Road access decline as 25-30 millimetres. The 'slight' impact category is 10-50 millimetres with impacts described as:

"Cracks easily filled. Redecoration probably required. Recurrent cracks can be masked by suitable linings. Cracks may be visible externally and some repointing may be required to ensure weather tightness. Doors and windows may stick slightly. Typical crack widths between one to five millimetres."

The 'slight' category represents extensive damage given the number of properties potentially affected. Inner West Council note that page 21-29 of the environmental impact statement outline that some properties near the project may experience very slight to slight cosmetic damage due to settlement, and that the environmental impact statement notes that this is not expected to impact on the serviceability or stability of buildings.

Specific concern is raised regarding the potential for damage to houses and other buildings where tunnels are at shallow depth. It is noted that community concerns about the potential for property damage from tunnelling and ground movement have been raised. It is not reassuring that the environmental impact statement verifies that ground movement may occur as a result of the relief of stress from tunnelling through intact rock and settlement induced from groundwater drawdown.

Further concerns are raised about potential for property impact, including to basement car parks, unit developments and pools due to tunnelling activities. More clarification is therefore requested regarding likely property impacts.

Response

No buildings were found to be in the 'slight' to 'very severe' damage categories, while approximately 106 buildings along the project alignment were categorised within the 'very slight' damage category. 'Very slight' damage (fine cracks) are easily treated during normal decoration. Damage is generally restricted to internal wall finishes, with small cracks visible on external brickwork or masonry. The risk to individual structures would be dependent on the geotechnical conditions, the depth of the tunnel, the number of storeys of the building, and the position, condition, and masonry of the structure itself. Changes in land use as the result of ground movement impacts is therefore considered unlikely during both construction and operation of the project.

Building/structure condition surveys would be carried out as applicable prior to commencement of construction. Any impacts from settlement caused by the project would be rectified to the condition prior to construction works.

As required by environmental management measure SG3 (refer to Table D2-1 of this submissions report), 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 and vibration monitoring requirements.

As identified in Table 16-7 of the environmental impact statement, the degree of severity and typical impacts has been adopted from Burland et al. (1977), and Boscardin and Cording (1989). Furthermore, the criteria for assessing the severity of settlement is taken from Australian Standard 2870, Residential slabs and footings, specifically:

- Appendix B – Foundation performance and maintenance
- Appendix C – Classification of damage due to foundation movements.

The ground movement assessment summarised in Section 16.4.2 of the environmental impact statement considered the combined impact of ground movement as a result of:

- Tunnel induced movement caused by the relief of stress from tunnelling through intact rock
- Settlement induced from groundwater drawdown.

B12.13.2 Contamination

Issue raised

Pages 10 and 29

Despite proposed mitigation measures for handling contaminated material from moderate to high risk areas including the Rozelle Rail Yards, Yurulbin Point, White Bay, Easton Park, Birchgrove Peninsula and Sydney Harbour, concerns remain about the risks and potential impacts based on Inner West Council's experience with WestConnex. Even with adequate regulation and best intentions, disturbance of these sites has the potential to affect surrounding residential areas as there is always a chance of an unforeseen spill or other pollution event, and this could take some time to rectify.

Response

Land and marine contamination are assessed in sections 16.4.3 and 16.4.4 respectively of the environmental impact statement. Areas of high potential risk of land contamination within the Inner West Council local government area include the Rozelle Rail Yards and Sydney Harbour above proposed tunnel alignment and within footprint of the Sydney Harbour Cofferdam construction support sites. Easton Park and the Birchgrove peninsula are both assessed as having a moderate contamination risk.

In addition, the sediments in Sydney Harbour would potentially pose a marine contamination risk due to the contamination associated with historical industrial use (over 150 years) of the harbour and the addition of polluted stormwater runoff originating from adjacent catchments. Refer to the NSW Environment Protection Authority submission and responses in Section B1 and Appendix C.2 of this submissions report for further information regarding marine and land contamination and management approach.

As required by environmental management measure SG6 (refer to Table D2-1 of this submissions report), potentially contaminated areas directly affected by the project will be investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the *Contaminated Land Management Act 2008*. Subject to the outcomes of the investigations, a Remediation Action Plan will be implemented in the event that site remediation is warranted prior to construction. The Remediation Action Plan will be prepared and implemented in accordance with *Managing Land Contamination: Planning Guidelines SEPP 55* – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998). 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.

Dredged material unsuitable for offshore disposal would be loaded into barges using a closed environmental clamshell bucket and transported to the White Bay construction support site (WHT3) as described in Chapter 6 (Construction work) of the environmental impact statement. No overflow from the barges would be permitted during loading operations and during transit to White Bay. After berthing of the barges at White Bay, lime and/or an inorganic polymer would be mixed with the dredged material while in the barge, prior to unloading, for management of acid sulfate soils and odour (as required), and to make the material spadeable. Mixing would take place by means of an excavator located on the adjacent wharf. The dredging process would not add any significant

quantities of water to the material (being a mechanical process with a closed environmental clamshell bucket) and the addition of lime and/or the inorganic polymer would significantly reduce moisture content. Accordingly, management of water/leachate in the dredged material at White Bay would be minimal or may not be required. Following the mixing process, material within the barges would be loaded either directly into trucks for transport to a licenced landfill or temporarily stockpiled on the wharf deck within a bunded area prior to loading into trucks for transport to licenced landfill. The bunded area would incorporate a leachate collection and treatment system in the event of any leachate from the temporary stockpile.

Construction of the project would require an Environment Protection Licence that would include the requirement for a Pollution Incident and Response Management Plan (PIRMP). This would supplement the implementation of environmental management measure SG10 and SG11 (refer to Table D2-1 of this submissions report) to minimise impacts on site workers and/or local community through disturbance and mobilisation of contaminated material.

As outlined in Section 28.5 of the environmental impact statement, the construction environmental management plan would include a framework for the management of environmental impacts during construction, including details on waste management, spoil management and soil and water management.

B12.14 Hydrodynamics and water quality

B12.14.1 Marine water quality – construction

Issue raised

Pages 2, 4 and 22

Construction of cofferdams will lead to marine water quality impacts as contaminated sediments pollute the harbour and impose odour and other health impacts on residents.

Response

The potential for marine contamination is discussed in Section 16.4.4 of the environmental impact statement. Contamination has been reported in sediments present within Sydney Harbour. This contamination is likely to be associated with inputs from the surrounding urbanised catchments, historical industrial operations, and the general maritime use within the harbour.

The cofferdam construction methodology is provided in Section 6.4.4 of the environmental impact statement. The cofferdam structure would be made up of a series of interlocking, tubular piles. Each pile would be driven from a flat top barge (or similar barge) using a crane fitted with a hydraulic vibrating hammer, offshore pile driving hammer and/or a similar piece of construction equipment. Once the cofferdam piles are installed and the cofferdam dewatered, excavation of the bed sediments and underlying rock would be contained within the cofferdam and this would avoid any potential water quality impacts outside the cofferdam. Shallow silt curtains would be installed adjacent to ecologically sensitive areas to provide additional protection to these areas.

Refer to the NSW Environment Protection Authority submission and response in Section B1 and Appendix C.2 of this submissions report for further information regarding contaminated sediments.

The implementation of environmental management measure SG6 (refer to Table D2-1 of this submissions report) would minimise the potential for impacts on site workers and/or local community through disturbance and mobilisation of contaminated material.

B12.14.2 Marine water quality operation

Issue description

Page 19

During operation, the project would treat water according to ANZECC water quality guidelines. Water should be treated to also meet the Sydney Harbour Water Quality Improvement Plan Targets.

Response

As outlined in Section 2.2.4 of Appendix O (Technical working paper: Surface water quality and hydrology), the *Sydney Harbour Water Quality Improvement Plan* (Greater Sydney Local Land Services, 2015) provides a coordinated management framework to improve the future health of Sydney Harbour and its catchments. This plan applies to the majority of the project footprint which ultimately drains to Sydney Harbour. While the plan itself does not include pollutant reduction targets for individual developments, catchment load and estuary condition targets have been developed for some sub-catchments and local government areas using feasible scenario options for both the management of stormwater and improvements in sewer outflow performance. These targets are based on the following scenario including assumptions of feasible change/actions:

- Water Sensitive Urban Design (WSUD) incorporated into 70 per cent of infill developments
- WSUD retrofitted into 10 per cent of existing urban areas
- Improving sewer overflow performance to limit overflows to no more than 40 events in 10 years.

The targets are designed to provide direction to change rather than being prescriptive of the exact management actions that should be carried out to achieve these goals. It is acknowledged that different scenarios to that assumed above could also achieve the targets. The targets would be considered in further design development.

During operation, the permanent wastewater treatment plant at Rozelle would treat wastewater generated from tunnel groundwater ingress and rainfall runoff in tunnel portals. As required by environmental management measure WQ9 (refer to Table D2-1 of this submissions report), the wastewater treatment plant at Rozelle will achieve the following discharge criteria:

- The relevant physical and chemical stressors set out in 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) which are likely to be finalised in October 2020.

Should any of the criteria be exceeded, a management response will be triggered. The management response will be documented within the operational water quality monitoring program (refer to environmental management measure WQ11 in Table D2-1 of this submissions report).

Should further design development identify the need for additional water quality controls during operation, the project would provide water quality treatment that meets the design targets listed in Table 17-3 of the environmental impact statement. Refer to the NSW Environment Protection Authority submission and responses in Section B1 of this submissions report for further information regarding water quality targets during operation of the project.

B12.15 Biodiversity

B12.15.1 Terrestrial flora

Issue raised

Pages 5, 18 and 20

Terrestrial biodiversity impacts are overall underestimated as tree removal is a major issue. The project will impact 55 trees at Yurulbin Park which is significant in the local context. Yurulbin Park

consists primarily of native plantings, and it is recommended that the map on Page 19-11 of the environmental impact statement is updated to show the area as native plantings.

Transport for NSW should consult with the Urban Forest and Ecology team to confirm retention values and replace impacted trees with mature plants in a 2 for 1 ratio. Offsets should also include the introduction of ecological restoration features, such as the development of a saltmarsh area at Yurulbin Park.

Any tree works must be carried out by an arborist with Australian Qualification Framework level 5 or equivalent in Horticulture (Arboriculture). Native vegetation should be re planted where vegetation is impacted. The re-planted vegetation should be maintained for 12 months by suitably qualified ecologists to ensure they are appropriately restored.

Response

Potential biodiversity impacts of the project are outlined in Appendix S (Technical working paper: Biodiversity development assessment report) and Chapter 19 (Biodiversity) of the environmental impact statement. The biodiversity development assessment report (BDAR) has been prepared in accordance with the Biodiversity Assessment Method (BAM), as required by the Secretary's environmental assessment requirements issued by the Secretary of the Department of Planning, Industry and Environment (formerly Department of Planning and Environment).

Figure 19-2 (on page 19-11) of the environmental impact statement and Figure 3-3 of Appendix S (Technical working paper: Biodiversity development assessment report) both identify Yurulbin Park as containing both Urban Exotic/Native and Native Plantings vegetation types. However, Section 3.4.1.1 of Appendix S (Technical working paper: Biodiversity development assessment report) describes the vegetation in Yurulbin Park as native plantings. The vegetation mapping has been amended to correct this inconsistency, and to reflect the prevalence of native plantings in this area (refer to Figure A4-8 and Table A4-2 of this submissions report). The amendment to the mapping has resulted in amended total areas of clearing for two vegetation types as presented in Table B12-2 below.

Table B12-2 Amended areas of vegetation clearing for the project

Vegetation type	Area of clearing identified in BDAR (ha)	Amended area of clearing following mapping updates (ha)
Native plantings	2.99	3.23
Native plantings within the vegetated medians of Warringah Freeway	2.84	2.84
Urban exotic/native plantings	1.11	0.87
Weeds and exotics	0.35	0.35
Total	**7.29**	**7.29**

Appendix W (Technical working paper: Arboricultural impact assessment) was prepared by Eco Logical Australia Pty Ltd using field techniques, review of aerial photography and spatial data analysis. The assessment was prepared to:

- Identify the trees within the project area (15 metres) that are likely to be affected by the proposed works
- Assess the current overall condition of the subject trees
- Evaluate the significance of the subject trees
- Assess potential impacts to the subject trees

- Identify tree management measures that could assist with tree retention.

The assessment identified 28 trees subject to direct impacts (removal) at Yurulbin Park, of which two have been identified as having a high retention value (*Eucalyptus saligna* and *Eucalyptus botryoides*) and a further seven have a medium retention value. The remaining four high retention value and 13 medium retention value trees would be retained with a further one medium retention value tree subject to potential impact. All other trees in Yurulbin Park are categorised as having a low retention value (based on significance and useful life expectancy).

The need for biodiversity offsets for the project has been assessed and is included Appendix S (Technical working paper: Biodiversity development assessment report). Biodiversity offsets would be provided for impacts to the single individual *Acacia terminalis* subsp. *terminalis* (Sunshine Wattle) recorded in the construction footprint in disturbed vegetation adjoining the Warringah Freeway. No biodiversity offset requirements have been identified for the impacts in Yurulbin Park.

Any 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 2011), per environmental management measure B2 (refer to Table D2-1 of this submissions report).

Transport for NSW is committed to replacing the trees removed by the project at a ratio equal to or greater than 1:1 to ensure no net loss (in accordance with revised environmental management measure B4, 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 this locality (rather than plant exotic or non-local native trees) where available and subject to the urban design and landscape plan. Environmental management measure B4 (refer to Table D2-1 of this submissions report) also requires that vegetation will be re-established, where feasible and reasonable, in accordance with *Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).

As outlined in Section 14.4.1 of the environmental impact statement, to minimise both heritage and land use impacts, reinstatement works following the completion of construction would be designed in consultation with Bruce Mackenzie. The new design would seek to retain and enhance the existing character and the original design intent as much as possible. These works would also improve the quality and long-term viability of landscaping and useability of the park.

B12.15.2 Terrestrial fauna

Issue raised

Pages 18, 19 and 22

Nocturnal wildlife should be considered a key receiver for the project in the night lighting impact assessment. Light spill impacts need to be considered for all potential bat roosting sites.

Noise and vibration impacts need to be considered in the context of multiple stressors and an overall loss of secure roost sites for threatened bats in the Sydney Basin.

The environmental impact assessment notes that threatened bats will be monitored, and microbats are likely to forage in the area. Prior to construction commencing, the Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour must be engaged to initiate monitoring to enable the identification of changes to bat behaviour. Monitoring should reflect a precautionary approach to impacts on threatened bat species and be undertaken to understand the distribution of threatened bats in the areas surrounding the construction footprint.

A Large Bent-winged Bat roost exists in a tunnel in the Inner West Council area which could also be protected as part of an adaptive management strategy.

Furthermore, construction scheduling must be informed by a bat ecologist to minimise impacts to threatened bats, suggesting the noisiest works near the former coal loader site should be scheduled for summer when the Large and Little Bent-winged bats are not present in the Sydney Region.

Inner West Council suggests the former coal loader site has not been adequately considered in the project siting to avoid impacts to the Large Bent-winged Bat roost.

Response

It is noted that due to a taxonomic revision since the environmental impact statement preparation, the *Miniopterus* genus the common and scientific names of this species have recently been changed from the previous Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*), by which the species is referred to in the environmental impact statement and the biodiversity development assessment report, to the new name the Large Bent-winged Bat (*Miniopterus orianae oceanensis).* This has been added as a clarification in Section A4.2 of this submissions report.

The biodiversity assessment, provided in Appendix S (Technical working paper: Biodiversity development assessment report) and summarised in Section 19.4.2 of the environmental impact statement, assesses the potential for noise, vibration, dust and light spill impacts on terrestrial fauna including the Large Bent-winged Bat. Potential light spill impacts to fauna are not expected to be significant given that most construction works would occur in already highly urbanised areas.

The environmental impact statement was submitted prior to the finalisation of the *National Light Pollution Guidelines for Wildlife: Including marine turtles, seabirds and migratory shorebirds* (Department of the Environment and Energy, 2020). Nonetheless, the guidelines have been considered below in the context of developing mitigation to minimise any impacts of light pollution on wildlife.

Construction lighting that has the potential to impact nearby fauna, including microbats, would be located at the harbour crossings and nearby construction support sites. All structures occupying part of the waterway or any exclusion/navigational marks placed in the water would be lit for marine traffic safety. Lighting would also be used at the construction support sites for night deliveries, site security requirements, worker safety, spoil management and to assist tunnel construction activities at the cofferdams.

Known bat roosts with the potential to be impacted by light spill include the Large Bent-winged Bat roost in the coal loader tunnels, and a harbour jetty occupied by the threatened Southern Myotis (*Myotis macropus*), further from the project site (Gonsalves & Law, 2017). These roosts are in a highly urbanised area with existing light sources on open water and foreshore areas. The broader locality is heavily populated with the Sydney CBD in proximity. As such, the existing sky glow currently impacts light levels in the locality.

Potential impacts to microbats from construction lighting include changing behaviours, reduced foraging and breeding success and changing movement patterns. However, changes in the light environment during construction would be very localised and temporary. More detail on impacts to microbats during construction would be known when lighting requirements are finalised.

A new environmental management measure B30 (refer to Table D2-1 of this submissions report) will require a site specific pre-construction assessment of construction lighting impacts on the Balls Head Coal loader Large Bent-winged bat habitat to be carried out. Subject to outcomes of the assessment, construction lighting will be managed to minimise light spill impacts on this habitat with consideration of meeting requirements for worker safety, navigation and security.

Operational lighting would have minimal impacts to fauna as it would be limited to below ground (tunnels) and heavily urbanised areas with existing lighting and minimal surrounding vegetation.

The environmental impact statement notes that there may be potential noise and vibration impacts to the Large Bent-winged Bat during autumn and winter (overwinter period) during construction of the tunnels below the coal loader tunnels and construction activities associated with the Sydney Harbour north cofferdam (WHT6).

Potential noise and vibration impacts to the Large Bent-winged Bat in the vicinity of the coal loader would be managed through monitoring and adaptive management measures.

Environmental management measure B8 (refer to Table D2-1 of this submissions report) states that monitoring of Large Bentwing-bats in the coal loader tunnel prior to and during construction (in the months of March to September) will be carried out. The frequency and methods of the monitoring will be provided in an adaptive management plan developed prior to the commencement of construction and in consultation with the Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour.

Adaptive management measures to minimise impacts on the Large Bent-winged bat will be developed in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour, prior to the commencement of construction activities consisting of the Sydney Harbour north cofferdam (WHT6), excavation of the mainline tunnel and any rock hammering works within close proximity to the coal loader roosting site. Refer to environmental management measure B9 of Table D2-1 of this submissions report.

The investigation of additional roosts of this species and other threatened bat species in the broader Sydney basin is beyond the scope of this project and its specific impacts and the management and tracking of these roosts are the responsibility of local government and state environment agencies.

Inner West Council's proposal to protect a known Large Bent-winged Bat roost in the local government area as part of the adaptive management plan is noted and would be considered during the development of the plan in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and the engaged qualified expert in microbat biology and behaviour in accordance with environmental management measure B9 (refer to Table D2-1 of this submissions report).

While the Little Bent-winged Bat (*Miniopterus australis*) and Large Bent-winged Bat are known to roost together, to date no Little Bent-winged Bats have been found in the coal loader tunnel roost.

B12.15.3 Marine

Issue raised

Pages 2, 4, 18, 22 and 25

Concern is raised regarding permanent impacts on marine life from the construction of cofferdams, dredging the harbour floor and laying the immersed tube. This includes impacts to seagrass habitat between Yurulbin Park and Sydney Harbour south cofferdam.

Response

Exclusion zones will be implemented to avoid disturbance to sensitive marine habitats not proposed to be directly impacted by the project, in accordance with environmental management measure B17 (refer to Table D2-1 of this submissions report). These include any intertidal sand and mudflats, intertidal rocky shore, subtidal rocky reef and seagrass habitats with potential to occur within or next to transit routes and vessel movements. Routine inspections and maintenance of exclusion fencing would be carried out.

There would be the removal of a small amount of subtidal rocky reef habitat and intertidal rocky shore habitat along the shore line of the crossing at the Sydney Harbour south cofferdam (WHT5) and the Sydney Harbour north cofferdam (WHT6) (refer to Section 6.7 of Appendix T (Technical working paper: Marine ecology)). This removal would be mitigated through re-instatement of similar habitat under the NSW Department of Primary Industries (Fisheries) policy of 'no net loss'. Further

discussion regarding potential impacts to seahorses is provided in the submission and response to Department of Planning, Industry and Environment (Regions, Industry Agriculture and Resources) provided in Section B6 of this submissions report.

No threatened marine ecological communities listed under the *Fisheries Management Act 1994* (FM Act) or the *Environmental Protection and Biodiversity Conservation Act 1999* have been identified in the marine biodiversity study area (refer to Section 19.3.6 of the environmental impact statement). One endangered population listed under the FM Act, the *Posidonia australis* seagrass population, has a high likelihood of occurrence within the marine biodiversity study area due to the presence of populations in the surrounding area.

There is the potential for scour from vessel movement and changes in water quality from wastewater discharge during construction of the project to result in removal of a small patch of seagrass habitat between Yurulbin Park and the Sydney Harbour south cofferdam (WHT5) (about 0.03 hectares), as outlined in Section 19.4.4 of the environmental impact statement. With appropriate management of vessel activities and wastewater discharge, impacts to this habitat would be minimal.

B12.15.4 Adequacy and accuracy

Issue raised

Page 18

Ecological restoration areas, consisting of native vegetation at Birrung Park, Waterdale Park, Birchgrove Park, Cameron's Cove (Ewenton Park), Mort Bay Park, Vanardi Reserve, Callan Park and King George Park are not identified or indirect impacts assessed in the BDAR. These areas need to be shown on the vegetation maps.

Response

The biodiversity assessment method assessment is based on the construction footprint (subject land) and as these parks are not likely to be subject to direct or indirect impacts, they were not considered relevant for the biodiversity assessment.

Most of the parks identified are not located directly beneath or adjacent to the tunnel alignment. Only one of the listed parks is located above the tunnel alignment, namely Birchgrove Park. The crown (top) of the tunnel would be located about 28 to 30 metres below the surface of Birchgrove Park, which would not impact the root zone of any vegetation within the park. While there would be drawdown of the groundwater table beneath the parks, as shown on Figure 3-6 of Appendix S (Technical working paper: Biodiversity development assessment report), there are no groundwater dependent ecosystems mapped or likely to occur within these areas and therefore any potential indirect impacts are likely to be minimal.

B12.16 Land use and property

B12.16.1 Loss of open space and amenity

Issue raised

Pages 4, 5, 11 and 27

General concerns are raised regarding the denial of public access to Yurulbin Park during construction lasting several years as it is a popular, well used passive recreational space and a site for weddings and family events. Additional confirmation is requested regarding the availability of the park or alternative locations to be used for New Year's Eve celebrations during the construction period given its prominent location.

Inner West Council acknowledge that the park will ultimately be restored and upgraded however oppose removal of any publicly accessible open space for motorway construction.

Response

The project acknowledges Inner West Council's opposition to the removal of any publicly accessible open space for motorway construction. Locating construction support sites to support large scale infrastructure projects in urban environments is a complex issue and needs consideration of a variety of aspects, including avoiding private property acquisitions wherever possible. The project requires a tunnel construction support site in Birchgrove that is situated close to the driven tunnel and immersed tube tunnel (IMT) interface. Birchgrove Oval has been avoided by the project due to its high community use.

The Yurulbin Point construction support site (WHT4) would support excavation of the mainline tunnels (including for connection to the immersed tube tunnel crossing). It is expected that Yurulbin Park would be used as a construction support site for a period of around four years (indicative program outlined in Table 6-16 of the environmental impact statement).

Table 20-3 in the environmental impact statement identifies that Yurulbin Park would be temporarily leased for use as a construction support site (WHT4). This site would not be required on a permanent basis to operate the project and would be rehabilitated in line with the design vision provided by the original landscape architect (Bruce Mackenzie) as part of this project as soon as practicable at the completion of construction. The project would not impact on the long term viability of the site to continue to be used for public recreation and open space purposes.

During construction, Yurulbin Park would not be available during New Year's Eve celebrations however alternative vantage points including Birchgrove Park, Mort Bay Park and Ballast Point Park would remain available. The nearest available alternate area of open space is Birchgrove Park located about 500 metres from Yurulbin Park.

B12.16.2 Property acquisition and construction site location

Issue raised

Pages 7 and 22

While the goal of minimising acquisitions is supported, Inner West Council expressed strong opposition to the acquisition of the former Balmain Leagues Club site for use as a construction site due to construction impacts on adjacent homes, shops and schools, and the delay in the imminent redevelopment of the site.

As part of Council's efforts to facilitate redevelopment of the site, Council adopted an amendment to the site-specific Development Control Plan (DCP) provisions (Part D of Leichhardt DCP 2000) in June 2019. The amendments aim to facilitate the redevelopment accordance with the provisions of *Leichhardt Local Environmental Plan LEP 2000* while achieving improved urban design, environmental and community outcomes. Council considered amendment of the DCP as the most appropriate means of influencing the outcomes for the precinct.

Additionally, clarification is requested with regard to the NSW Government's intentions for the privately owned residential property north of the former Balmain Leagues Club site. To provide Inner West Council and the community certainty regarding its future land use, the environmental impact statement should confirm if the property is to be leased or purchased and the period that it will be required.

Response

In the case of the Victoria Road construction support site (WHT2), 138-172 Victoria Road in Rozelle (the former Balmain Leagues Club site) currently has private owners. As identified in Chapter 20 of the environmental impact statement (Table 20-3) the site may be acquired by Transport for NSW or leased depending on ongoing property negotiations. If the property is leased, the site would be rehabilitated and returned to the landowner at the completion of construction. Any proposed redevelopment of the land would be subject to development assessment and approval from the

relevant planning authority. Further discussion is provided in Section A4.1.8 of this submissions report.

The privately owned residential property on Victoria Road would be acquired by Transport for NSW. Corrections to the information in Table 20-3 (on page 20-23) and Table 20-4 (on page 20-30) of the environmental impact statement have been made to reflect the acquisition, including statements that the temporary occupation of this land as a construction support site should not affect the existing land use zoning or development controls that are applicable to this site. Refer to Section A4 of this submissions report for these clarifications. The indicative construction program for the Victoria Road construction support site in included in Table 6-12 of the environmental impact statement. The site would be used as a construction support site for around four years.

Further assessment of the potential impacts against the amendment to the site-specific Development Control Plan (DCP) provisions (Part D of Leichhardt DCP 2000) is provided in Section B12.12.1 above.

B12.17 Socio-economic

B12.17.1 Business impact assessment

Issue raised

Pages 13 and 29

Inner West Council has been aware for some time that business communities in the Balmain and Rozelle area are concerned about impacts on business viability from the multiple infrastructure projects in the area, including Western Harbour Tunnel. Inner West Council is pleased that an analysis of the impacts of project on businesses has been undertaken in the environmental impact statement.

Response

Inner West Council's support of the inclusion of the business impact assessment as part of the environmental impact statement is acknowledged.

B12.17.2 Local business

Issue raised

Page 29

Inner West Council does not agree with the conclusion presented on page 21-29 of the environmental impact statement that the impact of construction on the visibility of business would be positive. Particular concerns relate to the Annandale village where truck diesel emissions and dust will result in reduced amenity for the community and make it unsuitable for outdoor dining and street stalls. This will reduce pedestrians in the area and affect businesses sustainability.

Significant impacts are likely for local businesses which would likely see a downturn in trading due to the negative visual impact of the Victoria Road site and the traffic congestion created by the spoil trucks and other construction traffic.

Response

Specific consultation will be carried out with businesses potentially impacted during construction, as required by environmental management measures BU2 and BU3 (refer to Table D2-1 of this submissions report). 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 process will be identified and implemented. A phone hotline that enables businesses to find out about the project or register any issues will be maintained.

Businesses across the precinct areas may be affected during the construction phase by temporary changes in passing trade, access and travel time (for employees, customers, deliveries and/or servicing), parking, serving and deliveries and amenity, as outlined in Section 21.4.7 of the environmental impact statement. Depending on the nature of the business, the actual impact on business revenue may vary (positively or negatively). These impacts may be an inconvenience for some businesses, although they would be temporary in nature as construction activities at each construction support site would be comparatively less than the overall construction program. There may also be benefits for businesses due to increased passing trade and business exposure.

Reductions in the amenity as a result of construction were assessed as having a moderate significance on local businesses in the Victoria Road/Darling Street Centre as the result of a moderate level of sensitivity and moderate magnitude of change. The significance of construction on impacts to amenity was assessed as being moderate to low for local businesses in the North Sydney CBD, and low in the Artarmon Industrial Centre. At other identified business centres, the impacts would generally be low or insignificant (negligible).

Due to its distance from the project, the Annandale village was not included for assessment within the assessment carried out in Appendix U (Technical working paper: Socio-economic assessment) and is not likely to be affected by the project. It is noted that Table 5-5 and Figure 5-11 of Appendix F (Technical working paper: Traffic and transport) identifies that proposed access routes to the construction support sites in the Rozelle area and surrounds would be on major arterial roads including Victoria Road, City West Link and James Craig Road. Construction vehicles would therefore not use Johnston Street or pass through Annandale to access construction support sites to minimise impacts on these areas.

B12.17.3 Sensitive receivers

Issue raised

Pages 10, 11, 12, 25, 26 and 31

Concerns are raised about impacts on schools and other sensitive uses which include schools and childcare facilities where students, teachers and visitors at the schools may experience temporary amenity impacts due to increased noise and dust from construction activities at construction support sites and surface road upgrades.

Response

Transport for NSW acknowledges that the Victoria Road construction support site (WHT2) at Rozelle would have the potential to result in indirect impacts on the amenity of nearby social infrastructure such as Rozelle Public School and use of outdoor areas along Victoria Road (as outlined in Section 21.4.4 of the environmental impact statement).

The project team would engage with sensitive receivers in the lead up to and during construction to ensure they are informed about key activities and what environmental management measures will be in place.

The implementation of environmental management measures outlined below, and listed in Table D2-1 of this submissions report, would assist in managing potential impacts:

- CTT7 – Vehicle movements to and from construction sites will be managed to ensure pedestrian, cyclist and motorist safety. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence
- CTT8 – Directional signage, barriers and/or line marking will be used as required to direct and guide drivers, cyclists and pedestrians past construction sites and on the surrounding network. This will be supplemented by Variable Message Signs to advise drivers of potential delays, traffic diversions, speed restrictions, or alternative routes

- CNV2 – Detailed Construction Noise and Vibration Impact Statements will be carried out for all construction support sites and major construction works required for the project prior to the commencement of construction. The Statements will consider the proposed site layouts and noise and vibration generating activities that will take place during all major stages of the construction support site, assess predicted noise and vibration levels against the relevant management levels, and incorporate 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, 2016a)
- CNV4 – Construction noise and vibration impacts will be monitored periodically throughout all stages of the construction support sites to ensure that:
  a) Impacts are consistent with the noise and vibration levels detailed in the relevant Construction Noise and Vibration Impact Statements
  b) Noise and vibration impacts are being appropriately managed
  c) Mitigation measures are effective
- AQ1 – Standard construction air quality mitigation and management measures will be detailed in construction management documentation and implemented during construction, such as:
  a) Reasonable and feasible dust suppression and/or management measures, including the use of water carts, dust sweepers, sprinklers, dust screens, site exit controls (eg wheel washing systems and rumble grids), stabilisation of exposed areas or stockpiles, and surface treatments
  b) Selection of construction equipment and/or materials handling techniques that minimise the potential for dust generation
  c) Management measures to minimise dust generation during the transfer, handling and on-site storage of spoil and construction materials (such as sand, aggregates or fine materials) (eg the covering of vehicle loads)
  d) Adjustment or management of dust generating activities during unfavourable weather conditions, where possible
  e) Minimisation of exposed areas during construction
  f) Management measures for managing unexpected 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
  g) 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
  h) Site inspections will be carried out to monitor compliance with implemented measures.

B12.17.4 Construction fatigue

Issue raised

Page 17

Areas considered most likely to experience sustained impacts to receivers that may result in construction and complaint fatigue appear to be accurate. These areas include residential receivers in the vicinity of the Rozelle Rail Yards, White Bay and Glebe Island, commercial receivers in the North Sydney CBD, residential receivers in Cammeray, and regular users of the Warringah Freeway. Construction fatigue in the above areas may occur as a result of the close proximity of

multiple construction sites for the project, and from construction activities associated with the following projects:

- M4-M5 Link
- Sydney Metro West
- Sydney Metro City & Southwest (White Bay truck marshalling yard)
- Glebe Island concrete batching plant
- Glebe Island Multi-User Facility
- The new Sydney Fish Market

Particular concern is for residents of Rozelle and Lilyfield where residents would have been subjected to impacts from WestConnex and other project for up to four years and will already be suffering from construction fatigue. Construction impacts will seem permanent and not temporary for these residents. Impacts at the Rozelle Rail Yards construction site should be minimised as far as practicable including the restriction of works at the site to only daytime construction hours.

Response

Construction fatigue is discussed in sections 7.5.3 and 27.3.5 of the environmental impact statement. There is potential for construction fatigue to be experienced by receivers in the vicinity of the project. Construction fatigue may be experienced by receivers that are in the vicinity of concurrent or consecutive project construction activities where the activities overlap or have little or no break between the activities of one project, or multiple adjacent projects.

Potential impacts considered most likely to result in construction fatigue include construction traffic and parking, construction noise and vibration, visual and amenity impacts, and impacts to community perceptions of public health and safety.

Work would be coordinated between the various project construction sites, where feasible and reasonable to minimise construction fatigue, as outlined in Section 27.3.5. Environmental management measures for construction fatigue are included in Table D2-1 of this submissions report (including CI2 and CI4).

During construction of the project, the project team would continue to build a working relationship with the project teams for other major projects (eg WestConnex Rozelle Interchange project) to identify stakeholders or community members who may be susceptible to construction fatigue. The project team would ensure the expectations of these stakeholders or community members are managed for the project. The project team would also work closely with its counterparts in different divisions of Transport for NSW and adjacent projects. This is to ensure the various State Government projects are releasing and/or consulting on projects in collaboration with each other and to reduce consultation and construction fatigue in local communities.

At present there are two formal groups in the project area which meet regularly to manage potential cumulative impacts, namely:

- The Bays Precinct Working Group, consisting of Government agency representatives from the Western Harbour Tunnel and Beaches Link, WestConnex Rozelle Interchange, Sydney Metro West, Port Authority of NSW and Transport for NSW teams
- Glebe Island and White Bay Community Liaison Group, coordinated by Port Authority, consisting of representatives from the local community and the current Ports tenants at Glebe Island and White Bay. Representatives from the project have attended these meetings in the past and will continue to do so on a regular basis during the construction period. Port Authority of NSW have advised that any future tenants of proposed projects such Hanson Glebe Island Concrete Batching Plant and Aggregate Handling Facility and the Glebe Island Multi-User Facility using the area would be invited to this group.

Additional coordination groups would be developed as required and Transport for NSW would continue to work closely with its internal departments.

At the Rozelle Rail Yards construction support site (WHT1), spoil haulage would be carried out during standard construction hours (7am to 6pm Monday to Friday, 8am to 1pm Saturday and no construction works on Sundays or public holidays).

B12.17.5 Health and wellbeing

Issue raised

Page 29

The cumulative impact assessment has underestimated health impacts of the in the context of WestConnex, Sydney Metro and other major projects in the Rozelle area. Inner West Council reiterates its concerns regarding resident's health from construction based on experience from WestConnex. Health impacts have resulted from incessant noise, dust and sleep deprivation from night works.

Construction work on inner-urban motorways should cease while the NSW Government undertakes a construction health study on the impacts WestConnex has had on residents of Haberfield, Ashfield and St Peters to date. Council is of the view that valuable lessons need to be learned about these health impacts and how to protect residents from them. The implementation of Environmental Management Plans alone is not sufficient to mitigate prolonged impact to the health of residents such as noise, dust and odour including contaminated soils.

The project will contribute to health impacts from overall increases in traffic and creation of a stressful, car dependent city. While traffic congestion needs to be addressed, the most effective means to do this is traffic reduction, not increasing road capacity.

Response

Environmental management measures outlined in Table D2-1 of this submissions report have been developed to minimise the potential for health and wellbeing impacts from construction traffic, noise and emissions (including dust). With the successful implementation of these measures, the likelihood of human health impacts occurring during the construction of the project are considered to be negligible.

The methodology for the human health impact assessment in Chapter 13 (Human health) of the environmental impact statement is aimed at assessing impacts and risks to human health from the construction and operation of the project. The human health assessment has focused on health-related impacts associated with key air quality, noise and vibration and social aspects. Overall, with the implementation of environmental management measures outlined in the Table D2-1 of this submissions report, air quality, noise and vibration and social impacts during construction or operation are unlikely to result in any health related impacts.

Potential cumulative impacts on health and safety from the Sydney Metro City & Southwest project at Rozelle and White Bay are provided in Table 27-5 of the environmental impact statement and are considered negligible. However, there is the potential for additional and prolonged impacts to community perceptions of public health and safety due to increases in construction traffic for residential receivers near the Rozelle Rail Yards and for industrial and commercial receivers around White Bay and Glebe Island.

The Public Accountability Committee, released a report on the impact of the WestConnex project in December 2018 which identified 27 recommendations including Recommendation 2 that the NSW Government mandate the completion of a public health impact analysis as part of the wider economic analysis carried out for future large scale infrastructure projects. In response the NSW Government noted that the environmental impact assessment process requires the preparation of a human health impact assessment in accordance with the secretary's environmental assessment requirements to evaluate the human health risk and costs associated with the project.

The human health assessment presented in Chapter 13 (Human health) of the environmental impact statement focusses on the key direct and indirect impacts of construction and operation on local and regional air quality, in tunnel air quality for tunnel users, noise and vibration and social changes. The environmental impact statement is reviewed and evaluated by the Minister for Planning and Public Spaces, who assesses whether the impacts, including on human health, are acceptable. The Minister may impose conditions on the project to mitigate specific risks.

The cumulative impact assessment considered publicly available information at the time and did not consider construction activities associated with the Sydney Metro West. Notwithstanding this, consultation would be carried out as required under environmental management measure CI1 which requires 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 (refer to Table D2-1 of this submissions report). Haulage routes and road occupancy will be coordinated with other major transport projects via Transport Coordination within Transport for NSW.

B12.18 Urban design and visual amenity

B12.18.1 Construction visual impacts

Issue raised

Pages 9 and 30

The environmental impact statement lacks detail on the design of the temporary structures at the Victoria Road construction support site (WHT2), hence the visual and amenity impacts (including overshadowing) cannot be verified. Detail should be provided on the materials and dimensions of these structures - in particular, the height and setbacks of the acoustic shed, the workshop and the noise barrier. This is critical given the site's prominent location and proximity to houses, a HCA, heritage items and the Darling Street commercial precinct.

While Inner West Council agree that Western Harbour Tunnel construction would have a negative visual impact on the Rozelle/Birchgrove area, it does not agree that these impacts would not be significant, particularly when considered in combination with WestConnex.

Response

Visual impacts at the Victoria Road construction support site (WHT2) would be temporary in nature and only be apparent during the construction period. Due to the degraded nature of the existing site, there are not expected to be major landscape character impacts during construction.

Due to the level of dilapidation at 138–172 Victoria Road (the site of former Balmain Leagues club), the proposed temporary noise wall around the Victoria Road construction support site (WHT2) is not expected to cause significant degradation to the existing visual amenity at Waterloo Street, as outlined in Section 22.5.4 of the environmental impact statement. Receivers looking onto the Victoria Road construction support site (WHT2) from the Victoria Road corridor (viewpoint 3) are expected to experience a low visual impact. Receivers looking onto the Victoria Road construction support site (WHT2) from viewpoint 1 on Waterloo Street are expected to experience a moderate visual impact.

Temporary structures at the site, including site hoardings, would be designed to minimise visual impacts including overshadowing as required by the following environmental management measures (refer to Table D2-1 of this submissions report):

- V1 – Construction support sites will be developed to minimise visual impacts for adjacent receivers where feasible and reasonable
- V3 – Site hoardings will be in neutral colours and designs in proximity to open space to help blend them into the surrounding environment

- V6 – Hoardings and temporary noise walls will be erected as early as possible within the site establishment phase to provide visual screening.

With the exception of the Yurulbin Park construction support site (WHT4) and Sydney Harbour south construction support site (WHT5), all other assessed landscape character zones in the Rozelle/Birchgrove area have a moderate-low or lower overall visual impact rating during construction. This is primarily due to low sensitivity of receivers and a low magnitude of change.

Impacts on the Yurulbin Park open space area are assessed as high due to the increase in built form on both water and land, combined with the removal of vegetation within the park itself, likely to temporarily adversely impact the landscape character of the landscape character zone. Construction works would also be visible from Birchgrove Park and residential dwellings along Louisa and Wharf Road, likely having a moderate to high temporary impact given the presence and proximity of construction works and the removal of vegetation. The landscape character of Sydney Harbour is expected to be moderately impacted during construction as a result of the temporary presence of additional built form by way of a floating dock and cofferdam structure within the harbour.

The visual impacts at Yurulbin Park and Sydney Harbour cofferdam sites are considered to be temporary in nature and localised to the specific areas in which they are expected to occur.

B12.18.2 Operational visual impacts

Issue raised

Page 16

General concerns were raised regarding the visual impact of ventilation outlets at the Rozelle Rail Yards.

Response

The ventilation outlets at the Rozelle Rail Yards are out of scope of this project. The ventilation outlets were assessed and approved as part of the under construction M4-M5 Link project.

B12.18.3 Urban design principles

Issue raised

Page 29

Table 22-2 of the environmental impact statement lists the project's urban design objectives. Inner West Council supports all these objectives but would argue that most would be undermined by motorways and enhanced by public transport.

Response

Inner West Council's support of the project's urban design objectives is noted. A discussion regarding the justification for the project and consideration of public transport alternatives is provided in Section B12.3.

B12.18.4 Water sensitive urban design

Issue raised

Page 19

Water sensitive urban design should be considered for permanent waste water treatment as it has the benefit of providing green infrastructure.

Response

As outlined in Section 2.1.2 of Appendix V (Technical working paper: Urban design, landscape character and visual impact), the *Water sensitive urban design guideline March 2016* (Roads and

Maritime, 2016), would be a fundamental consideration in the final design of the project, which would have environmental, aesthetic and amenity benefits.

During the operation of the project, all embankments would be landscaped and suitable stabilisation and management measures would be implemented during periods of vegetation establishment to minimise the potential for erosion and sedimentation impacts at nearby waterways including Whites Creek and Willoughby Creek (refer to Section 17.5.3 of the environmental impact statement).

The majority of open space used for construction of the project would not be required to operate the project and would be rehabilitated and returned to an equivalent state as soon as practicable at the completion of construction, as outlined in Section 20.4.2 of the environmental impact statement. The project would not impact on the long term viability of these areas as public open space.

B12.19 Resource use and waste management

B12.19.1 Adequacy and accuracy

Issue raised

Pages 19 and 30

Inner West Council is pleased 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.

Response

Inner West Councils support of the inclusion of the principles of the resource management hierarchy as defined in the *Waste Avoidance and Resource Recovery Act 2001* is acknowledged.

B12.20 Sustainability

B12.20.1 Environmental sustainability

Issue raised

Page 30

Compliance with environmentally sustainable development principles and project vision and policies would be more effectively achieved with public transport. The focus of the environmental impact statement sustainability assessment is on the project itself. This assessment should have been undertaken for motorways vs public transport long before the choice of transport option had been made.

Inner West Council are of the view that motorways themselves represent unsustainable development and facilitate further unsustainable development.

Response

Chapter 25 (Sustainability) of the environmental impact statement includes the sustainability framework for the project and describes the overall approach to sustainability through design, construction and operation. As outlined in Chapter 25, the project aims to achieve an ‘Excellent’ Design and As Build Infrastructure Sustainability rating from the Infrastructure Sustainability Council of Australia.

In addition to the application of the principles of ecologically sustainable development to the project (Table 25-5 of the environmental impact statement), the project would afford opportunities to improve local amenity, improve public transport access and active transport connections, and create additional green spaces.

Future Transport promotes the development of integrated multi-modal network solutions, 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. The project is one part of a complementary integrated multi-modal strategy being implemented by the NSW Government. The project objectives listed in Section 3.3 of the environmental impact statement cannot be achieved with improvements to the public transport network alone, and this was therefore not considered a feasible alternative. The construction and operation of a new tunnelled motorway crossing of Sydney Harbour was the preferred solution as this would provide additional transport capacity across Sydney Harbour to relieve congestion on existing crossings and improve the efficiency and reliability for all non-rail journeys across Sydney Harbour.

Further discussion regarding the strategic context and project need is provided in Section B12.2, while the project development and alternatives, including the consideration of public transport alternatives, is provided in Section B12.3.

B12.21 Greenhouse gas and climate change

B12.21.1 Greenhouse gas emissions during operation

Issue raised

Page 30

As required by the secretary's environmental assessment requirements and as was the case for WestConnex, the proponent has only been required to assess the impact of climate change on the project, not the project impact on climate change. Council believes that by creating additional traffic and sprawling development, motorways increase per-capita emissions and increase climate change risks.

Response

As outlined by Inner West Council, an assessment of the projects impact on per-capita emissions and potential impact of the project on climate change is outside of the scope of the environmental impact statement as defined by the secretary's environmental assessment requirements.

The SMPM used to model the traffic performance of the project includes changes in traffic as a result of induced demand, with induced demand equating to about 0.3 per cent additional daily trips in the Sydney metropolitan area in 2037. Indicative operational phase greenhouse gas emissions by scope are provided in Table 26-6 of the environmental impact statement and include the difference in traffic emissions between existing levels and with the project as Scope 3 emissions.

As outlined in Section 26.2.4 of the environmental impact statement, greenhouse gas emissions are projected to increase as traffic numbers across the road network grow, regardless of the minor increase in induced demand resulting from the project. However, the expected reduction in congestion as a result of the project and expected improvements in fuel efficiency and increases in electric vehicles are 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 assist in reducing emissions.

Section 26.2.4 of the environmental impact assessment identifies that the estimated operational emissions would represent about 0.04 per cent and 0.05 per cent of projected NSW emissions in 2027 and 2037 respectively, and 0.01 per cent of Australia's projected national emissions in 2027 and 2037. These percentage contributions are considered small within the NSW and national contexts and would be further minimised with the implementation of environmental management measures GHG1 and GHG2 (refer to Table D2-1 of this submissions report) which include:

- Greenhouse gas emissions during construction 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 of Australia rating scheme

- Energy efficiency will be considered during further design development with energy efficient systems installed where reasonable and practicable.

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B13 – City of Sydney Council

SEPTEMBER 2020

B13 City of Sydney Council

Contents

B13.1 Strategic context and project need

B13.1.1 Consistency with strategic plans

Issue raised

Page 2

Due to predicted cumulative traffic increases in the Inner West, the Western Harbour Tunnel project as a component of WestConnex is not consistent with the core objectives of the Future Transport 2056 strategy.

Response

The Western Harbour Tunnel and Warringah Freeway Upgrade project (the project) is not part of the suite of WestConnex projects and is subject to a separate approvals process. The project is being planned, procured and delivered independently to WestConnex. However, the project would leverage off the underground WestConnex network to significantly increase the efficiency and capacity of the transport crossings of Sydney Harbour and urban motorways network by delivering a new western bypass of the Harbour CBD.

The Western Harbour Tunnel and Beaches Link program of works is identified in the *Future Transport Strategy 2056* (Future Transport) (NSW Government, 2018) as a 'Committed' project forming part of the vision for the future strategic road network for Greater Sydney that will support key movements by road, including public transport, private vehicles and freight. As noted in Section 2.1.3 of Appendix F (Technical working paper: Traffic and transport) Future Transport is a 40 year strategy for mobility for Sydney and regional NSW, which seeks to improve communities (ie placemaking), transform customer experience (ie improve journey times and reliability) and boost economic performance (ie enable and accommodate growth). The Western Harbour Tunnel contributes heavily to all three objectives. Further to this, Future Transport promotes the development of integrated multi-modal network solutions, identifying that investment in motorways is needed in addition to investment in public transport such as Sydney Metro, Light Rail, and bus projects being rolled out throughout Sydney. The project is one part of a complementary integrated multi-modal strategy being implemented by the NSW Government.

The project supports the objectives of Future Transport as it would facilitate improvements to urban amenity by reducing through-traffic movements and relieving pressure on arterial roads connecting the broader Eastern City and North Districts to the Harbour CBD (refer to Section 3.5.6 of the environmental impact statement). The project would redistribute large volumes of through traffic, currently using surface arterial roads, underground. In addition to the direct benefit of moving bypass traffic underground, reduced congestion on the existing motorway and connecting arterial network offers flow-on benefits to the adjoining local network, reducing the impact of queuing on local high streets and local roads. Reduced congestion on the arterial road network would result in further improvements in amenity related to physical safety, air quality and noise levels.

A key element of Future Transport is the vision of a '30-minute city'. As discussed in Section B13.1.3 of this submissions report, the project, as part of an integrated multi-modal transport solution, would increase the number of people and places that are able to be reached within 30 minutes.

While cumulative impacts of the project with the approved M4-M5 Link may result in an increase in traffic demand through the Rozelle area, the majority of additional demand would be underground and connecting via WestConnex. In addition to the direct benefit of moving bypass traffic underground, reduced traffic as a result of the project offers flow-on benefits to the adjoining local network, improving overall road network performance including average travel speeds and the number and frequency of stops.

Through increased network capacity, the project would also cater more readily for the forecasted traffic demand, allowing greater freedom to travel as and when desired resulting in residents in the Inner West enjoying greater access as a result of the project.

B13.1.2 Opportunity cost of the project

Issue raised

Pages 2 and 9

The environmental impact statement states that the cumulative scenario for the 2037 morning peak would result in up to 13 per cent total unreleased trips despite the additional capacity improvements. There is subsequently only a reduction of four per cent compared to the 'Do minimum' scenario (17 per cent) which demonstrates that the project is not cost effective.

Justification should be provided on the allocation of government resources to the project and not public transport infrastructure, for example an expansion of the metro network to Zetland.

Response

The project has been planned as part of a multi-modal and integrated transport network by the NSW Government to meet the diverse travel and transport needs of Sydney, as outlined in Section B13.1.1 of this submissions report. This includes a well-developed road, rail, bus, ferry, walking and cycling network.

The Western Harbour Tunnel and Beaches Link program has followed the Infrastructure NSW processes to achieve investment decision. Through this process the program has demonstrated its economic merit and successfully passed 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. As part of this governance and rigorous review process, the Western Harbour Tunnel and Warringah Freeway Upgrade project has undergone extensive scrutiny throughout its development.

The base of the Final Business Case for the Western Harbour Tunnel and Beaches Link program of works was developed in 2016. This analysis 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. 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*.

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.

While some localised operational traffic impacts are possible, they are expected to be outweighed by travel time and reliability benefits on the broader strategic transport network, resulting in net benefits for the vast majority of future road transport customers. The project is predicted to result in higher demand through the network as a result of improved road transport customer outcomes and therefore increased economic activity. At a strategic level, due to the journey time and reliability benefits provided to transport customers, the project would enable more customers to travel as desired and at an improved level of service. For these reasons, a direct comparison of unreleased demand percentages to total demand is not applicable.

The increase in capacity is not expected to result in an increase in travel times for most road customers. As outlined in Section B13.1.1 above, the project is consistent with Future Transport and would support an increase in the percentage of jobs accessible within 30 minutes, particularly for residents in the Inner West and North Sydney.

B13.1.3 Key benefits of the project

Issue raised

Page 2

The City of Sydney disputes the veracity of the benefits attributed to the project, specifically:

- Travel time savings as a result of bypassing the central business district (CBD)
- Improved urban amenity as a consequence of moving traffic underground
- Improved public transport
- Improvements to walking and cycling routes.

Response

Land use planning and the multi-modal transport forecasting process which underpins the development and assessment of the project (and other major transport infrastructure projects) is a standard process carried out by the NSW Government with input and peer review from relevant subject matter experts. This planning and forecasting process is also used in the production of various strategic plans including Future Transport, discussed in Section B13.1.1 above. The Western Harbour Tunnel and Beaches Link program of works is identified in the strategy as a 'Committed' project forming part of the vision for the future strategic road network for Greater Sydney that will support key movements by road, including public transport, private vehicles and freight.

Similarly, the various environmental assessments which make up the environmental impact statement have been developed by relevant subject matter experts. The evidence base, assumptions and resultant findings have been thoroughly documented in technical working papers, which are summarised in chapters 8 to 27 of the environmental impact statement. The key benefits of the project were determined through the preparation of the various technical assessments and are outlined in Section 3.5 of the environmental impact statement.

The 30-minute city, a key element of Future Transport, is a guiding principle that provides people with access to education, jobs and services within 30 minutes of travel by public and active transport, regardless of where they live. This means people can reach their nearest metropolitan and strategic centres within 30 minutes, seven days a week. The project, as part of an integrated multi-modal transport solution, would increase the number of people and places that are able to be reached within 30 minutes. The project fulfils the strategic vision presented for the future strategic road network for Greater Sydney by supporting key movements by road for public transport, private vehicles and freight. Figure 3-11 of the environmental impact statement outlines the change in the percentage of jobs accessible within 30 minutes by road in the AM peak as a result of the project by 2037. Discussion on improved urban amenity as a consequence of moving traffic underground is discussed in Section B13.1.1 above.

As outlined in Table 5-3 of the environmental impact statement, the project would include the provision of a dedicated southbound bus lane along the Warringah Freeway from near Miller Street to the southernmost extent of the project near the Sydney Harbour Bridge, removing the need for buses and general traffic to weave. This would improve bus reliability and travel times along the Warringah Freeway and across the Sydney Harbour Bridge.

The project would also include several improvements to active transport infrastructure at the Warringah Freeway and surrounding area providing for improved connectivity to the Sydney and North Sydney CBDs and further enabling the North Shore Cycle Link to the Sydney Harbour Bridge. As summarised in Table 5-13 of the environmental impact statement, this would include:

- A new shared user path on the southern side of High Street bridge with signalised pedestrian crossings at the upgraded Alfred Street North/High Street intersection

- A new shared user bridge to the north of Ernest Street at Cammeray, connecting Cammeray Golf Course with ANZAC Park; this would provide the same pedestrian and cycle connectivity as the existing shared user path and cycleway on the Ernest Street bridge
- Replacement of the Ridge Street shared user bridge with a wider structure with dedicated, separated cycle and pedestrian paths, and replacement of the Falcon Street pedestrian and cyclist bridge with a new structure
- Consolidating pedestrian crossings into a central median shared user path at the Falcon Street interchange as part of the diverging diamond configuration
- Improved pedestrian crossings at the Falcon Street interchange ramp connections and increased pedestrian safety with fencing along the footpath
- A new dedicated cycleway on the eastern side of Warringah Freeway between Miller Street and Ernest Street.

A more detailed review of reported benefits of the project for traffic and transport (including public and active transport) is provided in Section B13.4 of this submissions report.

B13.1.4 Project objectives

Issue raised

Pages 3 and 4

If the aim of the Western Harbour Tunnel project is to remove traffic from surface streets and return streets for local transport access, CBD streets should be refocussed on people walking or cycling as these are the most efficient ways of getting around the CBD. The project objective of “increasing the ability of the harbour CBD and road network to cope with traffic incidents” misunderstands how redundant road space should be used. CBD streets should not be relied on to provide abundant capacity to deal with incidents or serve as a flawed ‘safety valve’ for congestion on the motorway network.

The objective is therefore flawed and prioritises vehicle movement over people and places. The objective should be removed as it is in direct conflict with NSW Government transport policy and international best practice. If the measure is retained clear evidence-based justification as to why this objective has been included should be provided.

Response

The Western Harbour Tunnel and Beaches Link program of works would contribute to a connected and integrated road and public transport network, taking the pressure off local roads with more public transport options. The objectives of the program of are provided in Section 3.3 of the environmental impact statement, and are as follows:

- Reduce congestion on distributor roads around the Harbour CBD, including the Sydney Harbour Bridge, Western Distributor and ANZAC Bridge
- Create faster, safer and more reliable journeys across Sydney Harbour, particularly for traffic bypassing the Harbour CBD to the west
- Improve productivity by allowing commuters and freight to reach their destination faster, safer and more reliably
- Increase the ability for the Harbour CBD road network to cope with traffic incidents
- Reduce travel times, delays and queuing on the Warringah Freeway by improving cross-harbour capacity and reducing merges and weaves, supporting long-term increased demand
- Improve streetscapes, sustainability and liveability across the Eastern City and North Districts by reducing congestion.

The major transport corridors around the Harbour CBD are critical links in Sydney's motorway network, with incidents on these corridors impacting the performance across the wider transport network. This heavy reliance on congested corridors with limited alternative routes and little spare capacity creates a significant reliability risk for the motorway and arterial network. Without action, it is estimated that the annual cost of incidents (excluding congestion) on the Sydney Harbour Bridge and Warringah Freeway corridor alone will be more than $66 million per annum by 2036. Creating alternatives to this corridor is necessary to increase network resilience and reduce the impact of incidents on Greater Sydney's productivity and is an important objective of the project.

The project would boost resilience through reducing demand on the Sydney Harbour Bridge, Sydney Harbour Tunnel and ANZAC Bridge, increasing their effective capacity and ability to absorb the impacts of minor incidents (eg a breakdown in a single lane), noting that during existing peak conditions, even small incidents can create major impact as the network is heavily saturated. Given this improvement to road network resilience it is not proposed that CBD streets should be reserved to deal with traffic incidents on the motorway network; they would actually benefit should an incident occur, due to reduced demand on key arterial connections.

In addition to improving the resilience of the Eastern Harbour City's road network, the project would also facilitate improvements to urban amenity by reducing through-traffic movements and relieving pressure on arterial roads connecting the broader Eastern City and North Districts to the Harbour CBD. The project would deliver the opportunity to redistribute large volumes of through traffic currently using surface arterial roads onto underground arterials. In addition to the direct benefit of moving bypass traffic underground, reduced congestion on the surface arterial network offers flow-on benefits to the adjoining local network, reducing the impact of queuing on regional and local roads. Reduced congestion on the arterial road network would result in further improvements in amenity related to physical safety, air quality and noise levels.

The general reduction in traffic and congestion in and around the Harbour CBD provided by the project would provide the opportunity for Transport for NSW and other stakeholders such as the City of Sydney to investigate alternative uses for road space. Reduced congestion on the arterial road network would also result in further improvements in amenity related to physical safety, air quality and noise levels.

As discussed above in Section B13.1.3, the project would also include improvements to active transport, which would promote pedestrian and cyclist connectivity. Benefits to public and active transport as a result of the project are also discussed below in Section B13.4.6.

B13.2 Project development and alternatives

Issue raised

Pages 7 and 8

A significant mode shift to public transport would help meet the NSW Government's objective of a '30 minute city' much more effectively than the Western Harbour Tunnel road option. However, alternatives to the project outlined in the environmental impact statement do not include public transport options, including options for heavy rail along the Western Harbour Tunnel alignment.

Response

The *Future Transport Strategy 2056* strategy sets the 40-year vision, strategic directions and outcomes for customer mobility in NSW. The plan identifies the transport challenges that will need to be addressed to support NSW's economic and social performance and establish a number of short, medium and long-term actions to address those challenges. The NSW Government, through Transport for NSW, is currently planning and delivering a series of new and upgraded transport projects and initiatives consistent with Future Transport, including a number of key public transport projects (further information on these projects can be found on the Transport for NSW website).

Section 4.3.5 of the environmental impact statement describes options relating to improvements to alternative transport modes and includes consideration of improvements to Sydney's bus, ferry and rail networks. Rail initiatives relevant and complementary to the project include the Sydney Metro City & Southwest and Sydney Metro West projects. It is further noted that the project would reduce demand and congestion on two of the most important strategic bus corridors in Sydney, the Sydney Harbour Bridge and ANZAC Bridge.

The environmental impact statement concludes that the Sydney Harbour crossing capacity is a major transport constraint for all modes. The Sydney Metro City & Southwest project is a committed project under construction which will integrate with the broader future metro network (including Metro West). The Sydney Metro City & Southwest project will deliver much needed cross harbour capacity for commuters and other mass transit users, connect new nodes, and deliver faster and more reliable train journeys to and from the north-west of Sydney. While this project will contribute to reducing congestion on the existing cross-harbour road connections it is only one part of an integrated transport network that is required to service the needs of a very diverse range of origins, destinations and journey purposes.

Strategic transport modelling completed by Transport for NSW indicates that there will still be a need for additional road transport capacity at the crossing of Sydney Harbour to cater for future demands post Sydney Metro City & Southwest and other complementary public transport initiatives.

B13.3 Stakeholder engagement

B13.3.1 Consultation with WestConnex during construction

Issue raised

Page 8

Effective coordination should be put in place between WestConnex and the Western Harbour Tunnel project, should it proceed to ensure that safe and accessible arrangements are put in place for active transport users during the construction period.

Response

The project does not include any surface works in the Rozelle/Bays area, with all surface integration works, including active transport upgrades, being delivered as part of the approved M4-M5 Link project. The project would not directly interact with active transport upgrades being carried out as part of the approved M4-M5 Link project, nor would additional surface works be required post-completion of the M4-M5 Link works.

The project has engaged with key government and other project stakeholders including the M4-M5 Link project team and Transport Coordination within Transport for NSW since 2016 with the objective of coordinating design, investigations and technical specification development to ensure integrated design and construction planning, as outlined in Table 7-3 of the environmental impact statement.

Moving forward, the project would continue to work closely with other Transport for NSW divisions and adjacent projects. This is to ensure the various State Government projects are releasing and/or consulting on projects in collaboration with each other and to reduce consultation and construction fatigue in local communities. As per environmental management measures CI1 and CI2 (refer to Table D2-1 of this submissions report), multi-party engagement and cooperation would be established prior to construction to coordinate with the M4-M5 Link project. Haulage routes, traffic management and other road occupancy would be coordinated with other major transport projects via Transport Coordination within Transport for NSW.

Further, as outlined in Chapter 7 (Stakeholder and community engagement) of the environmental impact statement, there are formal interface groups established which meet regularly to manage potential cumulative impacts. This includes the Bays West Communications Group, which consists

of communication and stakeholder engagement leads from various projects and agencies which have an interface with the Bays West area and projects on the water or foreshores either side of ANZAC Bridge. Members include:

- Infrastructure NSW
- Transport for NSW WestConnex Rozelle Interchange
- Transport for NSW Western Harbour Tunnel and Beaches Link program
- Sydney Metro West
- Port Authority of NSW.

Attendance and frequency of meetings vary depending on the work and activities being carried out at the time.

Communication strategies for the project would be managed consistently across the NSW Government transport portfolio including the M4-M5 Link, as required by environmental management measure CI3 (refer to Table D2-1 of this submissions report). Specific management of cumulative complaints fatigue would occur as required by environmental management measure CI4.

B13.3.2 Consultation with key stakeholders

Issue raised

Page 9

Clarification is requested regarding what governance arrangements the NSW Government is putting in place to ensure that the proponent is obliged to take direction from key stakeholders (both internal and external) on initiatives that improve places, even though they may be at the expense of motorised transport. In particular, the council commented on collaboration between Transport for NSW and North Sydney Council in developing a plan for the North Sydney CBD, and seeks clarification as to how the project aligns with the plan.

Response

The North Sydney Integrated Transport Program (NSITP or 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 around 2018, it aims to deliver a shared place-based vision for the North Sydney CBD.

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 key focus of the North Sydney Program is to ensure major projects, such as the Western Harbour Tunnel and Beaches Link program, integrate with the North Sydney CBD in a manner that supports the globally connected ‘Harbour CBD’ and enables delivery of befitting place-based outcomes.

Development of the North Sydney Program is ongoing, with validation of the vision for North Sydney currently underway with a number of scenarios being considered to support the place-based outcomes. As part of the collaboration, the multi-agency group will ensure the future integrated transport network and place-based vision for North Sydney is supported through projects such as the Western Harbour Tunnel and Warringah Freeway Upgrade project. Further refinements to movement and place outcomes within the North Sydney CBD may occur as part of the North Sydney Program.

Any changes to the project as a result of the North Sydney Program process 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.

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 program of works. Further information on the North Sydney Program is provided in Section A4.1.3 of this submissions report.

The project has been designed to take into account concerns raised by key stakeholders, including councils. Should the project be approved, a Community communication strategy would be prepared that outlines the community consultation and engagement activities that would support the design and construction of the project, based on the framework developed and included in Appendix E (Community consultation framework). The Community communication strategy would provide further details about community involvement during design, construction and the project opening phase. The Community communication strategy would guide the project team's interactions with the community and stakeholders and set standards for proactive engagement.

Communication strategies for the project would 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.

In addition to the Community communication strategy, in accordance with the Secretary's environmental assessment requirements, relevant management plans during construction and operation would also be developed in consultation with key stakeholders including relevant local councils.

B13.4 Traffic and transport

B13.4.1 Induced demand

Issue raised

Page 4

Urban motorways do not solve congestion, but induce demand for motor vehicle trips and any additional capacity is quickly filled. The underlying assumption that additional road space can reduce travel times is flawed. Examples should be provided in Sydney and other comparable contexts where additional road space has reduced travel times. To make the claim based on the outputs of a transport modelling process cannot be supported especially when the model used (STM) is an unconstrained travel model.

Response

The project is predicted to result in higher demand through the network as a result of improved road transport customer outcomes and therefore increased economic activity. At a strategic level, due to the journey time and reliability benefits provided to transport customers, the project would enable more customers to travel as desired and at an improved level of service.

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 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 3 (Assessment methodology) of Appendix F (Technical working paper: Traffic and

transport). Further discussion on induced demand is included in Section C9 of this submissions report.

The transport forecasting and modelling process is consistent for all scenarios and is consistent with impact assessments carried out for other road and public transport projects.

Following the transport demand forecasting process, microsimulation (VISSIM) modelling has been used to further refine the traffic analysis. Future traffic demand adopted in VISSIM traffic modelling has been informed by the Sydney Motorway Planning Model (SMPM). The SMPM is a strategic level model which assigns and distributes forecast traffic demands onto the broader Greater Sydney road network. The Sydney Strategic Travel Model (STM) was used to extract trip matrices for road traffic demand modelling within the Sydney area, using the SMPM. Future demands were estimated by applying future year traffic growth forecast by the STM, aided by census forecasts, to the SMPM. As such, high-level traffic redistribution that may occur external to the microsimulation traffic model study area has been factored into the development of future year traffic demands for the various project scenarios.

To address the limitations of strategic transport forecasting models they are supplemented and refined when translated into microsimulation models (such as VISSIM) which includes hard-limit capacity constraints on the network (eg signals, priority controls, reduced speeds, vehicle interaction and behaviour). For example, for the Warringah Freeway and surrounds area, during the future year traffic demand development process for microsimulation modelling, the following hourly demand capacity limits were adopted to reflect existing network constraints:

- 2350 passenger car units (pcu)/hr/lane for Gore Hill Freeway, Sydney Harbour Bridge (Cahill Expressway) and Sydney Harbour Tunnel
- 2150 pcu/hr/lane for Sydney Harbour Bridge (Bradfield Highway).

Further, as part of the reporting of microsimulation model performance, a comparison of the number of "unreleased vehicles" at the end of the model period (ie excess forecast demand) is reported which is an additional indicator of congestion, and reflective of capacity of the road network.

The analysis of induced demand for the project at opening (2027) incorporates a completed WestConnex and Sydney Gateway motorway. Induced demand in the future 2037 scenario, which equates to about 0.3 per cent additional daily trips in the Sydney metropolitan area, would result in a negligible impact to the traffic network.

B13.4.2 Impacts to local road network at Rozelle

Issue raised

Page 2

Additional traffic demand concentrated in the Rozelle area of 14 per cent as a result of the project along with a further eight per cent with the completion of the Beaches Link and Gore Hill Freeway Connection project is unacceptable when put on top of the impacts due to the WestConnex M4-M5 Link and Rozelle Interchange projects.

Response

When operational, the project would substantially improve accessibility, travel times and travel reliability across Sydney Harbour. This includes improved vehicle travel times along key traffic routes through Rozelle, resulting from changes in traffic demands and patterns with trips using the Western Harbour Tunnel component of the project in preference to existing surface routes including City West Link, ANZAC Bridge, and the Western Distributor.

The operational modelling for the project considered impacts due to other nearby projects. The ‘Do something’ scenario included the following projects:

- NorthConnex

- WestConnex
- Western Harbour Tunnel and Warringah Freeway Upgrade project
- Sydney Gateway
- M6 (Stage 1).

The 'Do something cumulative' scenario included the above projects, in addition to the Beaches Link and Gore Hill Freeway Upgrade project and the full M6 Project for the 2037 cumulative case.

As described in Section 9.4.2 of the environmental impact statement and Section 8.4.2 of Appendix F (Technical working paper: Traffic and transport), although traffic demand is predicted to increase in both the 'Do something' and 'Do something cumulative' scenarios, average travel speeds through the Rozelle area would improve by up to 60 per cent as a result of the project. This is largely a consequence of diverting large volumes of traffic from the ANZAC Bridge and Western Distributor to the Western Harbour Tunnel, substantially reducing delays on this part of the existing motorway network and connecting routes. Further, the number of stops would decrease as a result of the reduction in demand and congestion on the ANZAC Bridge and Western Distributor. In addition, much of the Western Harbour Tunnel project demand would connect directly to and from the M4-M5 Link at the Rozelle Interchange and would therefore not use the surface network, nor impact the performance or amenity of the local road network at Rozelle.

It is noted that the 'Do minimum' scenario includes the approved M4-M5 Link project and the predicted 60 per cent improvement in average travel speed is therefore the direct benefit created by the project.

B13.4.3 Impacts to CBD road network

Issue raised

Pages 2 and 3

Due to increased capacity of the Sydney Harbour Bridge and ANZAC Bridge, due to additional bypass lanes provided as part of the Western Harbour Tunnel, there will be significant negative 'downstream impacts' on the city because the new harbour crossing provides additional road capacity linking the North Shore with the CBD. Clarification should be provided about how road connections will be managed to reduce the flow of vehicles into the CBD in the context of the Western Harbour Tunnel and WestConnex projects, including details regarding:

- Volume of additional vehicles predicted along key corridors connecting to the CBD:
  - ANZAC Bridge
  - Western Distributor
  - Druitt, Market, King, Harris and Wattle Streets
- How any growth in private vehicles to the CBD as a result of the project and WestConnex will be catered for
- Due to through traffic bypassing the CBD, details regarding planned improvements for Sydney CBD streets
- Policies regarding queuing in motorway tunnels and strategies to ensure that queuing occurs on surface motorway links and not local streets and areas surrounding motorway portals
- Actions to limit traffic induction, reduce speeds and prioritise active and public transport connections on the surface road network in and around the City's local government area.

Response

Table 7-3 of Appendix F (Technical working paper: Traffic and transport) illustrates the following strategic demand reductions as a result of Western Harbour Tunnel in 2037 when compared to the 'Do minimum' scenario:

- Sydney Harbour Bridge: -17%
- Sydney Harbour Tunnel: -20%
- ANZAC Bridge: -10%
- Western Distributor: -37%

Given the project's alignment and connectivity it is unlikely that the Western Harbour Tunnel would be used for trips between the North Shore and the Sydney CBD. This is supported by the above modelled reduction in demand and indicates that the inferred downstream impacts to the Sydney CBD would therefore be unlikely. The reduction in demand, congestion, and queuing on strategic corridors surrounding Sydney CBD is expected to improve network performance on adjacent and connecting road links, including those within Sydney CBD. It is also anticipated that this general reduction in traffic and congestion in and around the Harbour CBD would provide the opportunity for Transport for NSW and other stakeholders such as the City of Sydney to investigate alternate uses for road space within the Sydney CBD if and where appropriate.

Although there is expected to be a reduction in strategic demand and congestion on the road network surrounding Sydney CBD, Transport for NSW would continue to monitor and manage strategic road network congestion and queuing as appropriate to the location.

Given that traffic volumes decrease in the 'Do something' scenario for both 2027 and 2037 when compared to the 'Do nothing' scenario, it is anticipated that traffic impacts to the Sydney CBD would be a slight positive (refer to Section 7.2 of Appendix F (Technical working paper: Traffic and transport)). For this reason, Sydney CBD streets including Druitt Street, Market Street, King Street, Harris Street and Wattle Street were not explicitly assessed in the environmental impact statement. However, roads in the Sydney CBD including the stated roads are included in the SMPM used for the assessment.

As a result of reduced demand and congestion on strategic road corridors serving Sydney CBD, the project would result in several local public and active transport benefits resulting in downstream positive impacts to the Sydney CBD including:

- Improvements to southbound bus travel times on the Western Distributor and ANZAC Bridge. Travel times for buses travelling on the Sydney Harbour Bridge and Warringah Freeway from both the Gore Hill Freeway and Falcon Street would also be substantially improved, particularly southbound in the morning peak
- Improved public transport priority infrastructure, with a free-flowing continuous bus lane on Warringah Freeway between Miller Street and the Sydney Harbour Bridge, and efficient access to and from North Sydney for fast interchange with the future Sydney Metro City & Southwest project and existing Sydney Trains infrastructure.

The modelled traffic demands on the ANZAC Bridge and Western Distributor are provided in Appendix F (Technical working paper: Traffic and transport). Forecast traffic volumes for the morning peak, evening peak and daily traffic demands under 'Do minimum', 'Do something' and 'Do something cumulative' scenarios are provided in Tables 7-1 to 7-3 of Appendix F (Technical working paper: Traffic and transport).

B13.4.4 Local street improvements

Issue raised

Pages 5 and 6

The environmental impact statement does not provide details about how the project would return streets for local customers and meet the needs of people who walk and bike who also use the corridor. Given that the City of Sydney does not own or control Sydney CBD streets, Transport for NSW should clearly articulate how it will realise these benefits and return streets to local customers.

In the City of Sydney's view the NSW Government should give control of Sydney CBD streets to local government or alternatively Transport for NSW should be obliged to implement treatments that return streets to local customers, reduce through vehicles and increase place amenity.

Effective planning with clear measures and targets that show how to improve places needs to be carried out at the beginning of the project to ensure the right outcomes are achieved. Surface road improvements to streets and town centres should be implemented in parallel with the opening of the motorways so that these benefits can be realised from day one.

Response

While the project would have no direct impact on Sydney CBD streets, due to a general reduction in traffic and congestion in and around the Sydney CBD, the project would enable opportunities for other divisions of Transport for NSW and other agencies (including Council) to explore alternative uses for road space. Due to the multi-disciplinary and multi-stakeholder nature of changes to local streets (for example the addition of bus and cycle lanes and/or kerbside parking, or increasing footpath widths or public space) local street upgrades are beyond the scope of the project.

Transport for NSW will continue to work with stakeholders, including councils, through agreed cross-organisational governance structures to investigate options to improve movement and place outcomes and leverage the strategic benefits of the program of works. The potential future improvements to Sydney CBD streets therefore falls outside of the scope of this project.

A discussion around potential impacts of surface road improvements and how the project can use operational network performance reviews to support opportunities for alternative uses for road space is provided in Section B13.4.5 below.

B13.4.5 Impacts of surface road improvements

Issue raised

Page 4

How will the project leverage improvements on the surface (street network and places) that arise through the potential to divert regional through traffic around (and under) the city via WestConnex should be more clearly articulated. No explanation of how surface road improvements and associated travel time savings will be achieved is provided in the environmental impact statement.

Response

The project would substantially improve travel times across Sydney Harbour, as outlined in Section 7.2.1 of Appendix F (Technical working paper: Traffic and transport). The greatest benefits would be for trips travelling between North Sydney and Rozelle. This trip is currently circuitous, requiring travel via ANZAC Bridge, Western Distributor and Sydney Harbour Bridge. The project would allow the bypass of these three highly congested sections of motorway and reduce travel times by up to 75 per cent.

Travel times would also be reduced for trips via the Sydney Harbour Tunnel and the Eastern Suburbs, primarily as a result of decreased congestion on this motorway corridor with longer-distance north–south trips transferring to the WestConnex-Western Harbour Tunnel corridor (for example, cross-harbour traffic that currently uses the Eastern Distributor to access the M5 East

Motorway would be more likely to use the Western Harbour Tunnel and M4-M5 Link for these journeys, in the future with the project).

No adjustments would be made to surface roads beyond what has been described in the environmental impact statement, for the Warringah Freeway Upgrade. However, through changing trip patterns and reduced demand on some routes the project would provide the opportunity for Transport for NSW network management teams and other stakeholders including Councils to investigate further opportunities for local road improvements and adjustments.

Transport for NSW would carry out a review of operational network performance to confirm the operational traffic impacts of the Western Harbour Tunnel and Warringah Freeway Upgrade on surrounding arterial roads and major intersections at both 12 months and five years after opening of the project, as per environmental management measure OT1 (refer to Table D2-1 of this submissions report). The assessment would be based on future updated traffic surveys taken during operation, utilising an appropriate methodology that follows the relevant and industry accepted guidelines current at that time.

Following the operational network performance review carried out under environmental management measure OT1, an action plan would be developed and action taken that would offer the ability to leverage further benefits or opportunities. For example, should the network perform better than expected (as confirmed through environmental management measure OT1), further opportunities for road space reallocation may be identified.

B13.4.6 Suggested public and active transport improvements

Issue raised

Pages 5, 6, 7 and 8

As mass transit and efficient space saving transport modes are the most effective way to access the Sydney CBD, transport connections to the Sydney CBD need to move more people not cars and any additional vehicles funnelled into the city will impact negatively on productivity. The NSW Government should commit to reallocating road space for public and active transport for people travelling between the North Shore and the Sydney CBD or the Inner West, including:

- Removing/repurposing sections of the Western Distributor along the west of the city centre
- Removing the off ramps serving Pyrmont on the city centre
- Removing/repurposing the Cahill Expressway
- A dedicated space for walking on both sides of the Sydney Harbour Bridge
- The reinstatement of the walking and cycling route on the southern side of the ANZAC Bridge.

Response

As outlined in Section B13.4.3 above, given the project alignment and connectivity it is considered unlikely that the Western Harbour Tunnel would be used for trips between the North Shore and the Sydney CBD. This is supported by the predicted reduction in traffic demand around Sydney CBD and indicates that downstream impacts to productivity within the Sydney CBD would therefore be unlikely. As outlined in Section 21.5.5 of the environmental impact statement, the increased capacity, connectivity, resilience and reduced travel times is in fact anticipated to result in a positive impact to productivity and encourage future development in the business centres. Furthermore, it is anticipated that the general reduction in traffic and congestion in and around the Harbour CBD would provide the opportunity for Transport for NSW and other stakeholders such as the City of Sydney to investigate alternate uses for road space within the Sydney CBD, further realising these productivity improvements.

An overview of the proposed public and active transport improvements as a result of the project, including bus priority infrastructure and new active transport connections is provided in Section B13.1.3 above.

Consideration of the removal or repurposing of other components of the road network including the Western Distributor and Cahill Expressway or providing new active transport connections outside of the project footprint is outside the scope of this project.

The proposed scope of the project complements other active transport planning being carried out by Transport for NSW. While they are outside the scope of the project, the active transport connections suggested by council would not be precluded by the project. As council is aware, 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 *transport.nsw.gov.au*.

B13.4.7 Funding for additional projects

Issue raised

Page 6

The NSW Government should formally commit to, and provide funding, to reduce road capacity for vehicles and improve streets for people in the City's local government area, including on:

- Druitt Street, Market Street, King Street accessing the city centre at the west
- Harris Street, Wattle Street accessing the city centre at the south
- Bridge Street and Bent Street accessing the city centre at the east.

Response

Consideration of potential future projects to reduce road capacity and repurpose Sydney CBD streets is out of scope for this project. Transport for NSW would continue to work with councils on broader network improvements.

It is noted that the general reduction in traffic and congestion in and around the Harbour CBD would provide greater opportunity for Transport for NSW and other stakeholders such as the City of Sydney to investigate alternate uses for road space, or local improvements within the Sydney CBD.

B13.4.8 Active transport impacts

Issue raised

Page 8

The environmental impact statement does not incorporate impacts to active transport users during construction the WestConnex M4-M5 Link Rozelle Interchange works, particularly the removal of shared user paths across Victoria Road and The Crescent.

Response

The project does not include any surface works in the Rozelle/Bays area, with all surface integration works, including active transport upgrades, being delivered as part of the approved M4-M5 Link project under construction. Potential impacts of surface works in the Rozelle/Bays area were assessed and approved in the environmental impact statement for the M4-M5 Link project. The project would not directly interact with active transport upgrades being carried out as part of the approved M4-M5 Link project, nor would additional surface works be required post-completion of the M4-M5 Link works.

B13.5 Noise and vibration

B13.5.1 Operational road noise impacts at Rozelle

Issue raised

Page 2

Additional traffic in the Rozelle area will result in traffic noise impacts for residents, many of whom work in the City's local government area.

Response

Overall, the project is predicted to increase the number of receiver buildings exceeding the relevant noise criteria, before mitigation, during the day and night periods at noise catchment areas surrounding the surface connection to City West Link at Rozelle. This is due to an anticipated increase in localised traffic demands on some surface roads in the area leading to and from the tunnels as motorists travel to and from surrounding areas to use the tunnels. Following implementation of mitigation described below, residual noise impacts at identified receiver buildings during operation would be reduced.

While an increase in the number of receiver buildings exceeding the relevant noise criteria is anticipated, there would also be a substantial number of buildings experiencing a noise level reduction when compared to the 'Do minimum' scenario (refer to Table 11-6 of the environmental impact statement).

Noise mitigation measures would be confirmed during further design development and in coordination with the M4-M5 Link project requirements, including the Modification 2 to the M4-M5 Link approval. Receivers in Johnston Street and The Crescent identified as potentially eligible for at-property treatment would either be mitigated under the M4-M5 Link's Minister's conditions of approval (E87), or where potential increase in traffic noise is more than two decibels due to multiple projects.

Table R.2 of Appendix G (Technical working paper: Noise and vibration) identifies receivers potentially eligible for at-property treatment - with mitigation. Table R.2 has a footnote that identifies for which properties mitigation would occur under M4-M5 Link conditions of approval E87 (footnote 1), which is four properties. Footnote 2 then identifies the properties that may experience a potential increase due to multiple projects, with impacts to be confirmed during further design development - for Johnston Street and the Crescent this would be 166 properties.

B13.6 Air quality

B13.6.1 Operational air quality impacts at Rozelle

Issue raised

Page 2

Additional traffic in the Rozelle area will result in air quality impacts for residents, many of whom work in the City's local government area.

Response

As noted in Section B1.4.2 above, although traffic demand is predicted to increase in both the 'Do something' and 'Do something cumulative' scenarios, average travel speeds through the Rozelle area would improve by up to 60 per cent as a result of the large volume of traffic would be diverted from the ANZAC Bridge and Western Distributor underground to the Western Harbour Tunnel.

The air quality technical assessment shows that, overall across the study area, the project would result in a better outcome for ambient air quality than conditions without the project. This would be

primarily due to the redistribution of surface road traffic to the tunnels and the effectiveness of ventilation outlets in managing emissions from the tunnels.

The operational air quality assessment is presented in Appendix H (Technical working paper: Air quality) and Chapter 12 (Air quality) of the environmental impact statement.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B14 – North Sydney Council

SEPTEMBER 2020

B14 North Sydney Council

Contents

B14.1 Assessment process

B14.1.1 Environmental impact statement process

Issue raised

Section 1 (pg 1)

The issues and impacts arising from the project have been included and considered in a segmented and clinical manner, such that the full extent of impacts, as they would be experienced by people, have not been appreciated and holistically accounted for.

Response

To enable a comprehensive assessment of impacts and to communicate these in a logical fashion, the environmental impact statement needs to discuss impacts in detail for each relevant environmental discipline. The environmental impact statement acknowledges that many disciplines and impacts are interrelated and has incorporated this as far as possible in the relevant chapters. Of particular importance is the Socio-economic assessment (Chapter 21 (Socio-economics) of the environmental impact statement and Appendix U (Technical working paper: Socio-economic assessment)) which brings together the various impacts and specifically discussed how these will be experienced by people. Chapter 28 (Synthesis of the environmental impact statement) of the environmental impact statement provides an integrated picture of the impacts of the entire project and cumulative impacts with other projects are addressed in Chapter 27 (Cumulative impacts) of the environmental impact statement.

B14.2 Strategic context and project need

B14.2.1 Benefits, costs and funding

Council raised a number of concerns about the cost and benefits associated with the project and how the benefits of the project would be realised within the North Sydney local government area.

Issue raised – Council placemaking plans and strategies

Section 4.8.3 (pg 50)

The environmental impact statement does not take into account the opportunity cost of the project jeopardising North Sydney Council's placemaking plans and strategies that could have improved the amenity, human health and wellbeing of North Sydney residents, workers and visitors.

Response

Transport for NSW will continue to work closely with North Sydney Council and other key stakeholders to investigate options to improve movement and place outcomes through the North Sydney Integrated Transport Program (the North Sydney Program) further leveraging the strategic benefits of the program of works (discussed further below and in Section A4.1.3 of this submission report).

The project is consistent with the broader NSW Government strategic planning direction for North Sydney and surrounding locality, as discussed in Table 20-5 of the environmental impact statement. As part of the North Sydney Centre Review, the traffic and pedestrian management study recommends a range of initiatives focused on prioritising pedestrians in the North Sydney CBD through improvements to connectivity, amenity and mobility. The Warringah Freeway Upgrade would provide a positive contribution to the local area by providing new and upgraded active transport infrastructure that would improve connectivity across the Warringah Freeway including connections to and from the North Sydney commercial centre.

The project has been developed to address regional traffic and transport issues, with consideration of local issues. Transport for NSW acknowledges that due to the project location in the North

Sydney local government area, the works might affect elements of North Sydney Council's key local strategic projects, both endorsed and draft.

Transport for NSW notes, however, that predicted population growth 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 has been developed to reduce predicted congestion increases in the Eastern City and North Districts. The environmental impact statement indicates that the project would generally improve network performance for roads surrounding North Sydney compared to the 'Do minimum' (without project) scenario. This improvement would potentially provide benefits to North Sydney Council's existing key strategic projects and also to support future strategic projects.

Issue raised – Disproportionate costs

Section 4.1.3 (pg 19)

Communities in North Sydney would bear disproportionate project costs to secure broader network travel time and reliability benefits.

Response

The project would deliver benefits to North Sydney by facilitating an overall net increase in traffic flows and average network speeds, as stated in Section 7.5.3 of Appendix F (Technical working paper: Traffic and transport). This means residents of North Sydney would benefit from travel time savings of up to 20 minutes from Sydney Olympic Park to North Sydney, and from Leichhardt to North Sydney. Journeys from North Sydney to Kingsford Smith Airport would experience time savings of about 15 minutes (as per Section 3.5.2 of the environmental impact statement). Section 3.5.3 of the environmental impact statement also notes that residents in the Lower North Shore (particularly North Sydney and surrounding areas) would enjoy greater access to jobs as a result of the project. Overall, the project would improve the strategic road connectivity to the North Sydney CBD, enabling growth in the area.

The North Sydney local government area would also experience other benefits as a result of the project. For example, Section 3.5.6 of the environmental impact statement notes that the temporary Berrys Bay construction support site (WHT7) provides a significant opportunity for the NSW Government, North Sydney Council and other relevant stakeholders to rehabilitate this residual industrial site to create an area of high quality public space for the wider community (refer to Section B14.18 below for further information).

To minimise the impact of the project on the North Sydney precinct, Section 9.1.1 of the environmental impact statement advises that planning and design to date has been developed to ensure operational impacts are minimised (and critical performance issues avoided), by spreading the demand generated by new infrastructure across multiple locations. Section 7.5.3 of Appendix F (Technical working paper: Traffic and transport) notes that the proposed road integration works and resultant traffic performance in the North Sydney area have been developed in the context of the growing North Sydney CBD environment. The works in the area proposed by the project seek to maintain an appropriate level of traffic movement while also preserving capacity and connectivity for other customers whose needs conflict with traffic – particularly pedestrians.

The proposed works are considered to provide a balanced and integrated transport network through North Sydney. Further refinements and changes to network operations within the North Sydney CBD may occur as part of works associated with the North Sydney Program.

Issue raised – North Sydney Integrated Transport Program (North Sydney Program)

Section 1.0 (pg 15)

The environmental impact statement suggests that the negative impacts of the project on the North Sydney CBD would be minimised through the ongoing development of the North Sydney Program

by Transport for NSW. However, recent communications with Transport for NSW suggest that development of North Sydney Program has been postponed indefinitely.

Response

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 around 2018, it aims to deliver a shared place-based vision for the North Sydney CBD.

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 key focus of the North Sydney Program is to ensure major projects, such as the Western Harbour Tunnel and Beaches Link program, integrate with the North Sydney CBD in a manner that supports the globally connected 'Harbour CBD' and enables delivery of befitting place-based outcomes.

Development of the North Sydney Program is ongoing, with validation of the vision for North Sydney currently underway with a number of scenarios being considered to support the place-based outcomes. As part of the collaboration, the multi-agency group will ensure the future integrated transport network and place-based vision for North Sydney is supported through projects such as the Western Harbour Tunnel and Warringah Freeway Upgrade project. Further refinements to movement and place outcomes within the North Sydney CBD may occur as part of the North Sydney Program.

Any changes to the project as a result of the North Sydney Program process 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.

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 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.

Further information on the North Sydney Program is included in Section A4.1.3 of this submissions report.

Issue raised - Cost effective, long-term transport solution

Sections 4.1.2, 4.1.4, 4.2.3, 4.3.4 (pg 18, 20, 24, 28)

Council questioned the project's ability to deliver a cost effective, long term transport solution. Comments include:

- Public investment in high cost road projects (for example, Cross-City and Lane Cove Tunnels) is not a sustainable or cost effective, long term transport solution
- New motorways are not the most cost effective way of delivering a 30 minute public transport catchment as envisioned in *The Greater Sydney Region Plan*
- The environmental impact statement does not provide case studies demonstrating how similar projects have delivered long-term congestion reduction and improved network resilience
- It is unclear from this document how many separate road crossings are expected to be required at/around the Sydney Harbour Bridge in order to minimise network interruptions

during traffic incidents in the long-term future. The reduced level of inter-operability of different 'channels' also becomes an issue for incident management.

Response

The *Australian Infrastructure Audit 2019* (Infrastructure Australia, 2019) listed the Eastern Distributor, Sydney Harbour Bridge, Warringah Freeway and the Gore Hill Freeway corridor among Australia's most congested road corridors, generating a congestion cost of $65,000 per day in 2016. If no action is taken, this is forecast to rise to $98,000 per day by 2031. As congestion on these corridors increases, so too will the costs.

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. The program of works represents an important step in the long-term development of Greater Sydney's strategic integrated transport network. The project would address major capacity constraints of the road network and would enhance the resilience of the road network across Sydney (as per Section 2.7 of Appendix F (Technical working paper: Traffic and transport).

As noted in Section 2.7 of Appendix F (Technical working paper: Traffic and transport), relieving congestion on the Sydney Harbour Bridge and Sydney Harbour Tunnel would provide opportunities to improve public transport accessibility across the harbour, which is currently constrained by the existing allocation of road space.

While the project would deliver these benefits for private car customers, the project also offers benefits to bus customers through the opportunity for new express buses and improvements to existing bus journeys, which would substantially reduce travel times and increase the 30-minute public transport catchments for key interchange locations such as North Sydney, Rozelle and Lane Cove.

Discussion about the consideration of public transport alternatives to the project is included in Section B14.3.2 below.

The project is important as it would enable and serve the natural growth in demand from Sydney's growing population and economy. Population and employment growth are major drivers of transport demand and much of this growth will occur on the motorway network (as per Section 2.7 of Appendix F (Technical working paper: Traffic and transport).

Issue raised – Economic impacts

Section 4.8.4 (pg 51)

Potential positive economic impacts associated with the project include increased employment and trade during the construction period. Were the network improvements and need for the project and various impacts justified, then theoretically there may be some wider economic benefits arising from increased access and connectivity across wider Sydney. These potential benefits are far outweighed by the identified negative economic impacts.

Response

In addition to the creation of direct construction-related employment on the project, Appendix U (Technical working paper: Socio-economic assessment) notes that the project may also increase expenditure on local goods and services, resulting in beneficial impacts for local businesses.

Table 3-2 of the environmental impact statement notes that improving connectivity and reducing congestion means more people would be able to access key employment centres like North Sydney CBD in less time. This strategic connectivity would enable longer term growth in the area.

The implementation of safeguards and management measures in Table D2-1 of this submissions report will assist in avoiding or mitigating potential impacts on the socio-economic environment during construction and operation, while maximising or enhancing project benefits.

Issue raised – Business case

Sections 4.1.5, 4.2, 4.2.3, 4.2.4 (pg 20, 23, 24, 25)

A compelling business case is required to justify the project need and substantial public expenditure. A number of federal and state strategic transport and infrastructure assurance documents is predicated on the submission of a final business case. These include:

- *Australian Infrastructure Plan* (2016)
- *Greater Sydney Region Plan* (Greater Sydney Commission, 2018)
- *North District Plan* (Greater Sydney Commission, 2018)
- *Future Transport Strategy* (2018)
- *Greater Sydney Services and Infrastructure Plan* (2018).

Response

The Western Harbour Tunnel and Beaches Link program of works has followed the Infrastructure NSW assurance framework to achieve its investment decision. Through this process the program of works has demonstrated its economic merit and successfully passed 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 strategic justification and economic merit of the program of works. As part of this governance and rigorous review process, the Western Harbour Tunnel and Warringah Freeway Upgrade project has undergone extensive scrutiny throughout its development.

The basis of the Final Business Case for the Western Harbour Tunnel and Beaches Link program of works was developed in 2016. This analysis 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. Infrastructure NSW has released a summary of the Final Business Case for the project, which is available online: *http://www.infrastructure.nsw.gov.au/media/2528/western-harbour-tunnel_bc-summary-may-2020.pdf*.

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.

As outlined in Chapter 1 (Introduction) of the environmental impact statement, the Western Harbour Tunnel and Beaches Link program of works would provide additional road network capacity across Sydney Harbour and to improve transport connectivity with Sydney's Northern Beaches. A combined delivery of the Western Harbour Tunnel and Beaches Link program of works would unlock a range of benefits for freight, public transport and private vehicle users. It would support faster travel times for journeys between the Northern Beaches and south, west and north-west of Sydney Harbour. The project would also provide an opportunity to introduce new express bus services to key employment and education centres, such as directly linking North Sydney to the Inner West region of Sydney.

B14.2.2 Project need

Issue raised

Sections 4.1.1, 4.1.6, 4.2.1, 4.3.1, 4.3.5, 4.3.6, 4.13.1 (pg 18, 20, 27, 38)

Issues were raised challenging the justification for the project. These include:

- The environmental impact statement does not identify specific travel behaviour problems that the project would solve. In transport planning, problems are usually defined in terms of

current/future populations and travel behaviour with consideration given to the network impacts of future transport infrastructure. Traffic congestion and network reliability should be viewed as symptoms of travel behaviour, not problems themselves

- The environmental impact statement does not provide an analysis of travel behaviour using ABS journey to work data, Opal trip data, household travel survey data and travel behaviour modelling identified in Transport for NSW's *How We Plan Transport* report. This baseline understanding, is required to establish:
  - What problem(s) the project is intended to address
  - How the project team has determined appropriate project options for investigation
  - How the proposed projects address the Vision for Transport detailed in the State Government's *Sydney Region Plan* and *Future Transport Strategy*
- While the *Infrastructure Priority List* (2018) identifies the Western Harbour Tunnel and Beaches Link program of works as a priority initiative, the *Australian Infrastructure Plan* (2016) identifies federal government policy reforms required to support better planning of major infrastructure projects. A key recommendation of this Plan is that project development studies must provide strategic options assessments to demonstrate the nature and scale of the problem(s), and identify solutions which may or may not involve the delivery of new infrastructure
- More detailed analysis of population growth in the North District (as per The Greater Sydney Region Plan) shows that areas closer to the Central Harbour City (for example, Ryde and Lane Cove) would experience higher levels of population growth. As such, priority should be given to improved connections between the North District growth precincts and the Central Harbour City instead of the Eastern Harbour City motorway connections.

Response

The traffic modelling and traffic and transport impact assessment have been completed in accordance with appropriate standards and guidelines, and developed, reviewed, and endorsed by Transport for NSW subject matter experts. In addition, the strategic justification for the project has been reviewed by Infrastructure NSW as part of the Assurance Review Process, which included consideration of the project's connectivity.

Giving consideration to future land use, population density and transport requirements, the *Future Transport Strategy 2056* (Future Transport) (NSW Government 2018) identified road based transport, including improvements to bus services, as important modes to support the development of the 30 minute city. Furthermore, the need for additional core motorway capacity at the crossings of Middle and Sydney Harbour was identified as key to development of an appropriate integrated multi-modal Sydney transport network – and specifically identified the Western Harbour Tunnel and Beaches Link program of works as transport projects required to support the plan.

As outlined in Section 3.3 of Appendix F (Technical working paper: Traffic and transport), a multi-tiered transport modelling approach was adopted to carry out a comprehensive assessment of the current and future performance of the road network. The Sydney Strategic Travel Model (STM) was used to extract trip matrices for road traffic demand modelling within the Sydney area. Future year trip matrices that take into account NSW Government plans and policies, population and employment projections, and transport infrastructure and service operation assumptions were also extracted from the STM. The Sydney Motorway Planning Model (SMPM) was also used as it provides a platform to understand changes in future traffic patterns under different land use, transport infrastructure and pricing scenarios. This overall transport modelling approach was used to confirm the current and future network problems, and to inform the project definition.

Challenges are identified in Section 3.2 of the environmental impact statement. The high demand and limited capacity on the Sydney Harbour crossings result in delays and unreliable journey times for a significant number of customers who directly rely on these corridors. In addition to this, a major

contributor to congestion around the Harbour CBD is that many of the most critical road corridors – including Sydney Harbour Bridge, Sydney Harbour Tunnel, ANZAC Bridge, Western Distributor, and the Warringah Freeway – perform both bypass and access functions. These conflicting functions, combined with high traffic volumes, result in congestion and poor network performance experienced by freight, public transport and private vehicle users.

Sections 4.2.1, 4.3.1 and 4.4.1 of Appendix F (Technical working paper: Traffic and transport) discuss the analysis of the Australian Bureau of Statistics Journey to Work data to determine travel patterns for residents and workers. This data was the best information available at the time the traffic modelling for the environmental impact statement was carried out. Planning and modelling for the project has been carried out according to appropriate standards and guidelines, described in Section 3.1 of Appendix F (Technical working paper: Traffic and transport). The modelling inputs and outcomes have been reviewed and endorsed by subject matter experts and independent experts who have verified its suitability for use for the assessment of traffic impacts of the project.

As described in Section 3.2 of the environmental impact statement, Infrastructure NSW estimated that the economic risk to growth and productivity posed by traffic congestion in the Eastern City District is about $5 billion a year and forecast to increase to about $8 billion annually by 2020 (Infrastructure NSW, 2014). The issue of congestion is therefore identified as one of the key objectives of the project, which are outlined in Section 3.3 of the environmental impact statement.

The project objectives were used to assess potential alternatives to the project which are presented in Chapter 4 (Project development and alternatives) of the environmental impact statement, including consideration of behaviour change, public transport and the ‘Do nothing’ option. These are presented in Section 4.3 of the environmental impact statement.

When considering the strategic alternatives and complementary projects, it was concluded the project was the preferred solution to achieve the project objectives. The project is consistent with Future Transport, as it improves transport customer journeys, enables growth, and will improve place outcomes. In the ‘Do minimum’ (without project scenario), network performance would continue to degrade as traffic demand rises (as described in Section 6 of Appendix F (Technical working paper: Traffic and transport)). Future Transport also promotes the development of multi-modal network solutions. The investment in motorways is needed in addition to investment to public transport such as the Sydney Metro, light rail, and bus projects being rolled out throughout Sydney. The project forms part of a complementary integrated multi-modal strategy being rolled out by the NSW Government.

B14.2.3 Strategic planning and policy framework

Council believes that the project would either directly prevent or significantly hinder the achievement of numerous State, Regional and local strategic directions, priorities and actions. Specific issues are discussed below.

Issue raised - State Infrastructure Strategy 2018-2038

Section 4.2.2 (pg 23)

As the city's population grows, Infrastructure NSW has observed that without corrective action, congestion will worsen and the costs to business and the community will escalate. The *State Infrastructure Strategy 2018-2038* does not suggest that arterial motorways are the solution to Sydney's congestion.

Response

The project has been developed to align with the objectives of the *State Infrastructure Strategy 2018-2038* (refer to Table 3-2 of the environmental impact assessment). The *State Infrastructure Strategy* recommends that subject to completion of the business case, the NSW Government should invest in the project to complete a Western CBD bypass and inner urban motorway network.

Issue raised - Future Transport Strategy (2018), Greater Sydney Services and Infrastructure Plans (2018) & NSW Freight and Ports Plan (2018)

Sections 4.2.4, 4.3.5 (pg 25, 28)

Council raised the following concerns:

- The identified NSW transport strategies were updated at the same time as Region Plan and North District Plan development in 2018. However, because these updates did not include a thorough review of transport projects already in the planning pipeline, there was no clear assessment of which *Long Term Transport Masterplan (2014)* projects support the revised land-use structure detailed in these land-use strategies
- The North Sydney CBD is identified as a key part of the Eastern Harbour City in the Region Plan. The *Future Transport Strategy 2056* identifies 'Successful Places' as one of the six outcomes for the planning and management of NSW's transport network and sets out a vision for better balancing place and movement outcomes in major centres. It is incongruous to suggest that the Western Harbour Tunnel offers a City by-pass route when one of the identified impacts of the project is to channel more regional traffic through the heart of the North Sydney CBD via Berry Street and Miller Street. Traffic analysis provided in Appendix F (Technical working paper: Traffic and transport) demonstrates that delays, reduced intersection level of service and, as a result, pedestrian and driver amenity would decline on Berry Street due to proposed portal arrangements. The widening of Berry Street, provision of a scramble crossing and re-allocation of phase time away from pedestrians are all proposed to facilitate through traffic access in the middle of the North Sydney CBD.

Response

North Sydney Council's comment regarding the updated strategies is acknowledged. *Future Transport Strategy 2056* (Future Transport) (NSW Government, 2018) is an update of NSW's *Long Term Transport Master Plan Annual Update (2014)*. It is a suite of strategies and plans for transport developed in concert with the Greater Sydney Commission's *Sydney Region Plan*, *Infrastructure NSW's State Infrastructure Strategy*, and the Department of Planning, Industry and Environment's regional plans, to align land use, transport and infrastructure outcomes for Greater Sydney. The Western Harbour Tunnel and Beaches Link program of works is identified in Future Transport as a 'Committed' project forming part of the vision for the future strategic road network for Greater Sydney that will support key movements by road, including public transport, private vehicles and freight.

As noted in Section 2.1.3 of the environmental impact statement, Future Transport seeks to "improve communities" (ie placemaking), "transform customer experience" (ie improve journey times and reliability) and "boost economic performance" (ie enable and accommodate growth). The project contributes heavily to all three objectives. As outlined in sections 2.6 and 2.7 of Appendix F (Technical working paper: Traffic and transport), the project is part of a multimodal network-wide effort to tackle Sydney's transport challenges (which aligns with Future Transport), and would address network underperformance and support Sydney's long-term economic growth. The project would not only meet its customer's needs, but it would also support customers that are best served by other transport modes rather than compete with them. Motorways best serve long distance and inter-regional trips connecting to or bypassing major urban centres. While shorter trips and long distance freight movements to regional and interstate areas are not the direct customers of the project, there would be a substantial reduction in traffic on the current arterial alternatives as a result of the project, which would reduce delays on these roads and provide a secondary benefit to these customers.

The project would deliver the opportunity to relocate a significant volume of through traffic on surface arterial roads underground. In addition to the direct benefit of moving bypass traffic underground, reduced congestion on the motorway and arterial network offers flow-on benefits to the adjoining local network, reducing the impact of queuing on local high streets and local roads.

Reduced congestion on the arterial road network would result in further improvements in amenity related to physical safety, air quality and noise levels.

As opposed to avoiding particular areas, the project aims to reduce the conflict between access and bypass functions for the Sydney Harbour Bridge, the Sydney Harbour Tunnel, ANZAC Bridge and Western Distributor. This is required to support the liveability and productivity of the Eastern Economic Corridor and its connections with international gateways and their surrounds (as per Section 3.2 of the environmental impact statement).

As shown in Table 4-10 of Appendix F (Technical working paper: Traffic and transport), Berry Street is currently a strategic state road providing access from North Sydney to Warringah Freeway northbound and Bradfield Highway/Cahill Expressway southbound with up to four lanes in some areas. The works proposed on Berry Street and at the intersection of Berry Street and Miller Street are described in Table 5-12 of the environmental impact statement.

Works at Berry Street would include capacity and configuration works, including:

- Provision of a fourth eastbound lane from the east of the Berry Street and Miller Street intersection to around west of Denison Street by removing the existing kerb build outs
- Extension of the existing eastbound clearway during the AM and PM peak periods, to create a continuous clearway between the Pacific Highway and Arthur Street.

The following works would be carried out at the intersection of Berry Street and Miller Street:

- Conversion of the existing pedestrian crossings to a scramble crossing, with a pedestrian only phase. This would allow pedestrians to access any leg of the intersection during the pedestrian only phase
- The existing right-turn provision from Miller Street northbound to Berry Street eastbound would be removed for general traffic. This would reduce traffic on Miller Street between Pacific Highway and Berry Street, adjacent the Victoria Cross Metro entrance. This reduced traffic would improve place and amenity on this section of Miller Street. Buses would still be permitted to make the right turn.

The proposed works would not present a material change in the function of Berry Street. However, Transport for NSW will continue to work closely with North Sydney Council and other key stakeholders to investigate options to improve movement and place outcomes through the North Sydney Program (refer to Section B14.2.1 and Section A4.1.3 of this submissions report), further leveraging the strategic benefits of the program of works.

Issue raised – The Greater Sydney Region Plan

Section 4.2.3 (pg 24)

Council provided the following comments regarding the project's alignment with the Greater Sydney Commission's 30 minute vision:

- The environmental impact statement Chapter 9 (Operational traffic and transport) and Appendix F (Technical working paper: Traffic and transport) forecasts 30 minute catchments by road and shows increases in private vehicle accessibility. However, The Greater Sydney Region Plan envisions a Sydney where people can reach their nearest metropolitan and strategic centres within 30 minutes, seven days a week by public transport
- While improved connectivity from the Mount Street overpass to the re-aligned Warringah Freeway bus lane may marginally improve bus priority in this area however, the environmental impact statement does not list any other options for increasing 30-minute bus catchments. It is also unclear if re-directing buses into the tunnel is desirable and if the Transport for NSW bus planning team would commit to delivering these bus improvements as a part of the project.

Response

Objective 18 of The *Greater Sydney Region Plan – A Metropolis of Three Cities* 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 (in conjunction with the Beaches Link and Gore Hill Freeway Connection project) would facilitate the Greater Sydney Region Plan's goal of delivering a 30-minute city by facilitating greater access to jobs, schools and health care within 30 minutes of people's homes by public transport. In addition to reduced congestion on strategic bus routes such as the Sydney Harbour Bridge and Anzac bridge, the project also offers the opportunity for the addition of express buses, which would substantially reduce travel times and increase the 30-minute public transport catchments for key interchange locations such as North Sydney, Rozelle and Lane Cove.

Issue raised – North District Plan

Section 4.13.1 (pg 82, 83)

Pursuit of the project in its current form would undermine the realisation of many of the positive city building interventions and identified by North Sydney Council. This would be at direct odds with key objectives of the Greater Sydney Commission's *North District Plan.*

The responsible consideration of these project needs to be done in the context of the *Greater Sydney Region Plan*, the *North District Plan* as well as other State Government strategies. The project would either directly prevent or significantly hinder the achievement of numerous endorsed strategic directions, priorities and actions as well as 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 (refer to Table 3-2 of the environmental impact assessment).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.

As described above, Berry Street is a strategic state road providing access from North Sydney to three existing motorways and currently provides four trafficable lanes during peak periods east of Little Spring Street, and three trafficable lanes at other locations. Berry Street currently has clearways operating during weekday peak periods. As described in Section 5.1.2 and Table 5-12 of the environmental impact statement, works on Berry Street would comprise capacity and configuration works.

The proposed changes mean that Berry Street would operate as a four-lane road during peak traffic periods and at other times (ie around 18 hours per day), it would continue to retain parking on both the northern and southern kerbsides. The proposed changes to Berry Street as part of the project, outlined in Table 5-12 of the environmental impact statement, would not present a material change in its function and would facilitate through traffic access, in line with the *North District Plan*.

Transport for NSW will continue to work closely with North Sydney Council and other key stakeholders to investigate options to improve movement and place outcomes through the North Sydney Program (refer to Section B14.2.1 and Section A4.1.3 of this submissions report), further leveraging the strategic benefits of the program of works.

Issue raised – Sydney's Cycling Future

Section 4.5.2 (pg 38)

Sydney's Cycling Future (2013) states that bicycle infrastructure will be delivered as part of *"major transport and development projects*" and that *"we will invest in state priority corridors to safely link inner Sydney customers to Sydney's CBD from the north, east, south and west. This includes connections to North Sydney..."*

While the project does include the replacement of existing North Sydney walking and cycling infrastructure (eg Ridge Street walking and cycling bridge) to accommodate the geometric requirements of traffic on the re-designed Warringah Freeway, there is no commitment to the delivery of new walking or cycling infrastructure in the environmental impact statement.

Response

Sydney's Cycling Future (Transport for NSW, 2013) has been addressed in Section 9.1.4 of the environmental impact statement. The project supports the strategy by improving cycle connectivity along the fragmented Warringah Freeway corridor, where the current cycle facilities are a combination of off-road and on-road paths. There is a strong community desire to fill a perceived missing link in the cycleway networks in these locations. The project would also result in reduced congestion on surface roads, which would contribute to improved conditions for cyclists.

New cycling infrastructure in the North Sydney area would include:

- A new shared user path would be provided on the southern side of High Street bridge with signalised pedestrian crossings at the upgraded Alfred Street North/High Street intersection
- A new shared user path would be provided on the northern side of Ernest Street bridge
- A new dedicated cycleway would be provided on the eastern side of Warringah Freeway between Miller Street and Ernest Street.

The proposed scope of the project complements other active transport planning being carried out by Transport for NSW. As council is aware, 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 2056* strategy, 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 *transport.nsw.gov.au*.

Issue raised – Local strategic planning

Sections 4.2.5, 4.2.6, 4.4.1, 4.4.5, 4.4.6, 4.8.3, 4.8.4, 4.13.1 (pg 25, 26, 30, 35, 50, 51, 82, 83)

The project would both directly and indirectly impact upon numerous adopted and draft local government strategic projects and initiatives. This includes:

- *North Sydney Public Domain Strategy* (and associated project) and *North Sydney CBD Transport Masterplan*
- *Ward Street Masterplan* and *draft Civic Precinct Planning* studies
- *Stage 1 Military Road Corridor Planning*
- *Local Strategic Planning Statement*
- *North Sydney Economic Development Strategy*
- *North Sydney Visitor Economy Strategy.*

Response

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 around 2018, it aims to deliver a shared place-based vision for the North Sydney CBD.

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 key focus of the North Sydney Program is to ensure major projects, such as the Western Harbour Tunnel and Beaches Link program, integrate with the North Sydney CBD in a manner that supports the globally connected 'Harbour CBD' and enables delivery of befitting place-based outcomes.

Development of the North Sydney Program is ongoing, with validation of the vision for North Sydney currently underway with a number of scenarios being considered to support the place-based outcomes. Further information is provided in Section A4.1.3 of this submission report.

The project has been developed to address regional traffic and transport issues, with consideration of local issues. Transport for NSW acknowledges however, that due to the project location in the North Sydney local government area, some of the physical works might affect elements of local strategic projects and initiatives. Some elements of the key local strategic projects and initiatives might need to be modified as a result, which will be determined during the North Sydney Program process.

Transport for NSW notes that predicted population growth 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 potentially on North Sydney Council's key local strategic projects. The project has been developed to reduce predicted congestion increases in the Eastern City and North Districts. The environmental impact statement generally indicates that congestion in North Sydney would reduce with the project compared to the 'Do minimum' (without project) scenario. This reduction would potentially provide benefits to North Sydney Council's existing key strategic projects and also to support future initiatives.

B14.3 Project development and alternatives

B14.3.1 Preferred alignment

Issue raised

Sections 4.1.7, 4.3.5 (pg 20, 29)

It is unclear why the current alignment was preferred instead of the original corridor defined in the Infrastructure NSW's State Infrastructure Strategy (2012) as a "motorway from the airport to the Victoria Road corridor, with a potential extension north to the M2". This original alignment would have by-passed the Eastern Harbour City providing an opportunity to separate by-pass traffic and traffic accessing the Eastern Harbour City CBDs (this includes North Sydney CBD).

Response

As stated in Section 4.3 of the environmental impact statement, the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012) and subsequent *Future Transport Strategy 2056* (NSW Government, 2018) set the 40 year vision, strategic directions and outcomes for customer mobility in NSW. Giving consideration to future land use, population density and transport requirements, both of these strategic plans identified road based transport, including improvements to bus services, as important modes to meet the needs of the Northern Beaches region. The need for

additional core motorway capacity at the crossings of Middle and Sydney Harbour was identified as key to development of an appropriate multi-modal Sydney transport network and specifically identified the Western Harbour Tunnel and Beaches Link program as transport projects required to support the plan.

Corridor alternatives are discussed in Section 4.4 of the environmental impact statement. Options were developed and assessed based on various technical and environmental factors by a multidisciplinary team including design engineers, construction engineers, transport planners and environmental advisors with direct experience in delivering major transport infrastructure in NSW, Australia and internationally. Four alternative routes were assessed, including a corridor that included a crossing of Sydney Harbour between Rozelle and North Ryde, broadly under the Victoria Road and Gladesville Bridge corridor. This would provide connection to the M2 Hills Motorway/Lane Cove Tunnel corridor around East Ryde and would bypass the Lane Cove Tunnel and Warringah Freeway. This alternative option aligns to the 'Inner West Bypass and enhanced North-South links to the M2', described in the *State Infrastructure Strategy* (Infrastructure NSW, 2012). In the *State Infrastructure Strategy* the route is identified as a conceptual option with no reservation or detailed alignment and it is also identified that construction costs are likely to be high. As identified in Section 4.4.1 of the environmental impact statement this corridor alternative (similar to the Inner West Bypass and enhanced north-south links to the M2 conceptual option) was shortlisted but not preferred as it would:

- Only slightly reduce traffic volumes on the Lane Cove Tunnel, Gore Hill Freeway and a portion of the Warringah Freeway through to Cammeray
- Result in poorer traffic outcomes on the existing harbour crossings, ANZAC Bridge and Western Distributor corridor. This is because the connectivity provided would not be attractive for the high number of users with origins and destinations east of the Lane Cove Tunnel, including areas such as Chatswood, Lane Cove, North Sydney and the Northern Beaches catchment. This reduces the usage, and hence benefits, of the new tunnel
- Require construction of 50 per cent more tunnel, increasing the number of intermediate construction support sites, heavy haulage trips, construction cost and operational cost
- Expose the tunnel alignment to poor geology due to increased harbour and river crossings, increasing construction complexity and cost and requirements for intermediate construction support sites.

B14.3.2 Public transport

Issue raised

Sections 4.1.2, 4.1.7, 4.4.6, 4.4.7 (pg 18, 20-22, 35)

Concerns were raised that the environmental impact statement did not provide sufficient analysis of public transport alternatives. These include:

- The environmental impact statement does not provide national and international benchmarking of how different project options such as motorway, rail, bus rapid transit or the like, might address the identified problems
- Insufficient non-motorway option identification and analysis, particularly rail-based alternatives. A comparative analysis of the relative costs and benefits of the project against a Metro Spur between Chatswood and Brookvale/Dee Why is recommended. The analysis should be undertaken prior to the project's inclusion in state strategies or NSW budget funding allocations. Cost benefit analysis of each project should consider the Greater Sydney Commission Performance Dashboard Criteria
- In dense urban areas, public transport would transport people more efficiently

- Improvements to North District bus services (for example, Military Road Bus Rapid Transit) would likely achieve better project and cost/benefit outcomes than the Western Harbour Tunnel and Beaches Link program of works
- Since the development of the North Sydney CBD Transport Masterplan, early data has indicated the first stage of the North West Metro operation (Rouse Hill - Chatswood) has exceeded Metro modelling and passenger predictions. This is supportive a wider increase across Sydney of mode shift to public transport and further evidence of North Sydney Council's preferred strategic direction and vision being the correct path to take
- Journey travel time benefits would be short lived and come at a direct and profound impact on North Sydney in terms of local traffic and amenity. Development of mass transit is the only responsible direction.

Response

Alternative transport modes, including bus, rail, ferry and active transport, could be considered as strategic alternatives to the project, as 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* and *Future Transport Strategy 2056.* 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, however, have dispersed origins and destinations, and/or varying purposes which are not well served by public transport alone.

Sydney Harbour crossing capacity is a major transport constraint for all transport modes. The Sydney Metro City & Southwest project will deliver much needed cross harbour capacity for commuters, connect new nodes, and deliver faster and more reliable train journeys to and from the north-west of Sydney. While this project will contribute to reducing congestion on the existing cross-harbour road connections it is only one part of an integrated transport network that 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.

In response to changing passenger needs and an increase in demand outlined in *Sydney's Bus Future* (Transport for NSW, 2013), additional services have already been added to the bus network (Section 4.3.5 of the environmental impact statement). However, without measures to improve journey times by increasing the road efficiency or capacity, the addition of more buses to the network can contribute to congestion, making bus services less effective at meeting customer needs. As discussed above, improved bus services alone would not be sufficient to provide the level of additional cross-harbour capacity that is required. This is in part due to the wide range of purposes and destinations associated with cross harbour trips and the limited ability for buses to cater for these. The ability for the bus network to provide extra capacity is also strictly limited by the capacity of the road network itself.

As outlined in Section 6.4 of Appendix F (Technical working paper: Traffic and transport), under the 'Do minimum' (without project) scenario, network statistics for the Warringah Freeway and surrounds study area show that forecast traffic conditions are expected to degrade into the future as traffic demands both on the Warringah Freeway and within North Sydney CBD increase over time. This includes increases in bus travel times. Overall, under the 'Do something' (with project) scenario, peak period traffic demand through the Warringah Freeway and surrounds study area would increase however, a greater amount of forecast demand would be able to travel as desired during peak periods. Average travel speeds through this area would increase and the number of stops would decrease substantially. The proposed works are considered to provide a balanced

approach to movement and place outcomes from the perspective of maintaining a balanced and integrated transport network through North Sydney. Further refinements and changes to network operations within the North Sydney CBD may occur as part of the North Sydney Program works (refer to Section A4.1.3 of this submissions report for further information on the North Sydney Program).

B14.4 Project description

B14.4.1 Motorway features

Issue raised

Sections 4.3.3 (Page 28)

Infrastructure Australia's Infrastructure Audit identified the Warringah Freeway as one of the most "complex" sections of motorway in Australia. Adding six new motorway tunnel portals to this network corridor, three of which would only be accessed/egressed via Berry Street and Falcon Street, would likely increase the complexity of trips in and around this critical section of the Sydney motorway network.

Response

The Warringah Freeway corridor has evolved in a piecemeal fashion between 1968 and 2006 and performs a number of competing functions making it a complex corridor. These competing functions, coupled with the evolution of the corridor over time and high traffic volumes, impact the efficiency, safety, and capacity of the corridor.

Simplifying the Warringah Freeway is fundamental to the project, through improved wayfinding and separation of traffic based on trip function (through traffic, traffic for arterial distribution and traffic for local destinations). The conceptual trip distribution strategy is shown on Figure 5-17 of the environmental impact statement. To achieve this strategy, the project would require the current access arrangements to the Warringah Freeway corridor to be modified, for streamlined connectivity and to support the growth in traffic demand and modification to traffic lanes. The project would also involve surface road works which includes upgrades to existing interchanges with High Street and Falcon Street, the removal of tidal flows at the Mount Street and Ernest Street interchanges, the provision of new, upgraded and relocated road bridges, upgrades to the surrounding road network and installation of cut and cover structures.

As described in Section 4.3.2 of Appendix F (Technical working paper: Traffic and transport), Falcon Street and Berry Street are arterial and sub-arterial roads, currently providing important southbound and northbound motorway access. The project, presented in the environmental impact statement, would not alter the function of these roads as providing motorway access but would include altering access arrangements to allow access to and from the Western Harbour Tunnel.

The upgraded Warringah Freeway would simplify traffic flow by providing the following traffic lanes (refer to Figure B14-1 below):

- A northbound outer carriageway which would comprise:
  - An outer western carriageway carrying northbound traffic from the Sydney Harbour Bridge to the proposed Beaches Link northbound on ramp and facilitating local distribution to local destinations such as North Sydney and Crows Nest
  - Inner western carriageways carrying northbound traffic from the Sydney Harbour Bridge and the Sydney Harbour Tunnel facilitating trips to North Sydney and Crows Nest
- A central carriageway, carrying northbound and southbound motorway traffic between the Western Harbour Tunnel, Gore Hill Freeway and Willoughby Road
- A southbound outer carriageway which would comprise:

- Inner eastern carriageways carrying southbound traffic to the Sydney Harbour Tunnel and facilitating distribution to local destinations such as Neutral Bay
- An outer eastern carriageway carrying southbound traffic to the Sydney Harbour Bridge (both the Bradfield Highway and Cahill Expressway) and facilitating distribution to local destinations such as North Sydney and Kirribilli
- A dedicated bus lane between Miller Street, Cammeray and the Sydney Harbour Bridge, which would carry southbound buses and other permitted bus lane vehicles.

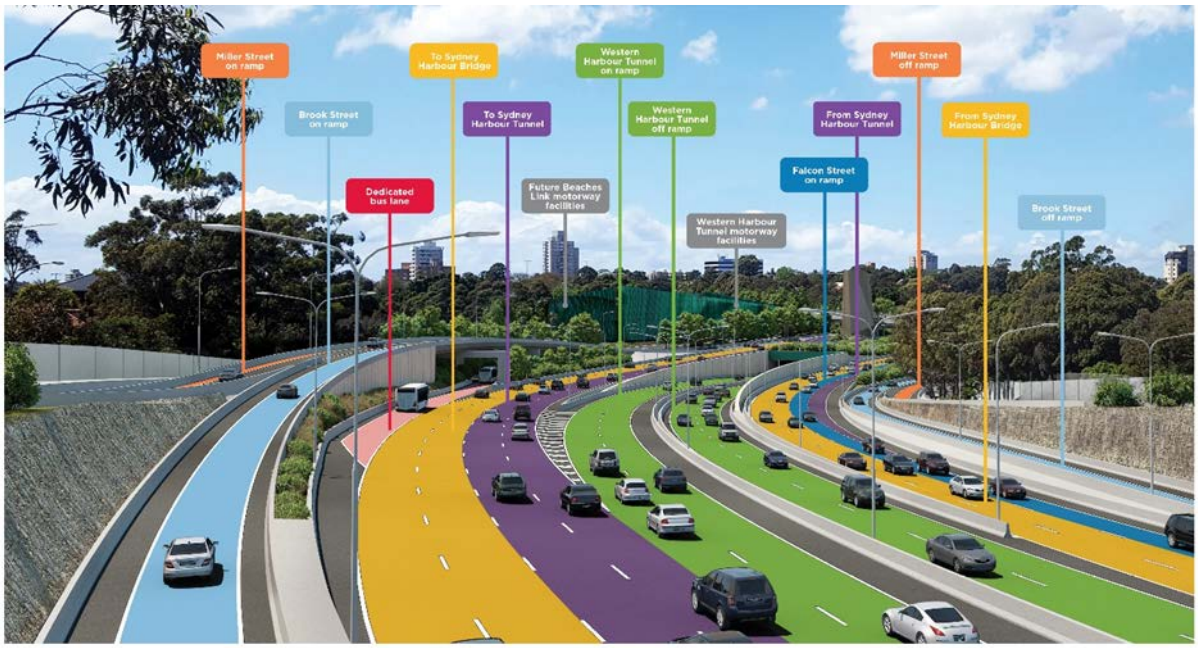


Figure B14-1 Warringah Freeway reconfiguration (looking south)

B14.4.2 Design changes

Issue raised

Sections 4.6.3, 4.6.7 (pg 35, 43, 44)

The scope of the project should be revised to include the delivery of agreed North Sydney Program directions. The proposed changes to road access and network arrangements in the environmental impact statement (for example, Warringah Freeway-Falcon Street slip-lane removal and widening of Berry Street) are inconsistent with key project recommendations and directions agreed previously through the North Sydney Program. In general, the impact of the project on traffic demand in the North Sydney CBD would make much of the North Sydney Program unachievable.

Response

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, as discussed in Section B14.2.1 above. Led by Transport for NSW since around 2018, it aims to deliver a shared place-based vision for the North Sydney CBD.

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 key focus of the North Sydney Program is to ensure major projects, such as the Western Harbour Tunnel and Beaches Link program, integrate

with the North Sydney CBD in a manner that supports the globally connected 'Harbour CBD' and enables delivery of befitting place-based outcomes.

Development of the North Sydney Program is ongoing, with validation of the vision for North Sydney currently underway with a number of scenarios being considered to support the place-based outcomes. As part of the collaboration, the multi-agency group will ensure the future integrated transport network and place-based vision for North Sydney is supported through projects such as the Western Harbour Tunnel and Warringah Freeway Upgrade project. Further refinements to movement and place outcomes within the North Sydney CBD may occur as part of the North Sydney Program.

Any changes to the project as a result of the North Sydney Program process 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.

Further information on the North Sydney Program is provided in Section A4.1.3 of this submissions report.

The environmental impact statement demonstrates that the project would not have a materially adverse impact on traffic demand or performance in the North Sydney CBD.

The North Sydney Program considers strategic public transport connections to the North Sydney CBD, improved pedestrian amenity and safety, road network changes, improved access for cyclists to and through the CBD, convenient interchanges between bus and rail services, and management of kerbside access to support business activity across the day.

Transport for NSW will continue to work closely with North Sydney Council and other key stakeholders through agreed governance structure to investigate options to improve movement and place outcomes within North Sydney (refer to Section B14.2.1 above), further leveraging the strategic benefits of the program of works.

B14.5 Construction work

B14.5.1 Access

Issue raised

Section 4.6.3 (pg 45, 46)

The temporary use of the Berrys Bays sites would cause substantial impacts to the Waverton Peninsula. This includes loss of the foreshore access path that connects the western end of Carradah Park and Balls Head Road (a popular pedestrian route) during tunnel construction (4 or more years). North Sydney Council recommend:

- Support and funding from the NSW Government for a replacement link path – following the route from the end of Balls Head Road, southwards along the existing access driveway behind the Woodleys administration building, then connecting via a boardwalk to the pathways within the former Quarantine Depot, and then to the existing track within Balls Head Reserve
- The path should include stair access to the existing beach (Woodley's Cove)
- The path should be established before the Berrys Bay lands are occupied for the project.

Response

Transport for NSW recognise the importance of maintaining pedestrian routes within the North Sydney local government area. While the existing foreshore access path at Berrys Bay would be temporarily closed, there is an additional, existing higher level path that links Carradah Park and Balls Head Road. This existing path would be used as the alternative path during construction.

The placement of the construction support sites in this area have been carefully selected based on a number of different factors. The Sydney Harbour north cofferdam construction support site (WHT6) is required to be located as close as possible to the northern end of the immersed tube tunnel and the southern end of the northern driven tunnel for the efficient and timely construction of the project. The Berrys Bay construction support site (WHT7) was chosen as this site is Government owned, therefore eliminating the need for private property acquisitions. The temporary closure of one foreshore access path is considered preferable to acquiring properties for the operation of a construction support site.

In accordance with environmental management measure LP9 (refer to Table D2-1 of this submissions report), during the construction period Transport for NSW will improve access to the beach area next to the former quarantine station. The project will work with North Sydney Council to provide boat or kayak storage racks at the beach before construction starts.

Transport for NSW acknowledge the importance of the Berrys Bay area and is committed to working with the community and key stakeholders to understand their views on the future use of the Berrys Bay, as outlined in Table 20-3 of the environmental impact statement. Once the project is completed, Transport for NSW would return the Berrys Bay area as public open space. As part of this process, Transport for NSW and the Department of Planning, Industry and Environment would jointly establish a reference group, to include representation of key stakeholders, the community and independent experts, to support the development of the final layout. Further discussion about the future Berrys Bay open space is included in Section B14.6.5 below.

The project has committed to retaining public access to the beach adjacent to the former Quarantine Depot, as per environmental management measure LP9 (refer to Table D2-1 of this submissions report). The project will continue to work with North Sydney Council on providing this path, including a potential extension to the Quarantine Depot, prior to the commencement of construction.

B14.5.2 Methodology

Issue raised

Section 4.10.4 (pg 58)

Unclear why the immersed tube tunnel methodology has been chosen, when the Sydney Metro City & Southwest project deemed this to present an unacceptable level of risk and that tunnel boring (under the harbour floor) was identified as the most environmentally sensitive construction method.

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.

Tunnelling method alternatives are considered in Section 4.5.1 of the environmental impact statement. Design development for the project included a significant focus on evaluation of potential tunnelling methods for the crossing of Sydney Harbour. This analysis was carried out by a multidisciplinary team including design, construction, transport planning, and environmental specialists to ensure a comprehensive analysis. It included the consideration of the use of tunnel boring machines.

The diameter and type of tunnel boring machine required for a motorway crossing of Sydney Harbour (as opposed to a rail crossing) cannot be considered a conventional solution. Depending on the depth of the alignment, the tunnel boring machines required to cross Sydney Harbour would need to be very large diameter slurry shield machines.

The immersed tube tunnel method has been applied to over 150 major road and rail tunnels around the world to overcome similar combinations of geology, topography and cross-sectional challenges including the existing Sydney Harbour Tunnel. Construction methodologies for immersed tube

tunnels also allow for their construction in areas of sensitive marine environments. The advantages of the immersed tube tunnel method (as described in Table 4-3 of the environmental impact statement) include:

- Provides the shallowest possible tunnel alignment at the Sydney Harbour crossing compared to either a bored or roadheader excavated tunnel, enabling the best possible gradient and associated performance outcomes (for example, safety, vehicle speeds, journey experience, long-term emissions)
- Minimises tunnelling risks by reducing exposure to tunnelling through poor geology
- Lower construction and operational costs when compared to alternate methodologies
- Minimises the size of waterside sites when compared to those required to launch large diameter tunnel boring machines
- Provides a smaller excavation cross section than a bored tunnel (refer to Figure B14-2). This significant reduction in the volume of excavated material and the use of marine logistics greatly minimises haulage of tunnel spoil material when compared to tunnel boring machine solutions
- The preferred alignment avoids interfaces with sensitive marine ecology.

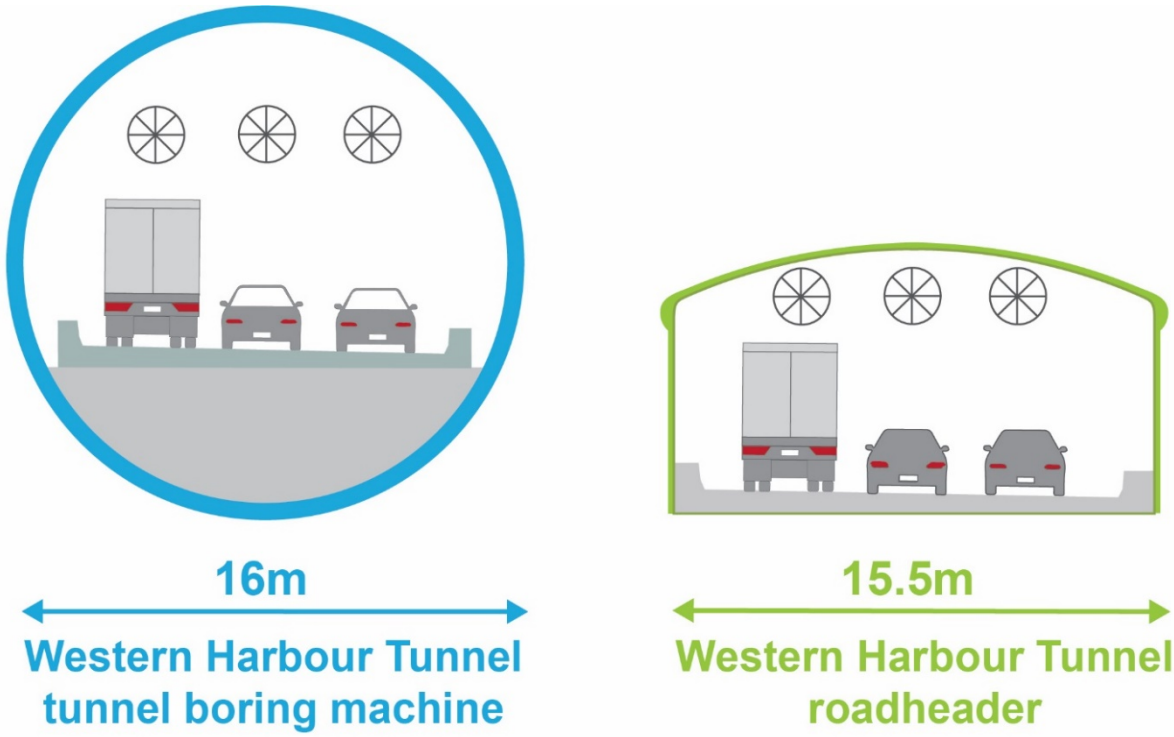


Figure B14-2 Comparison of tunnel cross sections using a tunnel boring machine and a roadheader

As described in Table 6-4 of the environmental impact statement, the dredging methodology has been designed to minimise impacts on the marine environment by tailoring the specific approaches to the material being dredged. This would involve using a backhoe dredge with closed environmental clamshell bucket for removal of the surface layer of material with elevated levels of contaminants from the bed of the harbour to avoid the spread of potentially contaminated material into the water column. Dredging operations would also be carried out within a floating silt curtain enclosure to a depth of two to three metres. An additional shallow silt curtain would also be installed adjacent to ecologically sensitive areas to provide additional protection. These commitments are

incorporated by environmental management measures B19, B20 and WQ6 (refer to Table D2-1 of this submissions report). These measures would be included within the dredge management plan that would be developed for the project, as described in Section D1.3 of this submissions report.

B14.6 Stakeholder and community engagement

B14.6.1 General comments

Issue raised

Section 4.12.2 (pg 79, 80)

The following adjustments to the Community consultation framework were recommended:

- Local Chambers of Commerce, including North Sydney and Neutral Bay are not listed as relevant stakeholders in the Community consultation framework
- Section 7.3 of the Community consultation framework should reference the dedicated consultation period seeking stakeholder/community input into the new open space at Berrys Bay
- Specific reference to the provision of respite or alternative accommodation where applicable should be added to the Community consultation framework and detailed in the construction noise and vibration management plan.

Response

Should the project be approved, a Community communication strategy would be prepared that would provide further details about community involvement during design, construction and the project opening phase. New environmental management measure SE4 advises that the consultation for the project will be in accordance with Appendix E (Community consultation framework), which includes the Community communication strategy (refer to Table D2-1 of this submissions report). A clarification has been provided in this submissions report to include the North Sydney Chamber of Commerce and Neutral Bay Chamber of Commerce as key stakeholders in Table 6-1 of the community consultation framework (refer to Table A-7 of this submissions report). The list of key stakeholders would continue to be updated as the project progresses.

As outlined in Section 7 of Appendix E (Community consultation framework), it is anticipated that some aspects of the project's construction would require specific communications 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. Section 7.2 of Appendix E (Community consultation framework) includes commitments for communication strategies relating to landscaping and urban design. This commitment is applicable to the redevelopment of Berrys Bay at the completion of construction (refer to Section B14.6.5 below for further details regarding consultation regarding Berrys Bay).

The construction noise and vibration management plan is discussed in Section 7.4 of Appendix E (Community consultation framework). Respite periods and alternative accommodation are addressed in the *Construction Noise and Vibration Guideline* (Roads and Maritime, 2016). Environmental management measure CNV1 (refer to Table D2-1 of this submissions report) requires that the construction noise and vibration management plan includes standard and additional mitigation from the *Construction Noise and Vibration Guideline* (Roads and Maritime, 2016), and detail how and when these will be applied in the project.

Transport for NSW is currently preparing a Construction Noise Management Framework document in consultation with both the Department of Planning, Industry and Environment and the Environment Protection Authority. The Construction Noise Management Framework describes the approach the project will take to mitigating and managing construction noise impacts for works outside standard construction hours for the Warringah Freeway Upgrade. The Construction Noise Management Framework, which will be publicly available prior to construction, will outline the

process for the implementation of additional measures to ensure that there is a transparent and consistent approach to the management of noise impacts along the Warringah Freeway.

B14.6.2 Project development

Issue raised

Section 4.1.7 (pg 22)

The project did not demonstrate a sufficient level of governance and transparency to determine the best long term transport solutions for Sydney. A more considered and transparent development process grounded in due process and stakeholder consultation might have given the project more credibility.

Response

The project has undergone extensive evaluation of alternatives from pre-feasibility and strategic investigations through to design development and refinement in line with standard government processes for major infrastructure projects. An overview of the strategic context and project need are provided in Chapter 3 (Strategic context and project need) of the environmental impact statement. An overview of the development process and options considered as part of this process are provided in Chapter 4 (Project development and alternatives) of the environmental impact statement. Figure 4-1 of the environmental impact statement outlines this process which includes assessment of strategic alternatives, followed by corridor alternatives and further project alternatives development prior to establishing the preferred option (the project).

Community and stakeholder engagement has been an integral component in the development of the project and the Western Harbour Tunnel and Beaches Link program of works more widely. The engagement program has proactively informed and involved stakeholders and community members during project development. This approach aimed to increase public understanding of the project, encourage participation in the development process, and promote the benefits of the project to local communities and stakeholders. The project has benefitted from the input of local knowledge, insight, experience, goals and priorities, which has helped to identify issues, potential mitigation strategies and opportunities to improve project and community outcomes.

All questions, comments and issues raised by the community have been recorded in the project's database. Feedback received during both the 2017 and 2018 consultation periods has been considered and addressed as part of the environmental assessment and, wherever possible, has been incorporated into the project development. A summary of how community and stakeholder feedback has been incorporated into the project is provided in Table 7-9 and Table 7-10 of the environmental impact statement.

Further, the environmental impact statement has been publicly exhibited (with an extended time period) to provide the community, government agencies and stakeholders with an understanding of what is proposed and to invite comment. This submissions report documents and responds to issues raised during the exhibition period. The Department of Planning, Industry and Environment will prepare an assessment report for the Minister for Planning and Public Spaces who will then determine whether to grant project approval and specify project conditions.

B14.6.3 Environmental impact statement

Issue raised

Sections 1.0, 2.0, 4.12.2 (pg 15, 16, 79)

The following concerns were raised regarding the public engagement during environmental impact statement development and exhibition:

- The duration and breadth of engagement methods employed during the project development stages was far greater than that provided during the environmental impact statement public exhibition period. Drop-in information sessions and individual Precinct

Committee meetings with Transport for NSW were not conducted during the environmental impact statement public exhibition period

- Display period was too short based on volume and technicality of the documentation
- Council made a submission on the July 2018 NSW Government 'Western Harbour Tunnel and Beaches Link Project Update' requesting clarification on numerous issues and concerns identified in the report which largely remain unresolved. The submission included the request that:
  - The State Government released a strategic/final business case for the Western Harbour Tunnel and Beaches Link program of works
  - More information regarding the design, construction and operational impacts of the Western Harbour Tunnel and Beaches Link program of works on North Sydney be provided
  - Ventilation outlets be filtered
  - 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

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 Department of Planning, Industry and Environment is responsible for determining the timing and duration of public exhibition periods for an environmental impact statement. For the project, the environmental impact statement was placed on public exhibition on 29 January 2020. The public exhibition period for the environmental impact statement was initially scheduled to be 43 days. However, following community feedback the Department of Planning, Industry and Environment extended the exhibition closing date from 12 March to 30 March 2020 (equating to a total exhibition period of 61 calendar days). This was to provide the community time to review the environmental impact statement documentation.

During this time 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 program used a diverse range of communication methods and platforms, including drop-in information sessions, an online digital portal and an online summary document, to achieve a significant reach and provide local communities and stakeholders information relevant to them. Refer to Section A2.3 of this submissions report for details of the community engagement activities conducted during the exhibition period.

Transport for NSW acknowledges the receipt of North Sydney Council’s submission in response to the July 2018 NSW Government 'Western Harbour Tunnel and Beaches Link Project Update'.

Several meetings were held with North Sydney Council following July 2018:

- 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

- 2 October 2019 – Drawings and construction methodology (for drilling and cofferdam) discussion
- 29 November 2019 – Program of works update
- 10 December 2019 – General project impacts discussion
- 8 January 2020 – Project team briefed North Sydney Council executive team on the environmental impact statement and key impacts to the local government area
- 7 February 2020 – Meeting to further discuss the release of the environmental impact statement and process of developing an interface agreement
- 17 February 2020 – Storage dam relocation meeting
- 19 February 2020 – Proposal for development of Warringah Freeway Upgrade
- 6 March 2020 – Business Buzz (presentation to North Sydney businesses on the benefits of the project and managing impacts in the North Sydney area)
- 9 and 29 April 2020 – Interface agreement meetings
- Regular meetings for the *North Sydney Integrated Transport Program* (North Sydney Program).

Issues raised in North Sydney Council's 2018 submission can be found in the following locations:

- Business case – refer to Section B14.2.1 above
- Project design – refer to Chapter 5 (Project description) of the environmental impact statement
- Ventilation outlets and filtration – refer to Chapter 12 (Air quality) of the environmental impact statement
- Impacts to social infrastructure – refer to Chapter 20 (Land use and property) and Chapter 21 (Socio-economics) of the environmental impact statement
- Storage dam at Cammeray Golf Course – refer to Chapter 5 (Project description) and Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement.

B14.6.4 Interface agreement

Issue raised

Sections 1.0, 4.14.2 (pg 15, 86)

Transport for NSW indicated its intention to enter into an 'Interface Agreement' with North Sydney Council which would provide more detail on the scope, rights and obligations for both the delivery and operational phases of the project. The legal document would detail processes to be followed for related works, repairs and upgrades to Council assets such as roads, footpaths, lighting, drainage infrastructure and the like. North Sydney Council recommend the following:

- Considering the early design stage, the agreement should not be progressed until further negotiations with respect to the project take place
- A Terms of Reference should be prepared prior to guide the preparation of the agreement and should be informed by the issues raised in the Council's submission.

Response

Transport for NSW is currently working with North Sydney Council to develop an Interface Agreement for the Western Harbour Tunnel and Beaches Link program of works. The development of the document and discussions between Transport for NSW and North Sydney Council are ongoing and beyond the scope of the environmental impact assessment or the project planning

approval process. This is an ongoing process and Transport for NSW continues to work with North Sydney Council to finalise the Interface agreement.

B14.6.5 Berrys Bay

Issue raised

Sections 4.12.2 (pg 79-80)

The environmental impact statement guide for the project (January 2020) refers to a dedicated consultation period seeking stakeholder/community input into the new public open space at the Berrys Bay site. This includes establishment of a reference group, with representative stakeholder groups, the community and independent experts. North Sydney Council made the following requests regarding the design process for the future open space at Berrys Bay:

- That in order to ensure that future open space reflects the values of the North Sydney community the NSW Government be advised that Council wishes to take the lead on consulting the community and preparation of design plans for the future open space parcels
- The NSW Government be requested to fund the full cost of the creation of the parkland (including remediation), in accordance with plans developed by Council and the community immediately, following the cessation of the tunnel project.

Response

The 'Berrys Bay – Future public open space – Draft principles & related considerations in Appendix 3 of the North Sydney Council's submission is noted. As discussed in Chapter 20 (Land use and property) of the environmental impact statement, Transport for NSW acknowledges the importance of the Berrys Bay area and is committed to working with the community and key stakeholders to understand their views on the future use of the Berrys Bay. Once the project is completed, Transport for NSW would return the Berrys Bay area as public open space. As part of this process, Transport for NSW and the Department of Planning, Industry and Environment would jointly establish a reference group, to include representation of key stakeholders, the community and independent experts, to support the development of the final layout. It is expected this process would be carried out prior to the start of construction works.

While North Sydney Council is a key stakeholder that would be consulted, the process would be led by a NSW Government representative. Further details will be provided upon further design development.

Berrys Bay urban design requirements are identified in Section 5.5.6 of Appendix V (Technical working paper: Urban design, landscape character and visual impact). These include:

- Ensure existing landscape impacted by temporary works is remediated using an appropriate native planting palette
- Ensure vegetation restoration and landscape improvements are within keeping of local council guidelines and existing landscape character
- Ensure heritage listed features are protected including bund wall and Woodleys Boatshed
- Reinstate any disturbed beach/foreshore edges
- Ensure views across Berrys Bay from nearby dwellings are not impacted post construction.

B14.6.6 Mitigation measures – recommendations

Issue raised

Sections 4.8.5, 4.12.2, 4.12.3 (pg 51, 80, 81)

Recommended mitigation measures include:

- Provision of adequate dispute resolution processes and communications

- A community communications strategy must be prepared outlining the engagement (including consultation) activities that would support the design and construction of the project. The proponent must work with the appointed construction contractor to prepare and implement the Strategy based on Appendix E (Community consultation framework). The purpose of the Strategy is to guide interactions with the community and stakeholders and set standards for proactive engagement. The Framework must detail:
  - Consultation purpose and objectives
  - Stakeholder identification
  - A complaints management system inclusive of the minimum methods to be established and available for community enquiries and complaints for the duration of construction
  - How data will be collected, monitored, reported and analysed during construction
  - Establishment of a focus group to discuss the project's performance and benchmark the effectiveness of the engagement activities - noting that engagement activities/processes would be modified as required, based on feedback and/or issue that arise during the monitoring process
  - Mechanisms for distributing information and seeking feedback, which will be detailed in the Strategy
  - Specific issues management, as some aspects of the project's construction will require specific communications and/or management strategies due to the nature of the potential impact and/or stakeholder group. Indicative communications and management strategies are identified for traffic management (including property and pedestrian access), landscaping and urban design, construction activities and out of hours work, and noise and vibration mitigation and management. With the latter to be detailed in a construction noise and vibration management plan
- Many community members may seek assistance from Council in representing their concerns about the project. Consideration of funding for additional North Sydney Council staff throughout the duration of the project to facilitate communication with the community and negotiate appropriate outcomes.

Response

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 to ensure the objectives and outcomes of the community communications strategy are delivery to a high level. Section 5.1 of Appendix E (Community consultation framework) discusses minimum requirements for the community communications strategy. As per environmental management measure SE4 (refer to Table D2-1 of this submissions report), the community communications strategy would be guided by the Community consultation framework.

Specific issues management is incorporated in Section 7 of Appendix E (Community consultation framework). Commitments to community consultation for traffic, land use and noise and vibration construction impacts have been incorporated by environmental management measures CTT4, CTT5, CTT10, CNV3, CNV8, CNV9, CNV10, LP2 and LP3 (refer to Table D2-1 of this submissions report), 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 environmental management measure CNV1 (refer to Table D2-1 of this submissions report).

Section 7.3 of Appendix E (Community consultation framework) advises that meetings would be held with stakeholders near construction support sites and worksites, especially residents and businesses to understand and address their issues and improve outcomes where reasonable and feasible. 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. Figure 3-1 of Appendix E (Community consultation framework) demonstrates a typical enquiries and complaints handling process which the project is likely to adopt.

Funding for additional North Sydney Council staff would not be provided by Transport for NSW.

B14.7 Construction traffic and transport

B14.7.1 Public and active transport

Issue raised

Section 4.5.2 (pg 38)

Council raised concerns about impacts to shared user paths during construction and the resulting additional travel distances for pedestrians and cyclists.

- Access to the underpass on the eastern side of the Falcon Street bridge would be permanently closed during the initial stage of the Warringah Freeway Upgrade works. Usage of this underpass is very low (12 movements per hour), however diversions via existing zebra and signalised crossings at Falcon Street and Military Road would result in up to 380 metres extra travel distance
- Access on the Jeaffreson Jackson Reserve shared user path would be diverted via temporary adjustments during construction of the new shared user bridge resulting in an additional 400 metres of travel distance
- Access on the Warringah Freeway shared path adjacent to the Cammeray Golf Course would be temporarily realigned to travel along the rear of the construction support site to connect to the Merlin Street and Ernest Street intersection. This would result in an additional 100 metres of travel distance for these users, however, would not coincide with the Jeaffreson Jackson Reserve diversions.

Response

Transport for NSW recognise that the proposed changes to existing shared user paths to facilitate construction would marginally increase distances and travel times, but considers these relatively small increases are preferable to not maintaining the connectivity of these paths. Transport for NSW notes, however, that it would not always be possible to provide temporary diversions that do involve some increase in distance and travel time. Transport for NSW has minimised the length of temporary diversion wherever practicable.

Environmental management measure CTT18 (refer to Table D2-1 of this submissions report) aims to minimise direct impacts to existing shared user paths. Any detours and adjustments will be designed with consideration of user safety and journey time.

Ongoing consultation would be carried out with local councils and bike groups to minimise traffic and transport impacts during construction. Environmental management measure CTT5 (refer to Table D2-1 of this submissions report) also states that the community will be notified in advance of proposed transport network changes.

B14.7.2 Parking

Issue raised

Section 4.5.4 (pg 38)

Parking in the North Sydney local government area is in very high demand. Council raised concerns about the loss of parking that would be felt by the community and place additional demand on the remaining limited parking resource in the surrounding localities.

- Temporary loss of approximately 32 parking spaces for the duration of construction in Ridge Street, Merlin Street and Ernest Street
- Up to 96 parking spaces would be removed on Alfred Street North between Wyagdon Street and Whaling Road to facilitate construction works.

Response

Transport for NSW acknowledges that there would be some loss of parking as a result of the project. Generally, projects involving surface road upgrade works will result in impacts to parking during the construction period. The loss of parking during construction has been considered and Transport for NSW has endeavoured to identify as much alternative parking as possible.

While there would be some loss of parking on Ridge Street, Ernest Street and Merlin Street, alternative parking on surrounding local roads would mitigate the loss of parking on these streets (as outlined in Table 8-17 of the environmental impact). Additionally, clearways currently operate on Ernest Street during peak periods, so any closure of the kerbside lane associated with the construction support site would only result in loss of parking outside of peak periods.

Transport for NSW acknowledge the loss of parking along Alfred Street North during construction, and that there is limited alternative parking. However, Transport for NSW is committed to investigating opportunities to reduce or offset the permanent loss of long stay parking spaces along Alfred Street North due to the project during further design development as per environmental management measure OT3 (Table D2-1 of this submissions report).

B14.7.3 Traffic changes

Issue raised

Sections 4.5.2, 4.5.5, 4.5.6 (pg 37, 39, 40)

The following concerns were raised about intersection performance and local access during construction:

- Projected 2024 cumulative construction traffic is expected to have significant impacts on intersection performance at several intersections, resulting in diversion or rat-running onto the local road network. The following intersections are expected to reduce to E or F service levels and are of particular concern:
  - Brook Street/Warringah Freeway off ramp (during morning peak hour)
  - Miller Street/Falcon Street (during morning peak hour)
  - Mount Street/Arthur Street (during evening peak hour)
  - Pacific Highway/Bay Road (during morning peak hour)
- Works associated with the Ridge Street pedestrian bridge reconstruction, Alfred Street widening, and Mount Street interchange would involve temporary long-term closures throughout construction which would impact local traffic access in Alfred Street North and the adjoining streets.

Response

Transport for NSW acknowledges these impacts to intersection performance and notes that they could be mitigated by considered and tailored construction traffic planning based on actual traffic conditions and confirmed cumulative activities at the time of construction (Section 5.6 of Appendix F (Technical working paper: Traffic and transport)). Tables 5-25 and 5-26 of Appendix F (Technical working paper: Traffic and transport) show that impacts to these intersections, and more importantly overall network performance, would be very minor; average delays would only increase by about two to 37 seconds, when compared to the 2024 performance without construction.

Environmental management measure CTT6 (refer to Table D2-1 of this submissions report) requires construction road traffic to be managed to minimise movements during peak periods. Additionally, environmental management measure CTT4 commits to ongoing consultation with (as relevant to the location) Transport Coordination within Transport for NSW (formerly the Sydney Coordination Office), the Port Authority of NSW, local councils, emergency services and bus operators to minimise traffic and transport impacts during construction.

Table 8-17 of the environmental impact statement notes that although temporary long-term closure of sections of Alfred Street North would be required during construction, access to properties along Alfred Street North would be maintained throughout construction via existing U-turn facilities or alternative routes on the local road network. Environmental management measure LP3 (refer to Table D2-1 of this submissions report) states that where impacts to private property access are unavoidable during construction, property owners will be consulted in advance to develop appropriate alternative access arrangements.

B14.7.4 Vehicle movements

Issue raised

Sections 4.5.2, 4.5.6 (pg 37, 39)

The following concerns were raised regarding the impacts of increased traffic volumes:

- Increases in traffic volumes on local roads as a direct result of construction would be felt by the community. Particularly on the residential streets of Bay Road, Balls Head Road, Ridge Street and Rosalind Street which are likely to see noticeable increases in overall traffic volumes and noticeable increases in the proportion of heavy vehicle traffic
- Council is of the opinion that increases in heavy vehicles poses a risk to vulnerable road users, including pedestrians and cyclists.

Response

Access to most construction support sites would be via State and regional roads with some exceptions where unavoidable. Environmental management measure CTT6 (refer to Table D2-1 of this submissions report) advises that construction road traffic will be managed to minimise movements during peak periods.

As noted in Section 5.3.4 of Appendix F (Technical working paper: Traffic and transport), the majority of construction support sites would be used for occasional works, generating low construction traffic volumes and therefore traffic impacts on local roads would be relatively low.

Bay Road and Balls Head Road are local roads that would provide access to the Berrys Bay construction support site (WHT7). However, the low volume of vehicle construction traffic generated by this site is not expected to substantially impact Bay Road and Balls Head Road (as per Section 5.3.4 of Appendix F (Technical working paper: Traffic and transport).

Ridge Street is also a local road that would be used by construction vehicles accessing the Ridge Street north construction support site (environmental management measure WHT9) during early works and site establishment, with primary access to be provided directly from the Warringah Freeway. Relatively low traffic impacts are anticipated, given the limited use of this access once the

site is established (as shown in Table 5-12 of Appendix F (Technical working paper: Traffic and transport). Vehicle movements generated by the Ridge Street east construction support site (WFU6) would not substantially impact traffic conditions on Ridge Street due to the low construction volumes anticipated.

Traffic impacts to Rosalind Street would also be relatively low (as per Section 5.3.4 of Appendix F (Technical working paper: Traffic and transport).

Information will be conveyed to drivers, cyclists and pedestrians during construction with regard to potential delays, traffic diversions, speed restrictions, or alternative routes in accordance with environmental management measure CTT8 (refer to Table D2-1 of this submission report). This will include directional signage, barriers and/or line marking as required, supplemented by variable message signs. In addition, the community will be notified in advance of any network changes as required by environmental management measure CTT5 (refer to Table D2-1 of this submission report).

Construction works would be appropriately managed and controlled so to not be detrimental to pedestrians and cyclists or result in unsafe situations. This will include requirements under environmental management measure CTT7 (refer to Table D2-1 of this submission report) including manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence as appropriate.

A construction traffic management plan for the project would be prepared as outlined in Section D1 of this submissions report. It would be prepared in accordance with *Austroads Guide to Road Design* (with appropriate Transport for NSW supplements), the RTA *Traffic Control at Work Sites* manual and AS1742.3: *Manual of uniform traffic control devices – Part 3: Traffic control for works on roads*, and any other relevant standard, guide or manual. The construction traffic management plan would:

- Document project-related heavy vehicle routes and any associated restrictions of use
- Include a Heavy Vehicle Code of Conduct and truck management strategy
- Include the following measures to minimise impacts of construction vehicle movements (which would be implemented as part of standard construction site practices, including inductions and toolbox talks as appropriate):
    - All drivers would be inducted specifically for the project and its designated construction traffic routes
    - The driver induction process would include safety awareness in relation to all road users and a requirement to walk and ride around the construction site and any key locations identified as having high levels of conflict to gain an understanding of the needs of vulnerable road users.

B14.7.5 Adequacy and accuracy

Issue raised

Section 4.5.2 (pg 37)

The temporary occupation of land within ANZAC Park would be required to support construction activities. There is no further detail about what specific activities would be undertaken within ANZAC Park and at what stage in the project schedule this would occur.

Response

Construction at ANZAC Park would be required to augment the existing drainage network in the vicinity of the park (as described in Section 6.5.4 of the environmental impact statement). These drainage works are proposed to reduce flooding risk in this area. The section of the land that would be used comprises less than 10 per cent of the total area of ANZAC Park. The temporary lease of this area during construction of the Warringah Freeway Upgrade component of the project would not

impact on the long term viability of the site, which would continue to be used for public recreation and open space. A clarification has been added to Section A4.1.8 of this submissions report to clarify the intended use of ANZAC Park.

The environmental impact statement is based on a concept design and indicative construction methodology. During the construction planning, the construction contractor would develop a detailed construction methodology. The specific activities that would occur in ANZAC Park and where they would occur would be confirmed at that time, including quantifying specific potential impacts to ANZAC Park. Transport for NSW would continue to liaise with North Sydney Council regarding matters of interest and relevance to North Sydney Council, including works within ANZAC Park as required, in accordance with the Community communication strategy which would be guided by the Community consultation framework in Appendix E of the environmental impact statement (as per environmental management measure SE4).

The additional information in Appendix 1 (Summary Table – Construction site traffic impacts) of the North Sydney Council submission is noted.

B14.7.6 Mitigation measures – recommendations

Issue raised

Section 4.5.7 (pg 40)

Recommended mitigation measures include:

- Site specific construction traffic management plans for approval by North Sydney Traffic Committee or Sydney Coordination Office in consultation with North Sydney Council
- Heavy Vehicle Road Safety Campaign coordinated by Transport for NSW
- Site specific green travel plans including consideration of shuttle bus services between public transport hubs and construction support sites to reduce number of private vehicle trips of construction workers
- All pedestrian and cycling facilities and shared user paths, including temporary diversions, must be designed and constructed in accordance with RMS *Bicycle Guidelines and Austroads Cycling Guidelines*.

Response

The inclusion of a construction traffic management plan would form part of the construction environmental management plan (refer to Section D1 of this submissions report). A Heavy Vehicle Code of Conduct and truck management strategy would be developed as part of the construction traffic management plan.

Additionally, environmental management measure CTT4 (refer to Table D2-1 of this submissions report) commits to ongoing consultation with (as relevant to the location) Transport Coordination within Transport for NSW (formerly the Sydney Coordination Office), local councils, emergency services and bus operators to minimise traffic and transport impacts during construction.

The construction workforce would be encouraged to use public transport in relation to each of the construction support sites. The use of shuttle bus services for construction staff are a matter for the construction contractor. This would be considered during the development of the detailed construction methodology at the construction planning phase.

In accordance with environmental management measure CTT19 (refer to Table D2-1 of this submissions report) direct impacts to existing shared used paths will be minimised where reasonable and feasible. All changes to existing shared user paths and temporary diversions would be designed with consideration of user safety.

B14.8 Operational traffic and transport

B14.8.1 Public transport

Issue raised

Sections 4.1.2, 4.2.3, 4.3.6 (pg 18, 24, 29)

Council raised the following concerns about the project's impact on current and future public transport services:

- Arterial motorways result in the undermining of existing public transport services (mode shift to private vehicle due to short term improved traffic travel times) and under-investment in future public transport infrastructure and services (the Downs-Thompson Paradox)
- Increased accessibility by private transport increases demands for further expansion of the motorway network. This will come at the detriment of future expansion of Sydney's public transport networks, which Sydney will increasingly rely on to efficiently and safely transport existing and future population
- The environmental impact statement highlights the potential for more direct bus services running through the Western Harbour Tunnel as a project benefit, but also notes that new public transport services are not proposed as part of the project.

Response

The project is one of a suite of transport projects in the Sydney Metropolitan area that include a number of major public transport projects. This integrated transport approach is designed to ensure an adequate level of investment in both existing and future public transport.

The existing harbour crossings are increasingly being used to bypass the North Sydney and Sydney central business districts rather than accessing them. While accessing the central business districts might best be served by public transport, 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. While the inclusion of new public transport services is not proposed as part of the project, the project would create opportunities for new, or extension of existing, public transport services for further investigation through complementary initiatives such as the North Sydney Program. These new service opportunities would benefit from the same increases in catchment size as private vehicles.

The Warringah Freeway and Sydney Harbour Bridge forms a corridor of critical importance due to its role in providing the primary bus corridor to and from the Sydney CBD. The project would materially improve the functionality and performance of the bus network, in particular the reliability and optionality for both long distance and inner North Shore services, and efficiency of the Warringah Freeway and Sydney Harbour Bridge southbound bus lane, which services about 57,500 bus commuters each week (as per Section 4.3.5 of the environmental impact statement). As outlined in Appendix F (Technical working paper: Traffic and transport), existing public transport services would save up to 20 minutes of travel time crossing Sydney Harbour as a result of improved bus priority and reduced congestion on Warringah Freeway and the Sydney Harbour Bridge. Table 5-13 of the environmental impact statement outlines the new and upgraded bus infrastructure would be provided as part of the Warringah Freeway Upgrade.

The continuing development of the Sydney Metro network will facilitate a mode shift from private cars to public transport along the Metro routes. Sydney Metro projects and associated mode shifts have been incorporated into the traffic modelling (refer to Section 3.3.2 of Appendix F (Technical working paper: Traffic and transport)) however, the modelling still demonstrates the need for additional cross-harbour motorway capacity. The design of the project has also been carried out with this mode shift in mind to provide opportunities for interchange with metro and rail services, and facilitate the movement of trips that do not have the option to travel by rail.

Traffic growth on new or upgraded roads can appear as induced traffic demand (new trips). However, traffic growth can also be influenced by population growth, increased economic activity or trips attracted from competing routes or modes resulting from improved travel times. These factors have all been included in the traffic forecasting model used for the operational traffic and transport assessment in the environmental impact statement. Appendix F (Technical working paper: Traffic and transport) notes that induced demand would result in a negligible impact to the traffic network.

B14.8.2 Parking

Issue raised

Section 4.5.4 (pg 38)

There would be a net loss of 73 parking spaces on Alfred Street North. Up to 96 parking spaces will be removed on Alfred Street North between Wyagdon Street and Whaling Road during construction, and only 23 of those spaces would be replaced at the completion.

Response

As discussed in Section B14.7.2 above, Transport for NSW is committed to investigating opportunities to reduce or offset the permanent loss of long stay parking spaces along Alfred Street North due to the project during further design development (refer to environmental management measure OT3 in Table D2-1 of this submissions report).

B14.8.3 Traffic changes

Issue raised

Sections 4.1.2, 4.2.5, 4.3.2, 4.4.1, 4.4.4 (18, 25, 28, 30, 33)

The following concerns were raised regarding traffic changes during project operation:

- Analysis of environmental impact statement modelling in Appendix F (Technical working paper: Traffic and transport, Part 1) shows that the increased capacity provided under the "with project" scenario, results in increased traffic using existing Harbour crossings to enter constrained road networks in the Sydney CBD as well as dramatic increases in congestion on roads in and around the North Sydney CBD. Any contended arterial network capacity improvements need to be carefully balanced against additional congestion impacts on more constrained local networks. The demonstrated imbalance and direct impacts arising as a result of this project brings its effectiveness further into question
- Figure 4 of Council's submission presents an analysis of delays and intersection level of service in and around the North Sydney CBD and demonstrates how proposed changes to road access and network arrangements in North Sydney Central Business District (CBD) would result in dramatic increases in congestion in and around the North Sydney CBD. The project would see significant net additional traffic on Berry Street, Miller Street, Falcon Street and Pacific Highway (south of Falcon Street)
- Removal of the left turn slip lane between the Warringah Freeway (northbound) and Falcon Street (westbound), means that all northbound Pacific Highway traffic, with destinations between Crows Nest and Chatswood, would be channelled through the North Sydney CBD. This is a major change from the 50-50 split that currently occurs between the Pacific Highway and Falcon Street routes and the currently preferred vision identified in the North Sydney Program, which sought to encourage more traffic to use the Falcon Street route instead of the Pacific Highway through the North Sydney CBD
- Channelisation of access between Ernest Street and Sydney Harbour Tunnel is also likely to result in more traffic on Military Road.

Response

Balance of impacts, intersection level of service and increased congestion

Overall, although the project would generally improve network performance for roads surrounding North Sydney, it would not resolve localised performance issues at a number of intersections. However, considering that the project would facilitate an overall net increase in traffic flows and average network speeds in North Sydney, this is considered a balanced and acceptable outcome (as per Section 7.5.3 of Appendix F (Technical working paper: Traffic and transport)).

Section 7.5.3 of Appendix F (Technical working paper: Traffic and transport) also notes that the proposed road integration works and resultant traffic performance in the North Sydney area have been developed in the context of the growing North Sydney CBD environment. The project seeks to maintain an appropriate level of traffic movement while also preserving capacity and connectivity for other customers whose needs conflict with traffic, particularly pedestrians. Options to further increase traffic performance at intersections throughout the area have been investigated. However, these alternative options would result in further impacts on other customers. The proposed works are considered to provide a balanced and integrated transport network through North Sydney. Further refinements to movement and place outcomes within the North Sydney CBD may occur as part of the North Sydney Program works.

The analysis of delays and intersection level of service in and around the North Sydney CBD shown in Figure 4 of the North Sydney Council submission compares the existing base case (2016 data) level of service with those of the 'Do something' scenario (with project) for 2027 and 2037. However, it should be noted that modelled future performance for key intersections in the Warringah Freeway and surrounds study area under the 'Do minimum' scenario (without the project) indicates that a large proportion of intersections in North Sydney would perform at capacity at LoS F during peak periods by 2037 (as per tables 6-22 and 6-23 of Appendix F (Technical working paper: Traffic and transport). This shows that without the project, intersections around North Sydney CBD would still experience an increase in congestion, compromising streetscapes, views, physical safety, air pollution and noise levels, and liveability.

Section 7.5.3 of Appendix F (Technical working paper: Traffic and transport) notes that the proposed phasing and access changes around the intersection of Miller Street and Berry Street would simplify the operation and increase the capacity of these corridors to offset potential additional delays associated with increased demand along these corridors under the project during the morning peak.

Removal of left turn slip lane (Warringah Freeway (northbound) and Falcon Street (westbound))

The statement that all northbound Pacific Highway traffic with destinations between Crows Nest and Chatswood will be channelled through the North Sydney CBD is incorrect. As described in Table 5-9 of the environmental impact statement, access from the Warringah Freeway northbound to Falcon Street westbound would be removed to accommodate the Falcon Street off ramp from the Western Harbour Tunnel. The adjacent interchanges at Ernest Street and Miller Street to the north would provide similar, alternative connectivity to that currently provided by Falcon Street. There are also motorway interchanges at Brook Street, Willoughby Road, Reserve Road, and the Pacific Highway in the Artarmon area. All of these interchanges provide alternative access routes without requiring motorists to travel through the North Sydney CBD.

Impacts to Military Road

Section 9.4.4 of the environmental impact statement acknowledges that under the 'Do something' scenario, the intersection of Ben Boyd Road and Military Road would operate with higher delays as a result of the project (when compared with the 'Do minimum' (no project) scenario) due to changes to access and travel patterns at the Ernest Street and Falcon Street interchanges. Table 9-8 of the environmental impact statement shows that there would only be an average delay of about one minute at this intersection under the 'Do something 2027' scenario.

The works in the area proposed by the project seek to maintain an appropriate level of traffic movement while also preserving capacity and connectivity for other customers whose needs conflict

with traffic, particularly pedestrians. Additionally, minor delays at local intersections would be offset by the substantial travel time savings on the broader network (via the Warringah Freeway and Sydney Harbour crossings).

B14.8.4 Modelling and planning

Issue raised

Sections 4.1.2, 4.1.4, 4.3.4, 4.3.6, 4.4.2, 4.4.3, 4.4.5, 4.4.7 (pg 18, 19, 28, 29, 31, 32, 34, 36)

Council question the analysis of the operational traffic modelling and the assumptions used which affect the accuracy. Specific concerns include:

- Arterial motorways result in induced traffic demand. As additional capacity fills, the demand for even more infrastructure for incident management/network resilience also increases
- Modelling uses LU16vl.3 (2017) population growth assumptions, reflective of *A Plan for Growing Sydney* (DPE, 2014) population growth projections, rather than more recent population forecasts based on growth targets detailed in the Greater Sydney Commission's District Plans. Sydney Strategic Travel Model assumptions were updated in 2019 to reflect the new population growth targets and the land use planning strategies detailed in the Region Plan
- The environmental impact statement notes that Sydney Metro West is not included in its modelling assumptions. This means that the mode shift impacts of Metro West, including reduced traffic demand in the Rozelle area, is not accounted for in the project modelling. This results in traffic demand and congestion being overestimated in the "no project" scenario with future congestion reduction and improved travel time then over-estimated under the "project" scenario as a result
- Travel time improvements within the Warringah Freeway Corridor are in some part, due to the impact that Metro mode shift is expected to have on traffic demand in the Metro corridor
- Analysis of the modelling (Figure 5) reveals that short-term AM peak bus travel time benefits are off-set by poorer travel times in the PM peak and would disappear rapidly in the medium-term under the "project" scenario. Given that no additional bus services and limited bus infrastructure improvements are delivered as part of the project, these short-term bus travel time benefits may be more reasonably attributed to the impact of Sydney Metro on traffic demand in the project area
- Traffic network modelling seems to show traffic demand expanding beyond the expected ceiling capacity of certain network links in the "no project" scenario. This approach appears erroneous in that when (or if) traffic conditions pass tolerable levels, motorists (particularly those driving by choice rather than absolute necessity) typically turn to alternative routes, move to public transport or adjust journeys. This results in traffic demand and congestion being overestimated in the "no project" scenario with future congestion reduction and travel time benefits then over-estimated under the "project" scenario
- The project may not deliver on the congestion reduction objectives outlined in the environmental impact statement. Analysis of the data in Figure 3 shows that:
    - Under the "project" scenario, there will be more southbound traffic entering the Sydney CBD via existing Harbour crossings than in 2016
    - Within one year of opening, the project will stimulate +26% and +18% total traffic growth for Harbour crossings in the PM and AM peak respectively, with +42% and +35% additional traffic demand stimulated by the projects by 2037
    - Short-term reductions in traffic demand for Harbour Bridge northbound lanes will disappear in the longer term and, although there will be more significant reductions in

northbound traffic demand in the Sydney Harbour Tunnel in the short-term, this will edge back towards equilibrium by 2037.

- Travel time improvements within the Warringah Freeway Corridor do not appear to account for downstream delays due to limited traffic capacity in the Sydney CBD
- Travel time improvements within the Warringah Freeway Corridor rely on channelisation of specific trips within the Warringah Freeway, which could be achieved with or without the introduction of WHT.

Response

Traffic modelling for the environmental impact assessment has been carried out in accordance with appropriate standards and guidelines, and developed, reviewed, and endorsed by Transport for NSW subject matter experts. Specific responses to issues raised by Council are provided below.

Induced demand

The traffic forecasting model has considered all factors influencing traffic growth including induced demand. Induced demand equates to about 0.3 per cent additional daily trips in the Sydney metropolitan area in 2037, which would result in a negligible impact to the traffic network. The operational travel benefits outlined are therefore inclusive of forecast induced traffic demand. This is discussed in Appendix F (Technical working paper: Traffic and transport).

Population growth assumptions

The key strategic transport planning model used in the Sydney greater metropolitan area is the Strategic Travel Model (STM), which is managed by Transport for NSW Transport Performance and Analytics. The STM considers population and employment projections and includes the capability to address future changes in land use, trip distribution and mode choice as well as producing traffic demand during peak and off peak periods. The population and employment projections are based on the latest land use data available at the time of forecasting. The data was consistent with demographics released by NSW Department of Planning, Industry and Environment in 2017 (version Land Use (LU) 16v1.3).

Further, recent sensitivity testing using updated land use scenarios has indicated little material difference in strategic transport demand between the various scenarios tested.

Sydney Metro West project

At the time of preparation of the environmental impact statement and related assessments, the Sydney Metro West was recently announced by NSW Government and is planned to link Parramatta and Sydney CBDs and serve Sydney Olympic Park and The Bays along the route. This project was at the early stage of development during preparation of the environmental impact statement and was not yet a committed project at the time of the environmental impact assessment and has not been included in the future strategic modelling (as per Section 3.3 of Appendix F (Technical working paper: Traffic and transport)). The Sydney Metro West environmental impact statement has since been placed on public exhibition and has considered the Western Harbour Tunnel and Beaches Link program of works in its traffic and transport assessment.

While the Sydney Metro is aimed at transporting passengers between residential areas and city centres (commuters), the Western Harbour Tunnel and Warringah Freeway Upgrade project would service buses, freight, commercial and many other individual journey needs with diverse origins and destinations. Considering that the Sydney Metro West project and the project serve very different transport functions and origins and destinations, it is unlikely that inclusion of the Sydney Metro West project would have a large influence on the modelling.

Sydney Metro mode shift

The development of the project has considered this mode shift and provides opportunities for interchange with metro and rail services, and facilitates the movement of trips that do not have the option to travel by rail (as per Section 2.4 of Appendix F (Technical working paper: Traffic and

transport). The project would form part of an integrated transport network; travel time improvements can be attributed to these collective upgrades to the network.

Data inputs into the Sydney Motorway Planning Model (SMPM) have included the Sydney Metro Northwest and Sydney Metro City & Southwest projects (as per Section 3.3 of Appendix F (Technical working paper: Traffic and transport). Table 3-1 of Appendix F (Technical working paper: Traffic and transport) also provides a summary of modelled scenarios ('Do minimum', 'Do something' and 'Do something cumulative') showing inclusion of the Sydney Metro.

Section 2.4 of Appendix F (Technical working paper: Traffic and transport) considers the Chatswood to Sydenham component of Sydney Metro City & Southwest project. This component of Sydney Metro would influence travel patterns within the footprint of the full program of works particularly around the Lower North Shore, with metro stations provided at Victoria Cross in North Sydney, Crows Nest and Chatswood, as well as multiple locations within the Sydney CBD. By relieving rail capacity constraints crossing Sydney Harbour and opening up Sydney's northwest to rail, its opening in 2024 would substantially increase the capacity of the public transport network to serve trips crossing Sydney Harbour, facilitating a mode shift from private cars to public transport. This mode shift, however, applies only to a portion of trip purposes in Sydney (ie commuters). 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. Strategic transport modelling completed by Transport for NSW indicates that there will still be need for additional road transport capacity at the crossing of Sydney Harbour to cater for future demands post Sydney Metro City & Southwest (as per Section 4.3.5 of the environmental impact statement).

Bus travel time benefits

Overall, the project would deliver substantial benefits to traffic travelling on the Sydney road network, with trips between strategic centres saving up to 15 minutes when crossing Sydney Harbour during peak periods (refer to Section 7.1 of Appendix F (Technical working paper: Traffic and transport)). Existing bus services would save up to 20 minutes of travel time crossing Sydney Harbour as a result of improved bus priority and reduced traffic conflicts on Warringah Freeway, while the project itself could facilitate the operation of express buses that would provide direct access between major centres on the Lower North Shore and Inner West.

Section 7.5.5 of Appendix F (Technical working paper: Traffic and transport) predicts that in the 'with project' scenario:

- Travel times for buses from Gore Hill Freeway to the Sydney Harbour Bridge would improve substantially, particularly southbound during peak periods. This is due to the reconfiguration of the southbound bus lane between Miller Street and the Cahill Expressway, which has been separated from the general traffic lanes, removing two existing weave movements between buses and cars. Buses would no longer be required to merge from left to right to access the bus lane from the north, and cars would no longer be able to cross the bus lane between Falcon Street and the Cahill Expressway
- Travel times for buses travelling to and from Falcon Street would improve as a result of the reconfiguration of the southbound bus lane, which removes the existing conflict with general traffic, and also as a result of the reduction in traffic demand to the Willoughby Road and Falcon Street ramps, which would otherwise block access to the northbound bus off ramp to Falcon Street
- Travel times on bus routes through North Sydney via Miller Street would generally be maintained, although some localised delays could occur during the busiest peak periods
- Travel times on bus routes through North Sydney from Pacific Highway would increase during the busiest peak periods. This is due to the increase in demand and congestion between Berry Street and Miller Street as a result of redirecting traffic from Miller Street

(resulting from the removal of the existing right turn from Miller Street northbound to Berry Street eastbound).

The analysis of the bus travel times shown in Figure 5 of the North Sydney Council submission compares existing travel times with those of the 'Do something' scenario for 2027 and 2037 for the Warringah Freeway and surrounds. However, it should be noted that modelled bus travel times for key routes in the Warringah Freeway and surrounds study area under the 'Do minimum' scenario (without the project) indicates that southbound bus travel times through North Sydney CBD, either via Pacific Highway or Miller Street, would increase in the future (as per Section 6.4.3 of Appendix F (Technical working paper: Traffic and transport)). For buses travelling into Sydney CBD, increased queues from the additional traffic travelling through the Cahill Expressway via Sydney Harbour Bridge would result in queuing across the bus lane south of Falcon Street and south of High Street. This would substantially increase travel times to the Sydney CBD from Gore Hill Freeway and North Sydney, as these queues are likely to block access for buses travelling along this lane.

It is acknowledged that the project would also increase traffic demands at either end of the project, where it would integrate with the existing transportation network. However, the delays associated at these locations would be offset by the large travel time benefits provided by the project at the broader network level. The connections between the Warringah Freeway Upgrade component and surface roads have been developed to minimise the impact of additional travel facilitated by the project and ensure that the competing needs of customers (including private vehicles, public transport passengers, cyclists and pedestrians) have been incorporated into a balanced approach to movement and place outcomes (as per Section 7.1 of Appendix F (Technical working paper: Traffic and transport).

'Do minimum' capacity considerations

The environmental impact statement is informed by the NSW Government's standard integrated land use and multi-model transport forecasting approach. This is a typical 4-stage transport forecasting approach which accounts for the trip generation, trip distribution, mode choice, and route assignment factors noted. It also accounts for other key factors including the potential for induced demand.

An overview of this approach is provided in Chapter 3 of Appendix F (Technical working paper: Traffic and transport). The transport forecasting and modelling process is consistent for all scenarios. The methodology used is consistent with other road and public transport projects.

Following the transport demand forecasting process, microsimulation (VISSIM) modelling has been used to further refine the traffic analysis. Future traffic demands adopted in VISSIM traffic modelling has been informed by the Sydney Motorway Project Model (SMPM). SMPM is a strategic level model which assigns and distributes forecast traffic demands onto the broader Greater Sydney road network. As such, high level traffic redistribution that may occur external to the traffic model study area has been factored into the development of future year traffic demands for the various project scenarios.

Where forecasts of demand are greater than available capacity they are refined when translated into microsimulation models (such as VISSIM) which includes hard-limit capacity constraints on the network (eg signals, priority controls, reduced speeds, vehicle interaction and behaviour), and further intervention on future year traffic demand assumptions are typically required. For the Warringah Freeway and surrounds area, during the future year traffic demand development process for microsimulation modelling, the following hourly demand capacity limits were adopted to reflect existing network constraints:

- 2350 passenger car unit per hour per lane for Gore Hill Freeway, Sydney Harbour Bridge (Cahill Expressway) and Sydney Harbour Tunnel
- 2150 passenger car unit per hour per lane for Sydney Harbour Bridge (Bradfield Highway).

Further, as part of the reporting of model performance, a comparison of the number of "unreleased vehicles" at the end of the model period (ie excess forecast demand) was reported. This is an additional indicator of congestion, and reflective of capacity of the road network.

Operational traffic modelling analysis – congestion objectives

The analysis of the traffic demands at key locations shown in Figure 3 of the North Sydney Council submission compares existing demands with those of the 'Do something' (with project) scenario for 2027 and 2037 for the strategic corridors. However, it should be noted that forecast growth at key locations under the 'Do minimum' scenario (without the project) in Section 6.2.1 of Appendix F (Technical working paper: Traffic and transport) show a substantial growth in peak period cross Harbour trips of up to 21 per cent by 2037, with daily trips also forecast to increase by 21 per cent within the same period. Without additional capacity, these cross harbour routes will become substantially restricted in the future.

A summary of forecast growth at key locations for the 2027 and 2037 forecast years comparing the 'Do minimum' with 'Do something' scenarios is provided in tables 7-1 and 7-2 of Appendix F (Technical working paper: Traffic and transport). The traffic growth is due to a number of factors including population growth, economic activity, trips attracted from competing routes or modes due to improved travel times as opposed to being entirely stimulated by the project.

When analysing project impacts for the purpose of an environmental impact statement it is important to separate project and non-project effects. It is for this reason that a comparison between the same forecast year for alternative scenarios is carried out, as it separates the impacts of non-project and project traffic effects.

The percentage changes cited in North Sydney Council's submission do not provide an accurate assessment of the likely traffic effects attributable to the project. The environmental impact statement demonstrates that for the same forecast year (ie for the same underlying non-project assumptions), delivery of the project would reduce demand and consequent congestion on both the Sydney Harbour Bridge and Sydney Harbour Tunnel throughout the day.

Consideration of downstream delays in the Sydney CBD

Downstream delays and congestion in the Sydney CBD are directly reflected by Reduced Speed Areas and other factors in the microsimulation modelling carried out.

Section 3.4 of Appendix F (Technical working paper: Traffic and transport) discusses the operational modelling approach used. Detailed operational modelling was conducted to provide a more accurate understanding of the forecast performance of the road network. Microsimulation traffic models have the ability to reflect key network features such as traffic signal operations, freeway merging and weaving, and other detailed vehicle interactions based on individual vehicles and movements at specific times on the road network. They can also accurately identify network capacity constraints. Multiple surface interface models were used to assess the current and future year road network performance.

Each base model was calibrated to ensure a match between modelled and observed traffic demands. This was followed by validation of each model by comparing a secondary set of modelled and observed results – in this case, travel times for key traffic routes. Calibration and validation of the base models was carried out to demonstrate accurate representation of the existing road network and to enable a satisfactory level of confidence in the modelling of the future year scenarios with and without the project. Calibration and validation of the base models was carried out in accordance with the *Traffic Modelling Guidelines* (Roads and Maritime, 2013).

Channelisation of trips

Channelisation of trips alone would not achieve the travel time benefits that would be achieved by the project. The project's predicted travel time benefits are derived from the combined operation of both the Warringah Freeway Upgrade (including the proposed channelisation) and the Western Harbour Tunnel.

B14.8.5 Mitigation measures – recommendations

Issue raised

Sections 4.4.7 (pg 35, 36)

Updated travel demand and network modelling is recommended using the following modelling assumptions:

- Use of updated land-use planning assumptions reflective of the Greater Sydney Region Plan strategic land-use outcomes and North District Plan growth targets
- Inclusion of Metro West in network modelling assumptions
- Recognition of the impact of road ceiling capacities on traffic demand under "no project" scenarios. Assuming that the current motorway network is at/approaching capacity, the project should comparing these "ceiling limits" to future "with project" modelling scenarios.

Response

Based on the responses above in Section B14.8.4, Transport for NSW is satisfied that the network modelling carried out as part of the environmental impact statement is appropriate to enable the project to proceed to detailed design without further updates.

B14.9 Construction noise and vibration

B14.9.1 Property impacts

Issue raised

Sections 4.8.3, 4.10.2 (pg 50, 51, 54)

The following concerns were raised regarding potential vibration impacts from construction to structures:

- Where vibration levels are predicted to exceed the screening levels, detailed assessments of the impacted structures and attended vibration monitoring to ensure vibration levels remain below appropriate limits for that structure have not yet been provided
- A number of heritage structures in the North Sydney local government area are predicted to be within the minimum working distances for major vibration-generating activities and this presents an unacceptable level of risk. More detailed assessments specifically considering the heritage values of the structure in consultation with a heritage specialist have not yet been provided.

Response

During construction, some properties located above or near the tunnel alignment may experience short-term vibration impact due to the use of equipment such as rock hammers and roadheaders. For most properties, vibration levels would generally be below levels that may cause potential risk to buildings or structures. However, there is potential for cosmetic damage risks to a small number of properties closest to vibration intensive construction activities.

For structures where the screening level is likely to be exceeded, environmental management measure CNV6 (refer to Table D2-1 of this submissions report) requires a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure to be done during detailed design to determine the applicable safe vibration level and approach to construction near the 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.

In addition to the above measures, any heritage item predicted to exceed the screening level would be investigated during further design development and appropriate vibration criteria for the structure adopted as outlined in environmental management measure CNV6 (refer to Table D2-1 of this submissions report).

In accordance with CNV6, attended vibration monitoring will be carried out to ensure vibration levels remain below appropriate limits for potentially affected structures.

B14.9.2 Adequacy and accuracy

Issue raised

Section 4.10.2 (pg 54, 55)

Council raised concerns about the lack of information surrounding construction noise and vibration management and mitigation. Specific concerns included:

- Mitigation measures are identified to be implemented for surface road works, local area and utility works, where construction activities are predicted to exceed noise management levels at receivers. The environmental impact statement does not define the term 'feasible and reasonable' which is applied to the approach to mitigation measures
- The construction noise and vibration management plan for the project has not been provided at this stage. The environmental impact statement only provides a high level idea of what the construction noise and vibration management plan will contain, leaving an open ended and uncertain level of impact and mitigation measures
- The outcomes expected from mitigation are not specified, nor the number of receivers who will or will not benefit from mitigation works
- "Periodic' monitoring of construction noise and vibration impacts throughout all stages of the construction support sites has not been defined
- A Blast Management Strategy prepared in consultation with the NSW Environment Protection Authority has not been provided at this stage.

Response

Appendix G (Technical working paper: Noise and vibration) includes potential noise and vibration impacts as a result of the project and details of proposed management and mitigation measures.

The NSW Environment Protection Authority has issued the *Interim Construction Noise Guideline* (DECC, 2009) to provide guidance on assessing and managing construction noise. *The Construction Noise and Vibration Guideline* (Roads and Maritime, 2016) integrates and adapts, for Transport for NSW roads projects, the direction and guidance provided by several other policies, guidelines and standards, including the *Interim Construction Noise Guideline* (DECC, 2009), *Assessing Vibration: a technical guideline* (DECC, 2006), and *Australian criteria for blasting* (AS 2187.2 2006). The *Construction Noise and Vibration Guideline* is the key document providing guidance for the assessment and mitigation of construction noise and vibration on this project.

The terms 'feasible' and 'reasonable' are defined in *The Construction Noise and Vibration Guideline* (Roads and Maritime, 2016) as:

- Feasible: Relates to engineering considerations (what can be practically built). These engineering considerations may include:
  - The inherent limitations of different techniques to reduce noise emissions from road traffic noise sources
  - Safety issues such as restrictions on road vision
  - Road corridor site constraints such as space limitations
  - Floodway and stormwater flow obstruction

  - Access requirements
  - Maintenance requirements
  - The suitability of building conditions for at receiver treatments.
- Reasonable: Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure. The factors to be considered are:
  - The noise reduction provided and the overall number of people that benefit from the mitigation
  - Existing and future noise levels, including changes in noise levels in the build and design year and the extent of any exceedance of the noise criteria
  - Potential for a mitigation measure to reduce noise during construction as well as from road traffic after the project is complete
  - The cost of mitigation, including the cost of noise mitigation measures as a percentage of the total project cost and the ongoing maintenance and operational costs
  - Community views and preferences (typically gathered during the community consultation process following the noise assessment)
  - Visual impacts for the community surrounding the road project and for road users. These are typically identified in the Environmental Assessment
  - The wider community benefits arising from noise mitigation of the proposed road or road redevelopment
  - Relative weighting of treatments with respect to protection of outdoor areas or only internal living spaces

Construction noise and vibration management plan

A detailed construction noise and vibration management plan cannot be provided at this stage of project planning. The assessment of potential noise and vibration impacts in the environmental impact statement is based on the concept design and associated indicative construction methodology for the project. The contractor, once appointed, would further develop the design and associated detailed construction methodology. Actual noise and vibration levels due to the project due to the detailed construction methodology may differ from the levels predicted based on the indicative concept construction methodology. As the construction contractor (when engaged) develops the detailed construction methodology, it is appropriate for the contractor to also develop the detailed management and monitoring strategies based on noise and vibration predictions.

During construction planning, a construction noise and vibration management plan will be prepared for the project and implemented for the duration of construction as per environmental management measure CNV1 (Refer to Table D2-1 of this submissions report). The 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, 2016) 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 Statements to assist with designing and selecting of the appropriate mitigation and management measures

- Include protocols that will be adopted to manage works required outside standard construction hours
- Detail the methodology and approach for managing residual construction noise impacts
- Detail the process for managing construction vibration, including heritage structures considering all types of vibration generating works, including blasting
- 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
- Where feasible and reasonable, detail how construction noise impacts from concurrent or consecutive nearby construction works associated with the project will be managed.

As noted in environmental management measures CNV1 and CNV4 (refer to Table D2-1 of this submissions report) the approach to noise and vibration monitoring during construction will be described in the construction noise and vibration management plan, and would be based on the potential for amenity impacts due to the detailed construction methodology developed by the construction contractor (when engaged).

Following the implementation of all reasonable and feasible mitigation measures, it would not always be possible for the noise impacts to achieve the recommended noise management levels at all impacted receivers. In this case, additional mitigation measures would be implemented (such as respite and alternative accommodation) (refer to Section 6.10 of Appendix G (Technical working paper: Noise and vibration)). These measures would be detailed in site-specific Construction Noise and Vibration Impact Statements in accordance with environmental management measure CNV2 (refer to Table D2-1 of this submissions report).

Blast management strategy

Blasting is a construction technique that is often adopted on a sub-surface construction project. Controlled blasting has been used in other infrastructure projects in Sydney including WestConnex M8 (formerly New M5) and NorthConnex. Whether or not controlled blasting is adopted as a construction technique during project delivery is a matter for the contractor (when engaged). If proposed, the contractor would be best placed to prepare a blast management plan based details of the blasting proposal. It is not, therefore appropriate to develop and provide a blast management strategy at this time.

Section 10.6.2 of the environmental impact statement notes that where blasting is proposed during construction planning, potential overpressure and ground vibration impacts from blasting would be managed through site and blast specific assessments. Overpressure and vibration would be predicted during blast design which would include test blasts to establish appropriate blast charges and configurations to ensure the objectives and criteria identified in AS 2187.2-2006 Explosives - Storage and use – Part 2 Use of explosives are achieved. A blast management strategy would be prepared in consultation with the Environment Protection Authority during construction planning to demonstrate that all blasting and associated activities will 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. Refer to environmental management measure CNV9 (refer to Table D2-1 of this submissions report).

B14.9.3 Mitigation measures – recommendations

Issue raised

Section 4.10.5 (pg 59)

Clearer commitments and processes should be provided in relation to noise monitoring and mitigation works.

Response

Transport for NSW is currently preparing a Construction Noise Management Framework document in consultation with both the Department of Planning, Industry and the Environment and the NSW Environment Protection Authority. The Construction Noise Management Framework describes the approach the project will take to mitigating and managing construction noise impacts for works outside standard construction hours. The Noise Management Framework, which will be publicly available during construction, will outline the process for the implementation of additional measures to ensure that there is a consistent approach to the management of noise impacts along this corridor.

A construction noise and vibration management plan will be prepared to document, in more detail, how all mitigation measures would be implemented for the project. Environmental management measure CNV1 (refer to Table D2-1 of this submissions report) identifies the content of the construction noise and vibration management plan. As discussed above, the plan would include the mitigation measures from the *Construction Noise and Vibration Guideline* (Roads and Maritime, 2016) and details of when they would be implemented.

The noise and vibration environmental management measures listed in Table D2-1 of this submissions report clearly identify Transports for NSW's commitments.

B14.10 Operational noise and vibration

B14.10.1 Adequacy and accuracy

Issue raised

Section 4.10.3 (pg 56)

The project is predicted to decrease the number of receiver buildings exceeding the relevant noise criteria when compared to the 'Do Minimum' scenario during the day and night periods, at noise catchment areas surrounding the Warringah Freeway Upgrade and the Gore Hill Freeway Connection. This is due to traffic being moved from the existing surface roads into the proposed tunnels. However, this methodology and assumption does not account for induced demand.

Response

Operational road traffic noise scenarios have been informed by road traffic volumes from the Strategic Motorway Planning Model. As discussed in Appendix F (Technical working paper: Traffic and transport), the traffic forecasting model has considered all factors influencing traffic growth including induced demand.

B14.11 Air quality

B14.11.1 Health and wellbeing

Issue raised

Section 4.7 (pg 47)

The environmental impact assessment concludes that the appropriate design of ventilation outlets would achieve the same outcomes as installing air filtrations systems and do not represent an unacceptable health risk to the community. Communities surrounding the proposed ventilation outlets are not likely to accept any level of risk to human health. The precautionary application of a filtration system, in line with various international practices, is a more responsible approach to this issue and to satisfying the Secretary's environmental assessment requirements. The additional cost associated with this would be negligible in the context of the total project cost.

Response

The independent NSW Chief Scientist and Engineer has recently released a report in relation to road tunnel air quality. The report 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 modelling carried out demonstrates that the contributions to air quality at ground level due to emissions from the ventilation outlets would be minimal. The inclusion of tunnel filtration was evaluated and found not to provide any material benefit to air quality or community health as discussed in Chapter 12 (Air quality) of the environmental impact statement.

The discussion on tunnel ventilation and filtration in the environmental impact statement reflects the outcomes of the review completed by the Advisory Committee on Tunnel Air Quality (ACTAQ, 2018b). The ACTAQ assessment reviewed options for treating road tunnel emissions (ACTAQ 2018b). The review concluded that:

- Decisions on how to best manage tunnel air can only be made at the project level. Health-based air quality standards must be a priority; however, engineering and economic factors also need to be taken into account
- Air filtration systems in tunnels are rare around the world. They have high infrastructure, operating and maintenance costs
- Although filtration for particulates or NO_2 is technically feasible, the available technologies will not lower concentrations of other air pollutants
- Alternatives such as portal air extraction (no portal emissions) and dispersion via ventilation outlets can achieve the same outcomes as filtration at a lower cost.

It is further noted that due to the reduction in surface road traffic caused by diversion to the tunnels, the project would generally result in a better outcome for ambient air quality than conditions without the project.

The Western Harbour 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. Further, the monitoring of ventilation outlet emissions during operation would be regulated under an Environment Protection Licence prescribed under the POEO Act.

The NSW Government is committed to continuing to work with the Australian Government to implement cleaner fuels and cleaner vehicles including renewables, hence reducing emissions at source.

B14.11.2 Adequacy and accuracy

Issue raised

Section 4.7 (pg 47)

The following issues with the air quality modelling and impact assessment were raised:

- It is assumed that background air quality growth will continue on its current trajectory (under a no-project scenario). Modelled emissions increases (resulting from the project) are then represented as a portion or measure above the projected air quality. However, the modelling also takes some account of projected emissions reductions likely to occur over time, assumedly to present the proposed project in a more environmentally favourable light.
- A more general reassessment of the potential air quality impacts of the proposal should include:
  - Application of the soon to be revised NO_2 (Nitrogen Oxide) standards proposed in the National Environment Protection Measure (Ambient Air Quality)

- Sensitivity tests should be performed for the surface roads which could have a much greater impact on the predicted concentrations at sensitive receptors
- Consider the limitations in the assessment of odour impacts from traffic and reassess proposal
- Consider the limitations in the meteorological modelling and reassess proposal
- Assess and consider mitigation measures near surface roads such as barriers, setbacks, gradient, vegetative barriers, etc.

Response

The results of the air quality assessment (Section 8 of Appendix H (Technical working paper: Air quality)) are presented as changes in air quality, in addition to the total predicted concentrations at receivers.

The change (being an increase or decrease) is determined by comparing the 'Do minimum' (without project) scenario, with the 'Do something' (with project) or 'Do something cumulative' (with program of works), and is not dependent on background air quality.

Background air quality is not modelled, rather the total predicted concentrations for each scenario is determined by adding background air quality values to the modelling outputs. For example, in the case of the 'Do minimum' scenarios (which represents the network *without* the project), this means the total concentration at receivers is represented by the modelled surface road network plus the background air quality. As a result, the totals created when adding background levels are conservative as the background air quality levels inevitably contains some influence from existing traffic (which is also a modelled source).

Future background air quality has not taken into account any future reduction in emissions, as these are incorporated into the modelled sources (being the surface roads). Background air quality values have been selected, to the degree that is possible, to represent a background that has as little influence from existing traffic as possible.

The air quality assessment does not assume emission reductions to present the project in a more favourable light, the trend is simply noted as it reflects the likely scenario. Other changes likely to result in further improvements in background air quality, such as continued transition to alternatively fuelled low (or zero) emission vehicles, which could have placed the project in a more favourable light, have not been considered. Section 6.4 of Annexure K (Ventilation report) of Appendix H (Technical working paper: Air quality) confirms that the fleet forecast for ventilation design is considered to be conservative, in that it does not account for alternatively fuelled and low (or zero) emission vehicles such as hybrid, hydrogen or electric.

Key documents, guidelines and policies used for the preparation of the air quality assessment are outlined in Section 5.2 of Appendix H (Technical working paper: Air quality). Further, the air quality assessment satisfies the Secretary's environmental assessment requirements (refer to Table 12-1 of the environmental impact statement). This included the consideration of odour impacts during both construction and operation, as described in Section 5.4.1 and Section 5.4.5 of Appendix H (Technical working paper: Air quality).

There are always limitations with meteorological modelling. The data is described in detail in Annexure F of Appendix H (Technical working paper: Air quality) and analysed in accordance with current modelling guidance and protocols.

With regard to the NO_2 standards in the National Environment Protection (Ambient Air Quality) Measure, and used in the air quality assessment, these were 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 185 $\mu g/m^3$ and 39 $\mu g/m^3$, and to 164 $\mu g/m^3$ and 31 $\mu g/m^3$ by 2025.

Figure B14-3 and Figure B14-4 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.

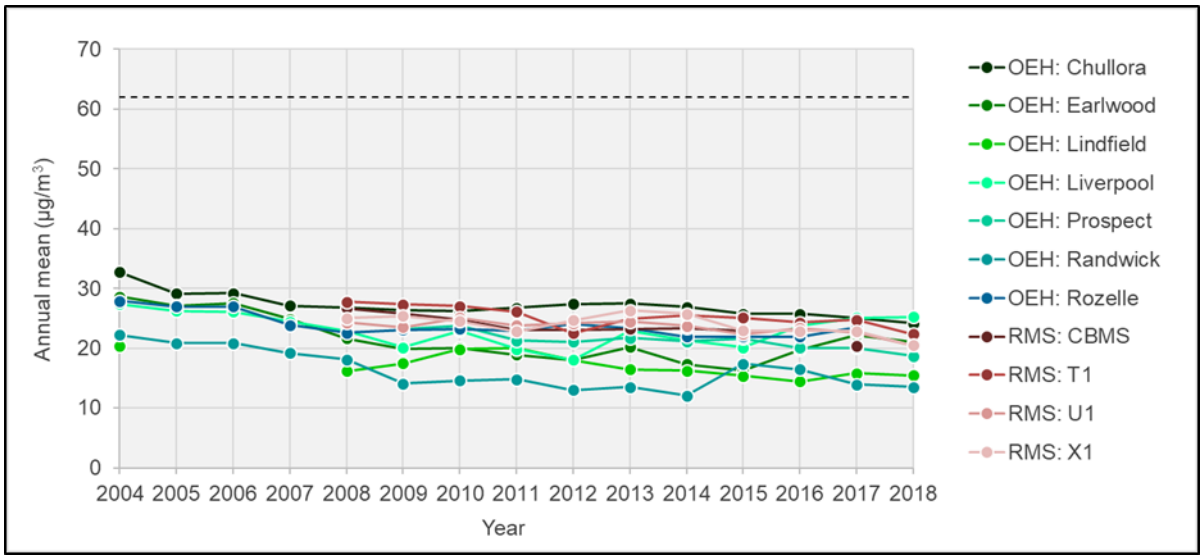


Figure B14-3 Trend in annual mean NO_2 concentration (Source: Annexure D of Appendix H (Technical working paper: Air quality))

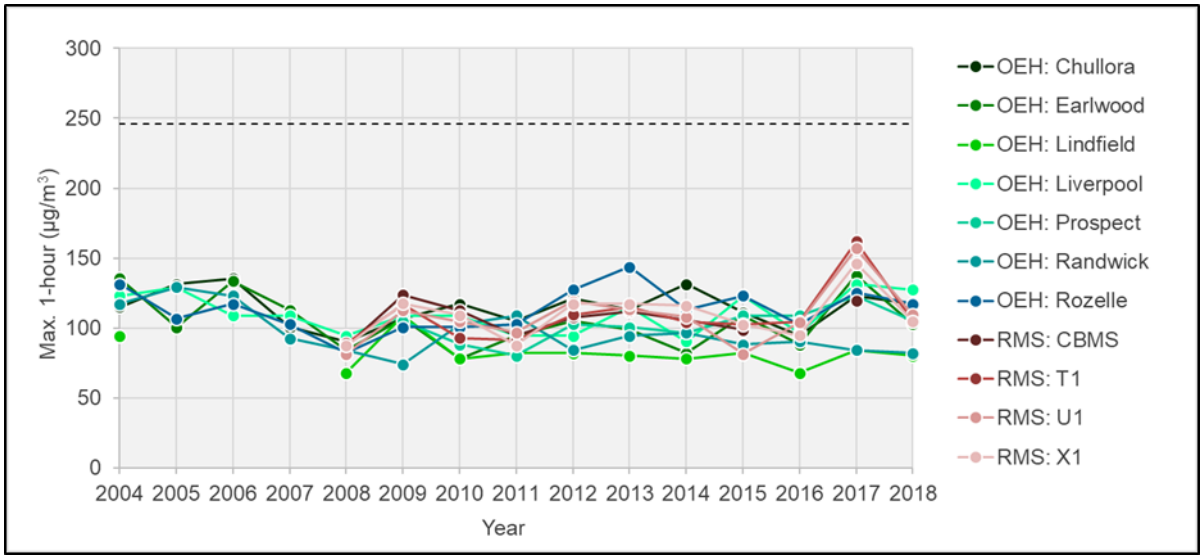


Figure B14-4 Trend in maximum one-hour mean NO_2 concentration (Source: Annexure D of Appendix H (Technical working paper: Air quality))

There were very few sensitive receptors 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 B14-5 is taken from Figure 8-30 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. The very few that are predicted to exceed do not exceed by much, 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).

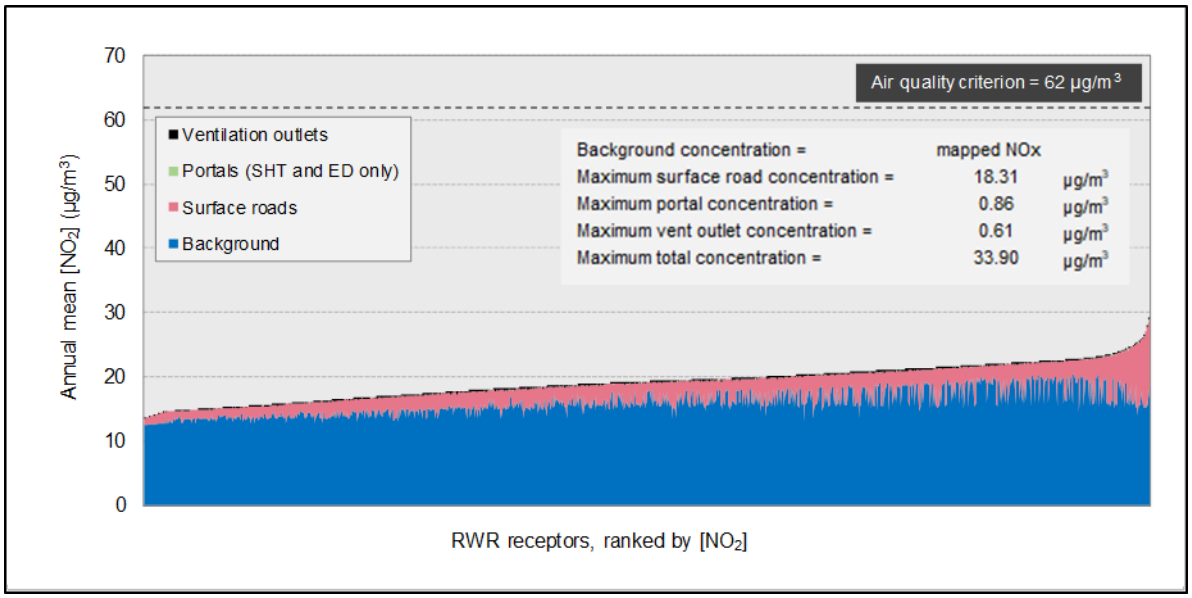


Figure B14-5 Source contributions to annual mean NO_2 concentration at residential, workplace and recreational receivers (Source: Figure 8-30, Appendix H (Technical working paper: Air quality))

B14.11.3 Ventilation outlets

Issue raised

Section 4.7 (pg 47)

The location of the proposed ventilation outlets is a key concern for the community as has been repeatedly articulated at various forums since the announcement of the projects.

Response

The independent NSW Chief Scientist and Engineer has recently released a report in relation to road tunnel air quality. The report 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 air quality assessment in the environmental impact statement determined that emissions from the ventilation outlets, under expected traffic conditions, at Rozelle Interchange and Warringah Freeway would not result in significant contributions to ground level concentrations of pollutants (refer to Section 8.4.1.11 of Appendix H (Technical working paper: Air quality)). Any predicted changes to ground level concentrations are driven by changes in traffic volumes on the modelled surface road network, not by the project ventilation outlets. The locations of the ventilation outlets, therefore, do not have any significant effect on air quality at ground level in the vicinity.

Section 4.5.3 of the environmental impact statement discusses the ventilation alternatives. The construction of the proposed ventilation outlet in Rozelle was approved as part of the M4-M5 Link project and would be located within the Rozelle Interchange.

The Warringah Freeway corridor was identified as the preferred location for the ventilation outlet to the north of Sydney Harbour. This location would provide the following key advantages:

- It would be immediately above the tunnel, with associated efficiencies (ie reducing power consumption for ventilation fans). 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. 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
- It would minimise the total project footprint, noting that alternatives would require additional property acquisition external to the existing road corridor.

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.

B14.11.4 Monitoring and mitigation

Issue raised

Section 4.7 (pg 47)

There is a need for real time dust monitoring programs for construction sites and other high risk areas, including the provision of localised air quality management plans.

Response

The assessment presented in Section 7 of Appendix H (Technical working paper: Air quality) for potential dust related impacts identifies the level of risk *prior* to mitigation. Overall, construction dust is unlikely to represent a significant impact, following the implementation of standard mitigation measures.

Standard construction air quality mitigation and management measures would be detailed in construction management documentation and implemented during construction. Refer to environmental management measure AQ1 (refer to Table D2-1 of this submissions report). This will include the identification of site-specific mitigation measures and will include site inspections to monitor for dust issues and check that appropriate mitigation measures are implemented.

B14.12 Aboriginal heritage

B14.12.1 General comments

Issue raised

Section 4.11.4 (pg 77, 78)

Section 4.9 of Appendix L (Technical working paper: Cultural heritage assessment) report – Ethnography needs to be updated as the term ‘Guringai’ is no longer considered appropriate to be used in the North Sydney region.

Response

The comment regarding the use of the term ‘Guringai’ is acknowledged. Section 4.9 of Appendix L (Technical working paper: Cultural heritage assessment report) uses the term ‘Guringai’ in a historical context.

A clarification has been added to Section A4.2 of this submissions report.

B14.12.2 Adequacy and accuracy

Issue raised

Section 4.11.4 (pg 77, 78)

The Aboriginal Heritage Office (AHO) reviewed the environmental impact statement and Aboriginal heritage assessment against the Secretary's environmental assessment requirements on behalf of North Sydney Council (included as part of North Sydney Council's submission). The AHO does not agree with the proposed route as it places a number of Aboriginal sites at risk of harm. The AHO believes the environmental impact statement does not adequately address the following:

- The socio-economic environment surrounding the nine Aboriginal sites
- The sites, especially Whale Rock, are used by community groups for education purposes, both within the Aboriginal community and across the broader community. The proposed area of construction contains these sites and access would be impacted. There are also insufficient details to enable a clear understanding of the social impacts, including cumulative impacts during the construction phase of the project should any of the sites be harmed or destroyed
- How any residual impacts to the nine identified sites would be managed or offset
- Management of the Aboriginal sites in the proposed construction area in the event that the sites are damaged
- The importance of the views and vistas relating to the nine identified sites and the importance of these sites in relation to the Sydney Harbour marine estate. The sites are only identified as locally significant to North Sydney, but they are significant to Sydney Harbour as a whole. Consequently, the AHO consider sites such as Whale Rock to be state significant, and they should not be impacted
- A comparative analysis informing the rarity and representative value of the Aboriginal sites. Whale Rock is the only site in Sydney Harbour with such varied and numerous engravings. It also has a modern focus of Aboriginal use.

Response

Throughout design development and refinement, the project's alignment and associated required infrastructure has been modified where possible, to avoid or reduce the impact to identified Aboriginal sites, particularly those of high significance. In particular, the location of construction support sites, and the use of cofferdams, were adopted in part to avoid land-based impacts to recorded Aboriginal heritage and areas of high archaeological potential (as per Section 8.1 of Appendix L (Technical working paper: Cultural heritage assessment report).

Section 7.1.2 of Appendix L (Technical working paper: Cultural heritage assessment report) discusses consideration of social significance of Aboriginal sites. Aboriginal people's views on the significance of archaeological sites are usually related to traditional, cultural and educational values. Aboriginal cultural significance was assessed from consultation with the nominated site officers for the relevant Registered Aboriginal Parties (RAPs) during and following field assessments. The statements of significance (Section 7.2 of Appendix L (Technical working paper: Cultural heritage assessment)) also provide an assessment of each Aboriginal site in the context of social, historical, scientific and aesthetic significance.

The Aboriginal cultural heritage assessment was carried out in accordance with the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime, 2011). The PACHCI applies the requirements of other relevant guidelines to road projects (refer to Section 15.1 of the environmental impact statement). The assessment of potential impacts are considered conservative and through implementation of the environmental management measures in Table D2-1 of this submissions report, there would be no residual impacts.

As outlined in tables 7-1 to 7-5 of Appendix L (Technical working paper: Cultural heritage assessment report), Waverton Park Cave (45-6-2181), Whale Rock (45-6-0026) and Quarantine Cave: Waverton (45-6-2180) were the only sites identified as having aesthetic significance near Sydney Harbour.

As described in Section 15.4 of the environmental impact statement and Appendix B of this submissions report, no Aboriginal heritage sites would be directly impacted by the project. As outlined in Table 1-1 of Appendix L (Technical working paper: Cultural heritage assessment report), a comparative analysis has not been deemed necessary as no Aboriginal heritage sites would be directly impacted by the project.

B14.12.3 Settlement/subsistence impacts to heritage

Issue raised

Section 4.11.4 (pg 77, 78)

The management and mitigation of 'Whale' Rock is of the greatest concern to the Aboriginal Heritage Office as it is one of the few rock engravings with multiple figures in Sydney Harbour and it has other heritage values. Section 8.2 of Appendix L (Technical working paper: Cultural heritage assessment report) identifies potential direct and indirect impact to the Aboriginal sites through vibration, settlement and subsidence. There is no known research regarding subsidence on rock engravings. Consequently, the safety of the rock engravings cannot be guaranteed. Projects of this nature have a (very recent) history of unexpected subsidence during construction. The potential for irreparable damage caused due to unexpected subsidence must be highlighted as of paramount importance. The identification of potential to harm Aboriginal sites triggers the application of an Aboriginal Heritage Impact Permit (AHIP) from the NSW Department of Planning, Infrastructure and Environment under the *National Parks and Wildlife Act 1974.*

Response

Transport for NSW acknowledge the significance of Whale Rock and have included discussions regarding this heritage site in the environmental impact statement and the associated technical working paper. There would be no direct impact to Whale Rock from the project.

Section 8.2.1.2 of Appendix L (Technical working paper: Cultural heritage assessment report) discusses the assessment of potential settlement impacts from tunnel excavation, combined with the subsequent impacts on groundwater levels. Numerical groundwater modelling was carried out to consider possible settlement resulting from groundwater drawdown. No Aboriginal sites were identified as being affected by groundwater drawdown through additional wetting or drying of rock. Any potential impacts associated with groundwater drawdown from tunnel excavation would be limited to settlement due to stress redistribution induced by tunnel excavation. Section 5.5.11 of Appendix N (Technical working paper: Groundwater) also confirms that Whale Rock has no reliance on groundwater. Section 8.2.1.2 of Appendix L (Technical working paper: Cultural heritage assessment report) also notes that ground settlement of between less than five millimetres and 25 millimetres has been predicted at Aboriginal heritage sites located directly above the mainline tunnels.

The impact assessment for Whale Rock provided in Table 8-3 of Appendix L (Technical working paper: Cultural heritage impact assessment) is that settlement at this location is predicted to be less than 10 millimetres, with a significance of potential impact being Negligible. Vibration impacts at Whale Rock have been identified as being outside the minimum working distance for unsound structures, with a potential impact of Negligible.

B14.12.4 Monitoring and mitigation

Issue raised

Section 4.11.4 (pg 78)

The project presents a very real risk of damage to places of high significance (such as the Whale Rock site) that if damaged can simply not be rectified. The proponent has failed to demonstrate a satisfactory level of risk nor mitigation plan. Stronger measures and commitments are sought so as to effectively reduce risk levels to zero. Such measures may include alternate construction methods, 'live' vibration monitoring and immediate stop work protocols and work methods or the like.

Response

The impact assessment for Aboriginal archaeological sites concluded that there would be no direct impacts to any sites. Indirect vibration and settlement impacts would be negligible at each site except for Waverton Park Cave (45-6-2181), where vibration impact to the site has been identified as being within the minimum working distance for unsound structures. In this case environmental management measure CNV6 (refer to Table D2-1 of this submissions report) would apply to ensure impacts are avoided. The results of the impact assessment for Aboriginal archaeological sites within the study area are shown in Table 8-3 of Appendix L (Technical working paper: Cultural heritage assessment report).

Environmental management measure CNV1 (refer to Table D2-1 of this submissions report) requires the preparation of a construction noise and vibration management plan. This will be developed prior to construction and will 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 of the appropriate mitigation and management measures.

Environmental management measure CNV2 (refer to Table D2-1 of this submissions report) advises that detailed Construction Noise and Vibration Impact Statements will be carried out for all construction support sites and major construction works required for the project prior to the commencement of construction. These would identify where more detailed vibration analysis is required at any structure.

B14.13 Non-Aboriginal heritage

B14.13.1 Adequacy and accuracy

Issue raised

Section 4.11.2 (pg 74, 77, 78)

North Sydney Council advise that not all impacts to heritage within the North Sydney local government area arising from the project have been adequately incorporated, or considered in the environmental impact statement, including Appendix J (Technical working paper: Non-Aboriginal heritage). These impacts are considered to be substantial, warranting a redesign and reconsideration of the construction footprint. Impacts to the following heritage items have not been addressed:

- The Ridge Street Lookout is in proximity to the proposed Ridge Street pedestrian bridge and construction site/exit portal and would likely be adversely impacted by the proposal. There is insufficient detail on the proposed Ridge Street north construction support site (WHT9) and little detail on the proposed pedestrian footbridge to determine the degree of impact
- Negative visual impacts to the expanded visual curtilage of the properties in the north-eastern end of the Ridge Street Conservation Area (CA20) which currently look over a green landscape in St Leonards Park. The proposed tunnel exit would likely introduce fencing, security measures, signage, additional screening etc

- Noise impacts from additional traffic volumes would also affect residential amenity in the High Street Conservation Area and Ridge Street Conservation Area.

Response

Ridge Street Lookout

The Ridge Street Lookout was assessed as 'Seating area (with sandstone walls), North Sydney' in Section A.20 of Appendix A of Appendix J (Technical working paper: Non-Aboriginal heritage), after being identified as a potential heritage item during the field survey for the project. It is not listed on any heritage register or database. It was assessed as not having heritage significance as it did not meet any of the heritage significance criteria, as follows (Appendix J (Technical working paper: Non-Aboriginal heritage), Section A.20.5):

> *This observation area (c.1968) was used for a 'small function' which involved the unveiling of a plaque commemorating the opening of the Warringah Expressway. However, this was not a formal opening of the expressway. While the area affords views of the Sydney skyline, it is not aesthetically significant. As such, this item does not meet the significance criteria thresholds for local or state listing.*

As the place was assessed as not being of heritage significance, there is no requirement to assess impacts to it, and is therefore not addressed further.

Ridge Street Conservation Area

Ridge Street Conservation Area was identified in Appendix J (Technical working paper: Non-Aboriginal heritage) as Walker and Ridge Streets Conservation Area (LEP CA20), and was noted specifically in Table 3-2 as being listed on the North Sydney local environmental plan 2013 (North Sydney LEP) and the Register of the National Estate (RNE), as well as in Table 5-30 as being within 50 metres of mainline tunnels. While the visual impacts to the Walker and Ridge Streets Conservation Area was not specifically addressed, the visual impacts assessed as part of the St Leonards Park statement of heritage impact are of relevance and would address the potential for impacts to the Walker and Ridge Streets Conservation Area. The Technical working paper: Urban design, visual and landscape impact (WSP and Arup 2020) for the project also addressed visual impacts.

Table 5-21 of Appendix J (Technical working paper: Non-Aboriginal heritage) states:

> *The visual sensitivity of St Leonards Park is high due to the expansive and scenic district views from the park and because the park constitutes a key area of public open space, of which visual amenity is an important factor (WSP and Arup, 2020). Vegetation would be removed as part of the construction works within the heritage curtilage of the park, which would result in temporary visual impacts during construction. The heritage item's immediate setting would not significantly change once construction works have concluded and replacement planting should mitigate this impact over time. For some views to the heritage item (such as from the south), the ventilation outlet within the Warringah Freeway may be visible in the distance where the new structure is not obscured by buildings, mature vegetation or other structures (such as bridges and throw screens). As construction works would be likely to take up to 18 months, the impacts to the aesthetic values of the park would be moderate during this period.*

The conclusion for the statement of heritage impact for St Leonards Park also notes in Appendix J (Technical working paper: Non-Aboriginal heritage), Section 5.4.10.4:

> *Direct impacts would occur through construction works required for surface connections from the mainline tunnels to Falcon Street and the Ridge Street north (WHT9) construction support site. Vegetation would be removed as part of the construction works within the heritage curtilage of the park, which would result in temporary visual impacts during construction. Reinstatement works following the completion of construction would be*

redesigned in consultation with a landscape architect and North Sydney Council, and would seek to retain as much of the existing character and the original design intent as possible.

As the Walker and Ridge Streets Conservation Area is in such close proximity to St Leonards Park and the proposed connection to the already existing Warringah Freeway (already adjacent to the Conservation Area), consideration of the visual impacts to each heritage item is the same. The proposed tunnel exit would be located on the Warringah Freeway side of St Leonards Park, rather than in the vicinity of Ridge Street with fencing that would be limited to boundary fencing that is currently there.

Residential amenity is not typically assessed as part of a heritage impact assessment. Noise impacts to residential amenity are included in chapters 11 (Operational noise and vibration) and 21 (Socio-economics) of the environmental impact statement.

B14.13.2 Methodology

Issue raised

Section 4.11.2 (pg 74, 77)

The following issues were raised regarding the level of impact on heritage significance ratings applied to heritage items and literature reviewed:

- The 'Minor' ratings applied to each of the significant heritage items in Table 14-3 of the environmental impact statement is inappropriate and disproportionately relies upon mitigation measures to justify potential and direct adverse impacts on a number of significant items, including State heritage listed items at St Leonards Park, Tarrella, the North Sydney Sewer Vent Tower and former coal loader platform and wharf.
- The detailed heritage impact assessments in Appendix J (Technical working paper: Non-Aboriginal heritage) are considered to be insufficient and inadequate. The assessments are not supported by a thorough review of the applicable Conservation Management Plans (CMP) or prior heritage studies applicable to St Leonards Park, the former coal loader platform and wharf and works within the curtilage of the Sydney Harbour Bridge CMP. Reference should be made to the following:
  - St Leonards Park CMP by Godden McKay Logan 2013 that notes that the site's archaeological potential has not been identified (Page 96).
  - Former coal loader platform CMP
  - The policies in the Godden McKay Logan Berrys Waverton Peninsula Industrial Sites: BP, Caltex, former coal loader dated May 2000 Bay CMP should be applied. Archaeological investigations to be undertaken prior to further design development as it may not be appropriate to undertake works at this site when it is considered that other convict sites have World Heritage Listing.

Response

<u>Impact ratings</u>

The methodology used for the non-Aboriginal heritage assessment is outlined in Section 2.3 of Appendix J (Technical working paper: Non-Aboriginal heritage). The level of impact on the heritage significance of each heritage item has been assessed based on the definitions and framework for assessing severity of impacts from the EPBC Act *Significant impact guidelines 1.2* (Department of Sustainability Environment Water Population and Communities, 2013). The following criteria were used to assess the level of impact:

- The scale of the proposed work and its impact
- The intensity of the proposed work and its impact
- The duration and frequency of the proposed work and its impact.

For impacts to meet a certain level it must generally have two or more of the characteristics noted. The level of impact assigned to each heritage item is based on the level assessed following implementation of management or mitigation measures which is in line with the relevant guidelines and policies outlined in Section 2.2 of Appendix J (Technical working paper: Non-Aboriginal heritage).

Adequacy of heritage impact assessments

Table 5-17 of Appendix J (Technical working paper: Non-Aboriginal heritage) outlines aspects of the project which could impact on the heritage significance of the Sydney Harbour Bridge as well as the measures that are to be taken to minimise impacts. Impacts have been assessed against the management policies of the *Sydney Harbour Bridge Conservation Management Plan* (Godden Mackay Logan 2007).

Given the detailed listings on the State Heritage Register and the local environmental plan (LEP) for St Leonards Park as a whole, and individual elements within the park, there was deemed to be sufficient information to identify key elements and assess impacts without referring to the *St Leonards Park Conservation Management Plan* (CMP) (Godden Mackay Logan, 2013).

In reviewing the St Leonards Park CMP, the following precincts and elements are of relevance to assessment of the current project, with the project works noted against each:

- Precinct 2 – Music Shell – adjacent road works along Miller Street – key elements include western boundary plantings (brush box) – High significance
- Precinct 3 – North West Precinct – adjacent road works on Miller Street and Falcon Street – bus shelter (outside SHR and LEP listing, but subject to separate listing); Large fig on Falcon Street overhanging Falcon Street – Exceptional significance
- Precinct 6 – South East Precinct – construction support compound – avoids all contributory elements in the precinct

The St Leonards Park CMP did not assess the historical archaeological potential in 2013, and it appears an assessment has not subsequently been carried out as recommended by the CMP. The entry for St Leonards Park on the State Heritage Register does not list the heritage item for its archaeological potential (Criterion E Research Potential) and the NSW Heritage Database is also silent under the 'Archaeological Potential' heading. Despite this, in reviewing the history, historical imagery, and the maps showing the phases of development in the St Leonards Park CMP (figures 2-26 – 2-30) there has been no development in the south east corner of the park where the construction support site is proposed, and development has only occurred in the South East Precinct from the 1960s onwards and none of these elements are within the project footprint. Therefore, it is considered that the archaeological potential in the south east corner of St Leonards Park is negligible. The edges of St Leonards Park along Miller Street and Falcon Street where adjacent road works form part of the project, are also unlikely to contain archaeological remains, given the existing roadways and the large plantings in the vicinity. The archaeological potential in these areas is also assessed as negligible.

Given that the project works are proposed in Sydney Harbour and are not impacting on the former coal loader structure on land, it was not deemed necessary to refer to a CMP for this heritage item. A review of the LEP listing in NSW Heritage Database, a general internet search, and a search of North Sydney Council's library catalogue did not indicate the existence of such a CMP (ie a former coal loader Conservation Management Plan) for an updated review at this time.

The Waverton Peninsula Industrial Sites: BP, Caltex, Coal Loader, Conservation Management Plan (Godden Mackay Logan 2000) was used in the preparation of the assessment and is referred to in Appendix J (Technical working paper: Non-Aboriginal heritage) in the following locations:

- Section 5.4.7 - statement of heritage impact for the BP Site
- Section A.7 of Appendix A of Appendix J (Technical working paper: Non-Aboriginal heritage) - Significance Assessment of BP Site

- Section A.6 of Appendix A of Appendix J (Technical working paper: Non-Aboriginal heritage) Significance Assessment of Woodleys Shipyard.

Table 5-14 of Appendix J (Technical working paper: Non-Aboriginal heritage) lists the potential impacts to various elements of the site. For further information regarding the historical archaeology, refer to the response to the Heritage Council of NSW submission in Section B8 of this submissions report.

B14.13.3 Item 5: Former coal loader, Waverton

Issue raised

Section 4.11.2 (pg 75)

North Sydney Council raised the following concerns and recommendations relating to the Former coal loader site:

- The environmental impact statement does not adequately address construction activity for the proposed cofferdam at Sydney Harbour north cofferdam (WHT6) which are likely to result in subsistence and vibration impacts and potentially causing structural failure of the former coal loader platform given its construction typology
- The historic former coal loader wharf projecting into Balls Head Bay from the former coal loader site, is of high heritage significance (deemed to be of state significance (Waverton Peninsula Conservation Management Plan - Godden Mackay Logan, 2000)) and Council's and the community's request that it be retained and adaptively reused in accordance with the principles outlined in the Waverton Peninsula Strategic Masterplan (North Sydney Council, 1999).

Response

Table 5-12 of Appendix J (Technical working paper: Non-Aboriginal heritage) provides an assessment of potential impacts to the project on the former coal loader, including indirect vibration and settlement impacts from tunnel excavation are addressed.

Environmental management measure NAH23 (refer to Table D2-1 of this submissions report) applies to the former Balls Head Coal loader and seawall, and requires that the construction methodology is further refined during detailed design as needed to ensure that adopted site-specific screening criteria and minimum working distances can be met. Environmental management measures will be implemented to manage any potential impacts from vibration, including CNV6, NAH22 and NAH23 (refer to Table D2-1 of this submissions report) where applicable. 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.

Settlement modelling based on conservative modelling assumptions for this project indicates that the ground settlement levels at the heritage item would have a predicted maximum surface settlement of 25 to 30 millimetres and a predicted maximum surface angular distortion of between 1:500 and 1:2000. As such, the degree of severity of ground settlement is ‘slight’. To protect the heritage item and reduce its exposure to settlement impacts, environmental management measure SG1 (refer to Table D2-1 of this submissions report) requires detailed predictive settlement models to be developed for areas of concern to guide tunnel design and construction methodology, including the selection of options to minimise settlement where required. Environmental management measure SG4 (refer to Table D2-1 of this submissions report) also requires preparation of a structure condition survey for any heritage assets within the zone of influence of tunnel settlement, where the project has the potential to cause cosmetic or structural damage prior to the commencement of construction. Any damage caused by the project will be rectified.

The local heritage significance of the former coal loader and wharf at Waverton is acknowledged in Chapter 14 (Non-Aboriginal heritage) and Appendix J (Technical working paper: Non-Aboriginal heritage) as per the current listing (under the *North Sydney Local Environmental Plan 2013*). Section 3.2.3 of Appendix K (Technical working paper: Maritime heritage) identified that the former coal loader has been nominated and is currently under consideration for listing on the State Heritage Register. Table 13 of Appendix K (Technical working paper: Maritime heritage) also evaluates the former coal loader as being of overall State heritage significance; specifically of State heritage significance under Criterion C (aesthetic/technical) and Criterion F (comparative/rarity).

An exclusion zone will be established around the former coal loader wharf extending at least 15 metres from the edge of the wharf apron, as required by environmental management measure NAH21 (refer to Table D2-1 of this submissions report).

The draft historic coal loader wharf adaptive re-use scheme in Appendix 3 of the North Sydney Council submission is noted. The project would have no direct impact on the former coal loader wharf, and renewal of the wharf is outside the scope of this project.

B14.13.4 Heritage Vessels

Issue raised

Section 4.14.2 (pg 84, 85)

The environmental impact statement proposes that the existing heritage vessels moored adjacent to the former coal loader platform be temporarily relocated (for the duration of the construction works), to enable demolition of the existing lower catwalk structure that the vessels used for access and construction of the proposed coffer dam in Balls Head Bay. The following issues were raised regarding relocation of these heritage vessels:

- Whilst the environmental impact statement proposes that the vessels be provided the opportunity to relocate to alternate berthing's ahead of the project (refer to Chapter 6 (Construction Work) Section 6.3.1 page 6-7) it is understood that the ships cannot move under their own steam, alternate existing moorings (particularly land-based which is essential for retaining volunteer crews) are not generally available and as the ships are being restored by volunteer organisations, these vessels do not have the financial capacity to fund such a move
- Whilst not being expressly stated in the environmental impact statement, it is understood that the tunnel proponents may be proposing to relocate the heritage vessels to newly built moorings in Balls Head Bay off the south west corner of the former coal loader platform. It is understood that the cost of the newly built moorings would be substantial
- It is also understood that the custodians of the MV Cape Don (one of the heritage vessels) subject to the move to the proposed new mooring off the south- west corner of the platform as this would greatly impact on their current access and result in a loss of their volunteer restoration crew. The MV Cape Don has only recently recovered from previous loss of access caused by demolition of their access, and now have a very active volunteer group attending fortnightly working weekends. The MV Cape Don Society has over a number of years spent large sums of their (volunteers) own time and monies reconstructing their existing access to a safe level.

It is recommended that the heritage vessels be relocated to moorings alongside the restored former coal loader wharf (as discussed in Section B14.13.3 above).

Response

During construction the *M.V. Cape Don* and *Baragoola* would need to be relocated, as would other vessels and moorings throughout the project area. The *M.V. Cape Don* and *Baragoola* do not have any known historical association with the former coal loader site and as such their temporary relocation would not impact on their cultural heritage values or the values of the former coal loader.

Due to the current state of the former coal loader wharf, it would not be possible to have the vessels moored alongside. As discussed in Section B14.13.3, the project would have no direct impact on the former coal loader wharf, and renewal of the wharf is outside the scope of this project.

Transport for NSW will relocate the historic vessels *M.V. Cape Don* and *Baragoola* to a suitable alternate berthing nearby within Sydney Harbour before construction commences, in accordance with the updated environmental management measure NAH20 (refer to Table D2-1 of this submissions report). Relocation of the vessels will be carried out in consultation with the vessel owners and associated community groups, and will be in the general vicinity of the existing berthing locations. Transport for NSW will take no action that results in the degradation of the heritage items until relocations occurs.

Further discussion regarding the relocation of *M.V. Cape Don* and *Baragoola* is discussed in Section A3.3.2 of this submissions report.

B14.13.5 Item 6: Woodleys shipyard, Waverton

Issue raised

Section 4.6.2, 4.11.2 (pg 42, 74, 75)

Council advise that not all impacts to heritage within the North Sydney local government area arising from the project have been adequately incorporated or considered in the environmental impact statement. This includes:

- The negative impact on the maritime area of non-Aboriginal archaeology potential identified in Figure 5-11 of Appendix J (Technical working paper: Non-Aboriginal heritage) has not been adequately addressed. The impacts of the proposed construction support sites/buildings WHT7 is currently unknown. Construction ramping and heavy vehicle movement would likely require substantial new infrastructure to be built within this sensitive area which is not adequately addressed within the environmental impact statement Heritage Assessments in Chapter 14 (Aboriginal cultural heritage) or Appendix J (Technical working paper: Non-Aboriginal heritage). Further and more detail consideration is required in this regard to understand the likely impacts arising from the project construction footprint
- There is concern that the construction site (environmental management measure WHT7) would cause irreparable damage to the historic Woodleys slipway.

Response

Some excavation may be required on the shoreward end of the wharf, which may require the partial removal of Slipway 1 and would have direct impacts to the earlier remains of the NSW Torpedo Corps slipway structure as well as archaeological remains from that period (refer to Appendix K (Technical working paper: Maritime heritage)). Any impact would vary from minor to moderate depending on the scale of any excavation carried out, and the condition of the archaeological remains. This potential impact can be mitigated to minor through limiting or negating the need for excavation to build the wharf and/or through archaeological excavation or monitoring.

Implementation of environment management measures in Table D2-1 of this submissions report will ensure that impacts to the heritage item are temporary and reversible and that any maritime archaeology is salvaged prior to construction.

Construction support sites have been located to minimise overall property acquisition requirements, as well as minimising impact on heritage items and ecologically sensitive areas. The Berrys Bay construction support site (WHT7) was selected as it enabled use of NSW Government owned property, and maximised opportunities for water transport for construction traffic, avoiding the need to use local residential streets where possible. Approaches to the site layout such as reusing heritage structures and considering subsequent adaptive reuse opportunities would further minimise impacts to the heritage item (refer to NAH7 in Table D2-1 of this submissions report).

Environmental management measure NAH15 (refer to Table D2-1 of this submissions report) advises that investigation into the potential to relocate or redesign the temporary wharves at Berrys Bay construction support site (WHT7) will be carried out to minimise impact on maritime heritage. Where this is not feasible then appropriate mitigation will be implemented before construction in accordance with the Maritime Heritage Management Plan (refer to environmental management measure NAH16, Table D2-1 of this submissions report). Such mitigation will include carrying out archaeological excavation and documentation under the direction of a qualified archaeologist across all areas of impact at the site as mentioned above.

B14.13.6 Item 7: BP site, Waverton

Issue raised

Section 4.6.2 (pg 42)

The Berrys Bay ex-industrial lands, including the former BP site working waterfront parcel would be utilised as a major work-site (Berrys Bay construction support site (WHT7)) for tunnelling operations. There is concern that the construction site would cause irreparable damage to significant heritage elements. These likely impacts include:

- Damage to the cliff-face by removal of rock for the decline access tunnel
- Damage to potential archaeological remains on the former BP site including to the possible remains of the former torpedo store, former Berry storehouse and associated out-buildings and remnants associated with the BP phase of site occupation.

Due to the high heritage significance (Waverton Peninsula Conservation Management Plan - Godden Mackay Logan, 2000) of the Berrys Bay foreshore area (and in particular the head of the western arm of the Bay known informally as Woodley's Cove), it is critical that the project does not in any way damage the elements deemed to be of high-moderate heritage significance. The environmental impact statement document only notes "Where feasible, the construction support site has been designed to retain and protect these structures". This is unacceptable. A formal undertaking needs to be provided that the project construction will not damage any elements of heritage significance.

Response

The proposed works on the site overall would be of medium-large scale and low intensity, with the majority of the area being temporarily modified. While the changes to the subsurface archaeology of the BP site would be permanent and irreversible, the changes to the heritage significance of the BP site itself would be short term and reversible, subject to the implementation of the environmental management measures (refer to Table D2-1 of this submissions report).

Appendix J (Technical Working Paper: Non-Aboriginal heritage) states that the significance of the BP site is related to its use as an industrial site and is represented mainly by its modified landforms (particularly ‘the stark form of curved cuttings and straight lines of massive masonry walls’). The stone cuttings and masonry walls would be retained following construction and the site being reinstated. Reinstatement of the site will include investigating the adaptive reuse of the site for the wider community (refer to environmental management measure NAH13 in Table D2-1 of this submissions report).

The layout for Berrys Bay construction support site (WHT7) has maximised the retention and protection of significant heritage components of the heritage item, or reinstatement of components (if temporarily removed/impacted).

Environmental management measure NAH5 (refer to Table D2-1 of this submissions report) requires that archival photographic recording be carried out for the BP site in accordance with the guidelines *Photographic Recording of Heritage Items Using Film or Digital Capture* (Heritage Council of NSW, 2006).

Impacts to areas of archaeological potential at the BP site have also been detailed in Table 5-15 of Appendix J (Technical working paper: Non-Aboriginal heritage). To mitigate the physical impacts to the areas of archaeological potential, an archaeological investigation of the BP site would be carried out in accordance with the Archaeological research design and methodology for BP site (environmental management measure NAH9). This would realise the research potential of the heritage item by capturing as much archaeological and site data as possible prior to disturbance at the site.

Environmental management measure NAH15 (refer to Table D2-1 of this submissions report) notes that investigation into the potential to relocate or redesign the temporary wharves at the proposed Berrys Bay construction support site (WHT7) will be carried out to minimise impact on maritime heritage. Where this is not feasible then appropriate mitigation will be implemented prior to construction in accordance with the *Maritime Heritage Management Plan* (refer to environmental management measure NAH16). Such mitigation will include carrying out archaeological excavation and documentation under the direction of a qualified archaeologist across all areas of impact at the site as mentioned above.

B14.13.7 Item 10: St Leonards Park

Issue raised

Section 4.11.2 (pg 75)

The proposed mainline tunnels to Falcon Street and the Ridge Street north construction support site (WHT9) would result in permanent and significant impacts to the curtilage of St Leonards Park, including the loss of substantial vegetation as well as regrading and loss of public open space associated with the heritage significance of the site. The supporting documentation including video fly throughs indicate an open tunnel interface is located wholly within St Leonards Park however, the assessment incorrectly considers that the tunnel openings are within the Warringah Freeway. A review of other plans and diagrams throughout the environmental impact statement appear inconsistent in this regard as to exactly where the tunnel is open to sky and where it is to be covered in this location.

Response

The location of the tunnel interface on the project website portal flyover video was incorrect. The project website portal flyover has since been updated and corrected. A clarification has been included in Table A-7 of this submissions report.

Figure 5-4 of the environmental impact statement shows the location of the surface connection between the Western Harbour Tunnel driven tunnel and the Warringah Freeway Upgrade surface road adjacent to St Leonards Park. Figure 6-33 of the environmental impact statement shows the indicative layout of the Ridge Street north construction support site (WHT9) that would be used to facilitate construction of the tunnel portal and connection to the Warringah Freeway. These two figures, rather than the video fly throughs and supporting documentation, best describe the likely impacts at this location. Transport for NSW notes, however, that much of the area required to facilitate construction of this connection would be rehabilitated at the completion of construction and would not form part of the project operational footprint.

Figure 20-7 of the environmental impact statement shows the majority of the project operational footprint would be located with the Warringah Freeway corridor SP2 infrastructure boundary. A small portion of the project operational footprint falls inside the St Leonards Park RE1 public recreation land use zone boundary at the south east corner of the park. This small amount of operational footprint is however outside the St Leonards Park State Heritage Register boundary therefore is not part of the heritage listed item.

Direct impacts due to the Ridge Street north construction support site (WHT9) (as noted in Table 14-3 of the environmental impact statement and Table 5-21 of Appendix J (Technical working paper: Non-Aboriginal heritage) would occur through construction works including surface connections

from the mainline tunnels to Falcon Street. Vegetation would be removed as part of the construction works within the heritage curtilage of the park, which would result in temporary visual impacts during construction. Reinstatement works following the completion of construction would be redesigned in consultation with a landscape architect and North Sydney Council, and would seek to retain as much of the existing character and the original design intent as possible.

Kerb and footpath adjustment works would occur on Miller Street southbound around the intersection with Falcon Street. These works would provide a new dedicated lane for left turning traffic from Falcon Street westbound to Miller Street southbound. Further review of the impacts in this area is currently being carried out to minimise or, where possible, eliminate the small permanent impacts to St Leonards Park. This would not impact on the ongoing use or functioning of the park, or facilities within the park.

Transport for NSW will continue to work with relevant stakeholders to understand North Sydney Council's and the community's visions for the future use of the project construction sites and surrounding areas, and endeavour to agree on how the project can help deliver this vision as it rehabilitates the sites in accordance with relevant planning approvals.

Implementation of management measures outlined in Table D2-1 of this submissions report will minimise disturbance and ensure that disturbed areas are reinstated to retain as much of the existing character and design as possible.

B14.13.8 Item 11: North Sydney Sewer Vent

Issue raised

Section 4.11.2 (pg 75- 76)

The proposed works to Falcon Street interchange may have potential significant impacts to the curtilage of the North Sydney Sewer Vent as a result of excavation required for the proposed ventilation tunnelling contained within the park. These impacts have not been adequately addressed.

Response

Direct and indirect impacts to the North Sydney Sewer Vent (including its curtilage) have been identified in Section 14.4.1 of the environmental impact statement.

Potential direct impacts include:

- Physical impacts to the heritage item due to operation of construction vehicles and equipment in close proximity to the heritage item. The likelihood of these impact occurring would be low with the implementation of standard construction management procedures.

Indirect impacts include:

- Temporary and permanent visual impacts due to the construction of permanent operational infrastructure in the vicinity of the heritage item
- Temporary vibration impacts due to construction activities in the vicinity of the heritage item
- Very slight permanent settlement and ground movement impacts to the heritage item caused by tunnel excavation.

The proposed works would be of small scale and of low intensity. While some permanent and irreversible changes would occur on the roadways adjacent to the heritage item, they would not impact the heritage item.

Potential impacts would be managed by the unexpected finds procedures incorporated by environmental management measures NAH10 and NAH11 and non-Aboriginal historical heritage awareness training for contractors (environmental management measure NAH12). As per environmental management measure CNV6 (refer to Table D2-1 of this submissions report) vibration generating activities will be managed through the establishment of minimum buffer

distances to achieve screening levels. Where vibration levels are predicted to exceed the screening levels, a more detailed assessment of the impacted structure, including consideration of the heritage values of the structure, and attended vibration monitoring will be carried out to ensure vibration levels remain below appropriate limits for that structure.

B14.13.9 Item 14: Cammeray Park (including Golf Course)

Issue raised

Section 4.11.2 (pg 76)

The environmental impact statement has not adequately addressed the major and direct loss of significant parkland at Cammeray Park and there is no understanding of the extent of the works or mitigation measures. The ventilation shaft would have a high visual impact.

Response

The key features of the Cammeray Golf Course construction support site (WHT10) are incorporated in Table 6-23 of the environmental impact statement. Additionally, Table 14-3 of the environmental impact statement outlines the direct and potential direct impacts to Cammeray Park. Potential direct impacts to the curtilage include operation of construction vehicles and equipment within and in close proximity to the heritage boundary. Direct impacts include planned physical impacts to the heritage item due to the construction of permanent operational infrastructure within the heritage boundary.

The project has been designed and developed to minimise impacts to Cammeray Golf Course and Transport for NSW will continue its collaborative engagement with Cammeray Golf Club to maintain the long term viability of the Cammeray Golf Course. The project would not impact on the site's feasibility as a nine hole golf course and for public recreation and open space purposes, either during construction or operation. As such, the heritage item would however still retain its use as a golf course during construction and following completion of the project, although in an altered arrangement. Due to the level of change required, environmental management measure NAH5 advises that an archival photographic recording of the heritage item would be carried out, in accordance with the guidelines *Photographic Recording of Heritage Items Using Film or Digital Capture* (Heritage Council of NSW, 2006).

The proposed works would be of small-medium scale and of moderate intensity, with the changes to the heritage item being permanent and irreversible. The heritage item would lose a large portion of its significance as a relatively intact open space. Management measures are included in Table 14-5 of the environmental impact statement, this includes a commitment to preparing a thematic heritage study of golf courses in Sydney, for the region north of the Sydney Harbour. This study would assist in identifying other potential heritage items in the region that would demonstrate the same or similar significance as the Cammeray Golf Course.

Indirect visual impacts are discussed in Table 5-25 of Appendix J (Technical working paper: Non-Aboriginal heritage). Temporary and permanent visual impacts would occur due to the change in land use and the presence of permanent infrastructure (road-related infrastructure, the motorway facilities at the Warringah Freeway and motorway control centre).

As noted in Table 5-25 of Appendix J (Technical working paper: Non-Aboriginal heritage), the operational ancillary facilities have been developed to reduce the perceived scale of the building and its integration into the surrounding context. This has been achieved through a number of approaches including through the selection of material colours and finishes to reflect the open space context of Cammeray Park. Landscape treatments have been proposed to screen views from residential and open space receivers surrounding the park.

As per the strategic urban design framework included in Appendix V (Technical working paper: Urban design, landscape character and visual impact), the design and treatment of operational ancillary facilities would look at further refinements, as well as opportunities to provide increased screening though landscape plantings. A landscape plan would also be developed under environmental management measure V12 (refer to Table D2-1 of this submission report) which will

detail built and landscape features to be implemented prior to operation of the project. The urban design and landscape plan will be developed in consultation with local councils, other key stakeholders and the community.

B14.13.10 Item 15: Cammeray Conservation Area

Issue raised

Section 4.11.2 (pg 76)

The following impacts have not been adequately addressed:

- The project would result in potentially negative visual impacts to the character of properties on Morden Street, Cammeray located within the Cammeray Conservation Area
- Noise impacts from additional traffic volumes would also affect residential amenity in the Cammeray Conservation Area.

Response

As a residential-based heritage conservation area, the project would avoid direct impacts on the majority of the heritage conservation area (refer to Section 5.4.15 of Appendix J (Technical working paper: Non-Aboriginal heritage)). Views within the heritage conservation area would experience localised impacts due to the demolition of three buildings within the heritage curtilage. As this occurs on the periphery of the conservation area, and one of the buildings is not a contributing element to the heritage listing, the impact is considered to be minor.

The permanent noise barrier would be located along a short section of the heritage conservation area curtilage. The indicative location of the proposed noise barrier is shown on Figure 5-31 of the environmental impact statement. The final barrier height and design (eg materials) would be confirmed during detailed design, in consultation with the community and considering urban design issues. While the noise barrier would introduce a new permanent element, the impact would be localised and would not obstruct view lines beyond the conservation area.

Temporary and permanent visual impacts along the boundary of the conservation area would occur due to changes to the Cammeray Golf Course and the presence of project-related infrastructure. Mitigation of these impacts has been addressed in B14.13.9 above. The proposed noise barrier discussed above would mitigate noise impacts affecting residential amenity in the conservation area.

Environmental management measure NAH2 (refer to Table D2-1 of this submissions report) commits to appropriate heritage interpretation being 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* (Roads and Maritime, 2005f), and the *Heritage Interpretation Policy* (NSW Heritage Council, 2005).

B14.13.11 Item 16: Tarella, Cammeray

Issue raised

Section 4.11.2 (pg 76)

The environmental impact statement has not adequately addressed impacts to Tarella heritage item.

Response

The permanent road or ancillary operational infrastructure associated with the project would avoid direct impacts to this heritage item as works would be situated outside its heritage boundary, on a lower level than that of the heritage item (refer to Section 5.4.16 of Appendix J (Technical working paper: Non-Aboriginal heritage)). As such, this would respect the heritage significance of the item.

Potential indirect impacts are incorporated in Table 5-27 of Appendix J (Technical working paper: Non-Aboriginal heritage).

Views to the south are already obscured by an existing solid property boundary wall of around two to three metres. As such, the provision of a new noise barrier would be unlikely to result in indirect impacts to the heritage item. The final barrier height and design (eg materials) would be determined during detailed design and appropriate heritage interpretation would be incorporated into the urban design for the project. Refer to environmental management measure NAH2 (refer to Table D2-1 of this submissions report).

Vibration from surface works in the vicinity of the heritage item could exceed the trigger level of 2.5 millimetres per second given works would be required within the road reserve, including modifications to the existing retaining wall. Management measures triggered by the predicted vibration level would be implemented to control and minimise vibration impacts from the construction; specifically the use of minimum working distances for vibration-intensive activities would be applied to avoid indirect impacts to the heritage item. Refer to environmental management measure CNV6 (refer to Table D2-1 of this submissions report).

B14.13.12 Item 18: Holtermann Estate A Conservation Area, Crows Nest

Issue raised

Section 4.11.2 (pg 76)

The following impacts have not been adequately addressed:

- Potentially negative visual impacts to the character of the north eastern Holtermann Estate A Conservation Area from high acoustic walls
- Noise impacts from additional traffic volumes will also affect residential amenity in the Holtermann A Conservation Area.

Response

Indirect visual impacts are discussed in Table 5-25 of Appendix J (Technical working paper: Non-Aboriginal heritage). Impacts would be negligible due to the fact that only views to or across the Warringah Freeway would be impacted by the proposed noise barrier. The indicative location of the proposed noise barrier is shown on Figure 5-32 of the environmental impact statement. The final barrier height and design (eg materials) would be determined during detailed design and appropriate heritage interpretation will be incorporated into the urban design for the project. Refer to environmental management measure NAH2 (refer to Table D2-1 of this submissions report).

A number of residences within the conservation area have also been identified as being eligible for architectural noise treatment. Eligibility would be confirmed during detailed design and in consultation with the property owner. Should architectural noise treatment be required, this would be done in such a way to minimise heritage impacts, while preserving owner amenity and heritage values of the conservation area. If noise treatment within the heritage building is required, the advice of a conservation architect would be sought. Refer to environmental management measure NAH4 (refer to Table D2-1 of this submissions report).

In addition, Figure 5-23 of the environmental impact statement shows that there is an existing noise barrier between Holtermann Estate A Conservation Area and the Warringah Freeway. As a result, the residential amenity of this conservation area is unlikely to be affected by any additional traffic volumes.

A clarification has been provided in Section A4.2 of this submissions report to confirm that no buildings or houses are proposed for demolition within the Holtermann Estate A Conservation Area. The assessment of impacts to the conservation area remains as negligible.

B14.13.13 Mitigation measures – recommendations

Issue raised

Sections 4.10.7, 4.11.2 (pg 60, 61)

General:

- Detailed dilapidation studies must be undertaken and site specific management plans prepared for all sites identified above
- Detailed archaeological studies of terrestrial and marine based areas must be undertaken prior to detailed construction development and site specific management plans prepared for the all sites identified above.

Item 5 - Former coal loader site specific recommendations:

- Given the age of the former coal loader buildings and platform, a detailed dilapidation survey should be prepared on the basis that tunnelling and construction of the nearby cofferdam may result in ground settling in the vicinity of the former coal loader structures
- Stronger measures are sought so as to effectively reduce subsidence and vibration damage risk to the former coal loader platform to zero. Such measures may include alternate construction methods, 'live' vibration monitoring and immediate stop work protocols and appropriate work methods or the like
- That Council seek to retain a sufficient monetary bond from the NSW Government to cover any potential repairs and restoration of the former coal loader structure (that may be necessary as a result of vibration and/ or settlement) following completion of tunnelling activities. Council would seek independent costings to establish the amount of the bond that would be required.

Berrys Bay construction support site (WHT7) specific recommendations:

- The project is conditioned to ensure there is no loss of heritage due to the occupation of the Berrys Bay sites for the construction activities
- Council engage the services of an independent heritage consultancy to assess the potential impacts of the project to the heritage of Berrys Bay
- The services of an independent heritage assessor should be engaged (at no cost to Council) to monitor the ongoing protection of heritage elements for the duration of the construction project
- Should the cliff-face (BP site) be disturbed for the incline tunnel entrance that the sandstone bedrock be carefully removed in sections, stored for replacement at the end of works (a similar approach was successfully achieved with the tunnel portal at Tunks Park for the Northside Storage Tunnel incline entry point).

Response

Transport for NSW consider the environmental management measures included in the environmental impact statement, as amended in Table D2-1 of this submissions report, to be appropriate. North Sydney Council's recommended mitigation measures have been addressed by project environmental management measures as follows:

General

- NAH5 – Archival recording prior to any works that have the potential to impact upon the items
- NAH16 – A Maritime Heritage Management Plan that details the objectives and methodologies to conserve maritime heritage and mitigate impacts will be prepared in

consultation with a qualified and experienced maritime archaeologist. The Maritime Heritage Management Plan will specify:

- Unexpected finds protocols relevant to each type of activity such as dredging or piling
- Artefact management procedures, including identification of approved submerged reburial locations
- Relevant work method requirements and maritime heritage inductions tailored for each type of work activity such as dredging or piling
- Exclusion zone, archival, baseline and periodic monitoring protocols including before and during construction, and final site inspections within three months of completion of works for the following maritime heritage sites:
  - Former coal loader wharf
  - Yurulbin Park maritime infrastructure
  - Unidentified Balls Head Bay 2 wreck
  - Collapsed wharf, BP site, Berrys Bay

- Requirements for any mitigation recovery or archaeological excavations. Section D1 of this submissions report notes that environmental management measures relating to construction would be incorporated in a construction environmental management plan. The plan would be prepared, and reviewed and certified by Transport for NSW and the Department of Planning, Industry and Environment, prior to the commencement of any on-site work. The construction environmental management plan would be a working document, subject to ongoing change and updated as necessary, to respond to specific requirements. The construction environmental management plan would include a framework for the management of environmental impacts during construction including details on heritage management.

<u>Item 5 – Former coal loader and Berrys Bay</u>

- NAH23 – For the Balls Head Coal Loader and seawall, where vibration levels are predicted to exceed the standard minimum buffer distances to achieve screening levels, a detailed structural assessment will be carried out before construction commences to determine appropriate vibration criteria and site-specific minimum working distances to achieve this criteria.

  The detailed assessment will specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is protected. During detailed design, the construction methodology will be refined as needed to ensure the adopted criteria and site-specific minimum working distances for all vibration-intensive activities (eg compaction, rock hammering, piling) can be met.

  During construction, site-specific buffer distances will be maintained to comply with relevant vibration limits for cosmetic damage, and vibration monitoring will be carried out to ensure vibration levels remain below the appropriate limits for the structure.

- SG4 – Pre-construction building/structure condition surveys will be offered and prepared for properties (and heritage assets) within the zone of influence of tunnel settlement (for example within the 5 millimetre predicted surface settlement contour and within 50 metres of surface works) and within the minimum working distances for cosmetic and structural damage due to vibration. 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/structure.

Within three (3) months of the completion of construction activities that have the potential to impact on 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, post-construction building condition surveys will be carried out by a suitably qualified person. The results of the surveys 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 (1) month of the survey being completed.

Any property damage caused by the project will be rectified.

- CNV6 – For heritage items, where vibration levels are predicted to exceed the screening levels, a more detailed assessment will specifically consider the heritage values of the structure in consultation with a heritage specialist to allow the potential for impact to be reduced and ensure sensitive heritage fabric is adequately monitored
- NAH16 – Preparation of a Maritime Heritage Management Plan will be prepared in consultation with a qualified and experience maritime archaeologist
- NAH21 – An exclusion zone will be established around the former coal loader wharf extending at least 15 metres from the edge of the wharf apron
- NAH5 – Archival recording of sites prior to construction
- NAH7 (Woodleys Shipyard) – Should heritage buildings be changed externally, such as by adding cladding or extensions, further assessment will be carried out to identify approaches to avoid heritage fabric and/or minimise impact on heritage significance. This will include consideration of how works can be carried out to facilitate subsequent adaptive reuse or to minimise incremental impacts
- NAH9 – Archaeological investigations at the BP site
- NAH10 – Unexpected heritage finds procedure
- NAH13 – BP site will be rehabilitated and returned to an equivalent state as soon as practicable. Reinstatement of the site will include investigating the adaptive reuse of the site for the wider community
- NAH15 – Investigation into the potential to relocate or redesign the temporary wharves in Berrys Bay will be carried out to minimise impact on maritime heritage.

The stone cuttings and masonry walls will be retained and in accordance with environmental management measure NAH13 (refer to Table D2-1 of this submissions report) the BP site would be rehabilitated and returned to an equivalent state as soon as practicable after construction. This is discussed further in Section B14.13.6 of this submissions report.

Based on the environmental management measures in place, Transport for NSW does not consider it necessary to pay for North Sydney Council to engage a heritage assessor.

B14.14 Geology, soils and groundwater

B14.14.1 Adequacy and accuracy

Issue raised

Section 4.10.6 (pg 60)

It is not clear in the environmental impact statement how contaminated soil from both the terrestrial and aquatic environment would be removed, transported and disposed of.

Response

Waste management plans would be prepared as part of a construction environmental management plan prior to construction (refer to Section D1 of this submissions report). The plans would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation. The waste management plans will include procedures for handling and storing potentially contaminated substances (refer to environmental management measure SG10 in Table D2-1 of this submissions report).

Prior to the commencement of construction, dredging contractors would develop a dredge management plan which will document all of the potential risks associated with the dredging works and describe in detail the procedures and measures, including the handling of contaminated dredge materials, that would be established to mitigate these potential impacts. Refer to Section D1 of this submissions report for further discussion regarding the construction environmental management plan and sub plans.

As described in Appendix P (Technical working paper: Hydrodynamics and dredge plume modelling), dredged sediment material that is not suitable for offshore disposal would be barged to White Bay transfer site for treatment and disposed of at a land-based licensed facility. In accordance with environmental management measure SG7 (refer to Table D2-1 of this submissions report), all spoil material will be classified in accordance with the NSW Environment Protection Authority (2014) Waste Classification Guidelines. Treatment (eg addition of lime or polymers) of this material for dewatering, for mitigation of odour generation, and for neutralisation of acid sulfate soils would be carried out while in the barge prior to unloading. Treated material could be either directly loaded from the barges into sealed and covered trucks or temporarily stockpiled in a controlled onshore containment area for subsequent rehandling into trucks for disposal at an appropriately licensed waste management facility. Refer to Section B1.7 of this submissions report for further details.

Section 24.5 of the environmental impact statement discusses the location of facilities within Sydney licensed to accept waste. The environmental impact statement notes that specific facilities and collection contractors for the disposal of waste included contaminated soil would be selected during the later stages of the project by the construction contractor and documented in the construction waste management plan.

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 *Waste Classification Guidelines: Part 1 Classifying Waste*. Wastes will be appropriately transported, stored and handled according to their waste classification and in a manner than prevents pollution of the surrounding environment.

B14.14.2 Mitigation measures – recommendations

Issue raised

Sections 4.10.6, 4.10.7 (pg 53, 58)

Detailed soil and sediment erosion management plans for Berrys Bay, Berry Street (east) and Ridge Street (east) construction support sites. There is a high potential for soil erosion on existing slopes and excavated or stockpiled soils have the potential to runoff construction sites during periods of rainfall due to the steep nature of the sites.

Response

The high potential for soil erosion at the Berrys Bay (WHT7), Berry Street east (WFU5) and Ridge Street east (WFU6) construction support sites is noted in Section 16.4.1 of the environmental impact statement. Environmental management measure SG5 (refer to Table D2-1 of this submissions report) provides that erosion and sediment measures will be implemented at all work sites in accordance with the principles and requirements in *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) and *Volume 2D* (NSW Department of Environment and

Climate Change, 2008), commonly referred to as the 'Blue Book'. Environmental management measure WQ1 (refer to Table D2-1 of this submissions report) also requires a soil conservation specialist to be engaged for the duration of construction to provide advice regarding erosion and sediment control.

B14.15 Hydrodynamics and water quality

B14.15.1 Marine water quality

Issue raised

Sections 4.10.1, 4.10.4 (pg 53, 58)

The following concerns were raised regarding dredging impacts to marine water quality:

- The submerged tunnel construction method requires significant dredging and sediment disturbance of the harbour floor, which the Sydney Metro City and South-West project advised would have likely considerable environmental impacts
- Sydney Harbour north cofferdam (WHT6) construction implications to water quality in Berry's Bay caused by disturbance of marine sediments and pollutants potentially contained within these sediments.

Response

As identified in Chapter 4 (Project development and alternatives) of the environmental impact statement, a number of different harbour crossing options were considered at different depths. The immersed tube option was chosen by a multidisciplinary team as it would provide the best solution when considered against a number of criteria specific to design, constructability, traffic performance, environmental and social impacts. It is noted that the main disadvantage of this option is that it would require excavation of bed sediments, whereby some sediment would become suspended in the water column. This would need to be managed to minimise potential migration and sedimentation impacts. Overall however, due to the different technical, environmental and geological constraints, a direct comparison between the options assessments for this project and the Sydney Metro City and South-West project is not appropriate.

Prior to the commencement of construction, dredging contractors would develop a dredge management plan which will 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.

Appendix Q (Technical working paper: Marine water quality) provides a detailed assessment of potential impacts on Sydney Harbour of the proposed dredging activities. It describes the results of sediment sampling carried out for the project within Sydney Harbour and Berrys Bay. Sampling identified levels of contaminants within the top 1.5 metre of sediments in certain areas which would, if mobilised, exceed guideline criteria. The assessment also considered the behaviour of sediment-bound contaminants when resuspended into the water column to determine the potential for adverse environmental effects from dredging. Previously assessed in the study for the Sydney Metro City & Southwest (Chatswood to Sydenham) project, Geochemical Assessments (2015) carried out laboratory elutriation tests (by simulating resuspension of sediment in ambient seawater) for identified contaminants, apart from total petroleum hydrocarbons (TPHs). These tests demonstrated that trace metals and all organic contaminants, including PCDD/Fs, are likely to remain bound to sediment particles and are not likely 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 estuary bed. The majority of sediment settlement would occur within and adjacent to the

dredging footprint, concentrated at the north eastern end of the dredging footprint and along the shoreline adjacent to the former coal loader wharf, with sedimentation rates of just over one millimetre per day expected. Lower levels of sedimentation are expected to occur within Balls Head Bay and the bays that line Sydney Harbour due to the lower tidal current speeds in these bays. Overall, the effects of sedimentation as a result of dredging are expected to be minor.

Subsequent to the 2017 marine sediment contamination investigation carried out by Golder-Douglas for the environmental impact statement, and at the request of Transport for NSW, RHDHV have been engaged to undertake additional sediment coring, sampling and testing at the harbour crossing to better understand the level and extent of contamination in sediments. Investigations into the level and extent of contamination have been carried out, and investigations are ongoing. The purpose of these investigations is to assess the suitability of dredged sediments for offshore disposal, an activity regulated under the Commonwealth Environment Protection (Sea Dumping) Act 1981. Further information, including elutriate test results, is provided in Appendix C2 of this submissions report. Based on the elutriate test results and available initial dilution, water quality impacts at the dredging site due to dissolved contaminants would not be expected.

As described in Table 6-4 of the environmental impact statement, the dredging methodology has been designed to minimise impacts on the marine environment depending on the material being dredged. This would involve using a backhoe dredge with closed environmental clamshell bucket supported by silt curtains for removal of the surface layer of material with elevated levels of contaminants. These buckets have been specifically designed for dredging material with elevated levels of contaminants and provide three significant advantages compared to conventional open buckets, including, minimisation of suspended sediments during contact with the harbour bed, minimisation of spill as the bucket is raised through the water column, and precision (accurate dredging).

As discussed in Appendix P (Technical working paper: Hydrodynamics and dredge plume modelling), backhoe dredging operations would be completed within a floating silt curtain enclosure (or ‘moon pool’) that is secured to the dredge barge. This would comprise a fixed or floating boom upon which a shallow-draft (two to three metres deep) silt curtain is attached to provide a controlled area for the dredge operator to work within. Silt curtains would also be deployed around any sensitive aquatic habitats that could be potentially impacted by dredging activities.

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 the limited sediment mobilisation, means it is unlikely that water quality would be significantly impacted by contaminants mobilised from dredging and marine construction activities.

Environmental management measure WQ6 requires ongoing monitoring of dredge plumes. Exceedances of the predicted dredge plume extents and intensities will trigger subsequent management responses that will include a range of strategies. The strategies would include the cessation of dredging for a period sufficient to remove the stress to marine species where required.

Refer to Section B1.7 and Appendix C.2 of this submissions report for further details on impacts from disturbance of marine sediments and pollutants.

B14.15.2 Adequacy and accuracy

Issue raised

Section 4.10.9 (pg 63)

The following concerns were raised regarding the treatment and volume of wastewater treatment plant discharges:

- The majority of wastewater generated during construction would be through groundwater infiltration in the tunnels. It is unclear what level of water testing and treatment would occur

and whether this would guarantee the groundwater is not contaminated. Water must be tested and treated at construction wastewater treatment plants prior to reuse or discharge

- The indicative average wastewater treatment plant discharge volumes are significant and being discharged into Berry's Bay and Willoughby Creek every 10 days. It is unclear what remedial actions are planned to minimise the likely impacts of this amount and velocity of water on the receiving waters (such as erosion and scouring), what modelling has been done and what mitigation measures would be in place.

Response

Wastewater treatment

During construction, tunnelling activities would result in wastewater being generated from the following sources:

- Groundwater ingress
- Rainfall runoff in tunnel portals and ventilation outlets
- Heat and dust suppression water
- Washdown runoff.

Rozelle Rail Yards, Victoria Road, Yurulbin Point and Berrys Bay construction wastewater treatment plants would treat wastewater from tunnelling activities and discharge treated wastewater into marine environments. The Cammeray Golf Course construction wastewater treatment plant would treat the tunnel inflows which would be discharged into Willoughby Creek via the local stormwater system, ultimately flowing to Middle Harbour.

Wastewater treatment plants used during construction and operation would be designed such that discharge will be treated to meet specific discharge criteria as required by revised environmental management measures WQ3 and WQ9 respectively (refer to Table D2-1 of this submissions report). The criteria will ensure that the water is of acceptable quality to discharge. Appropriate testing will occur to ensure that the treated water meets the criteria.

Wastewater discharge

As discussed in Section 5.1.3 of Appendix O (Technical working paper: Surface water quality and hydrology), water availability would vary due to climate and as construction progresses. It is expected that the potential for treated wastewater reuse and treated wastewater discharge would also show variability.

Treated water would be discharged either via existing stormwater outlets or via new outlets. Discharge flow rates and velocities are not anticipated to be greater than those of existing flows in existing outlets. As per environmental management measure WQ7 (refer to Table D2-1 of this submissions report), construction drainage and discharge outlet infrastructure will direct flows downstream to minimise alterations and erosion of watercourse bed and banks. Energy dissipation and erosion scour protection will be implemented as appropriate.

B14.15.3 Mitigation measures – recommendations

Issue raised

Section 4.10.5 (pg 59)

Further investigation be undertaken of the potential for water quality impacts caused by dredging/disturbance of contaminated marine sediments and cofferdam construction in Balls Head Bay.

Response

The Marine water quality assessment in Appendix Q (Technical working paper: Marine water quality) outlines the investigations already completed. Results of sediment sampling carried out for the project within Sydney Harbour and Berrys Bay identified levels of contaminants within the top 1.5 metre of sediments would generally exceed guideline criteria. The assessment also considered the behaviour of sediment-bound contaminants when resuspended into the water column to determine the potential for adverse environmental effects from dredging. Previously assessed in the study for the Sydney Metro City & Southwest (Chatswood to Sydenham) project, Geochemical Assessments (2015) carried out laboratory elutriation tests (by simulating resuspension of sediment in ambient seawater) for identified contaminants, apart from total petroleum hydrocarbons (TPHs). These tests demonstrated that trace metals and all organic contaminants, including PCDD/Fs, are likely to remain bound to sediment particles and are not likely 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 estuary bed.

Subsequent to the characterisation of contamination within Sydney Harbour provided in Section 16.3.5 of the environmental impact statement and Appendix M (Technical working paper: Contamination), Royal HaskoningDHV have been engaged by Transport for NSW to carry out sediment coring, sampling and testing at the harbour crossing to better understand the level and extent of contamination in sediments. Investigations have been carried out and are ongoing. The purpose of these investigations is to assess the suitability of dredged sediments for offshore disposal. Further information is included in the Royal HaskoningDHV memo in Appendix C.2 of this submissions report.

Dredging of contaminated harbour sediments would be carried out using a backhoe dredge with a closed environmental clamshell bucket specially designed for dredging material with elevated levels of contaminated sediments. A silt curtain extending below the water surface would be deployed around the dredging activity. This method provides current best practice for removal of potentially contaminated sediments while minimising the migration of fine material to the surrounding waters.

Prior to the commencement of construction, dredging contractors would develop a dredge management plan which would consider 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 details regarding construction environmental management sub plans.

B14.16 Flooding

B14.16.1 General comments

Issue raised

Section 4.10.8 (pg 62)

The change in flood depth maps are hard to read with the use of very similar shades of green for both "land rendered flood free" and "land flooded as a result of the changes". More detail on affected properties is required.

Response

The comments regarding flood depth maps are acknowledged. The colour scheme has been developed to be consistent with other figures within the environmental impact statement. The scale of the figures is considered appropriate for presenting the results of the flood modelling that was carried out as part of the environmental impact statement.

In accordance with environmental management measures F1 and F9 (refer to Table D2-1 of this submissions report) 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.

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.

B14.16.2 Construction flooding impacts

Issue raised

The following concerns were raised regarding flooding impacts from construction activities:

- Berry Street north construction support site (WHT8) would have the potential to increase flooding for the downstream properties, particularly in Hampden Street and subsequently downstream to the existing harbour tunnel
- Ridge Street north construction support site (WHT9) would have the potential to increase the rate of flow within the Warringah Freeway. It is also unclear what impacts this would have in the Ridge Street minor catchment
- Cammeray golf course construction support site (WHT10 and WFU8) would have the potential to increase flooding conditions for the downstream properties. The proposed works to increase the size of the undersized line from ANZAC Park to the golf course would have the effect of increasing the pressure on the downstream system. There are known existing issues with flooding downstream of the golf course, particularly in Creek Lane which would be exacerbated by increasing the flow in this line. Mitigation works would need to be undertaken to minimise this impact
- Arthur Street east construction support site (WFU4) would have the potential to increase flooding inundation along the properties along Arthur Street and needs to be assessed in detail
- The storage dam at Cammeray Golf Course is now also classified as a stormwater detention and reuse basin. The final use of the golf course needs to be determined in order to design and construct a suitable facility before works commence in order to maintain the viability of this important scheme during construction and operation. This large interconnected system would require a lot of work to finalise before the dam is removed for construction purposes.

Response

The project has been developed such that, in respect to flooding (as outlined in Table 28-4 of the environmental impact statement):

- 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
- Construction support sites and construction sites would be laid out such that flows are not significantly impeded
- The project would maintain or reduce flood levels within and adjacent to the alignment.

Section 18.5 of the environmental impact statement provides an assessment of potential impacts of construction activities on flood behaviour. The flood assessment in the environmental impact statement is based on the indicative design and construction methodology presented in the environmental impact statement. 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 F8 (see Table D2-1 of this submissions report), including:

- 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
- Measures to mitigate flooding during construction are to be incorporated into the construction environmental management plan for the project.

Refer to environmental management measures F5, F6, F7 and F8 in Table D2-1 of this submissions report for further measures relating to mitigating potential flooding impacts during construction. The impacts of construction activities on flood behaviour for the particular issues raised are discussed below.

Berry Street north construction support site (WHT8)

It is assumed that the comment relates to properties that are located upstream of the Berry Street north construction support site (WHT8) in Hampden Street, not downstream as stated in the comment.

Measures have been incorporated in the design of the project to mitigate the impact that it would have on flood behaviour in existing development. For example, a new culvert is included in the design under the Berry Street on ramp to the Western Harbour Tunnel which would limit the depth to which floodwater would pond on the western (upstream) side of the road corridor.

Ridge Street north construction support site (WHT9)

There would be no impact on the Ridge Street road reserve as the land falls toward the Warringah Freeway. Flow generated from within Ridge Street north construction support site (WHT9) would be managed within the construction support site boundaries, with flow diverted to the existing pipe drainage system within the road corridor.

Cammeray Golf Course construction support site (WHT10 and WFU8)

The intent of the upgraded transverse drainage system at this location is not to increase the capacity of the underground system. As such, increased flows are not expected in the receiving drainage line.

Arthur Street east construction support site (WFU4)

As per environmental management measure F8 (refer to Table D2-1 of this submissions report), detailed construction planning will consider flood risk at construction sites and 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.

The impact of the project on flood behaviour during construction and operation will be confirmed during further project development.

North Sydney Council stormwater harvesting scheme at Cammeray Golf Course

Transport for NSW is consulting North Sydney Council and Cammeray Golf around the most suitable location for the storage dam.

Subject to a timely agreement with Cammeray Golf Club and North Sydney Council regarding a suitable alternate location, Transport for NSW will install a new permanent replacement storage dam (and associated infrastructure) within the golf course prior to decommissioning of the existing dam, to maintain ongoing operational functionality of the water harvesting scheme. If a suitable location cannot be agreed prior to the commencement of construction, Transport for NSW will come to an interim arrangement with Cammeray Golf Club and North Sydney Council regarding compensation for additional water usage, for the period until the period until the replacement dam in operational. Refer to environmental management measure WQ8 in Table D2-1 of this submissions report.

B14.16.3 Operational flooding impacts

Issue raised

Section 4.10.8 (pg 62)

The following concerns were raised regarding flooding impacts during operation:

- Nook Avenue would have an increase of 55 millimetres of peak flood depth. There are already issues at the end of Nook Avenue where it flows into the Sydney Water channel
- James Milson Village would have an increase of 75 millimetres of peak flood depth. There have been flooding issues in the village previously and whilst works were undertaken about five years ago to lessen the effects, it is unclear whether the increase has been adequately modelled
- The new freeway crossing needs to consider the impact on the downstream properties in Falls Street, Park Avenue, Grafton Street, Cammeray Road Warringah Road, and Creek Lane. These properties are already under pressure in the current regime and the increase in flows would worsen this situation.

Response

The project would generally result in a neutral or beneficial effect on flood behaviour external to the road corridor for storm events up to 1% AEP in intensity with some exceptions as outlined in Section 18.6.2 of the environmental impact statement. The assessment in the environmental impact statement is, however, based on the concept design. The potential for flood impacts due to the project design would be considered further during design development.

Environmental management measure F1 (refer to Table D2-1 of this submissions report) commits to carrying out a floor level survey to determine whether the minor increase in peak flood levels attributable to the project would result in an increase in above floor inundation in existing habitable areas. Where flood levels in the 1% AEP event are predicted to increase at any residential, commercial and/or industrial buildings as a result of the 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 impacts.

<u>Nook Avenue</u>

The potential for the project to adversely impact flood behaviour in the Nook Avenue properties was identified in the environmental impact statement. The detailed design of the project would incorporate measures that are aimed at mitigating the impact of the project on flood behaviour in properties where existing buildings would experience above-floor inundation under present day conditions during floods of up to the 1% AEP.

James Milson Village

Peak flood levels would be increased by up to 75 millimetres in a 10% AEP storm event, and increases of up to about 40 millimetres during a 1% AEP storm event at the James Milson Village (Retirement and Residential Care) development. This area would already be inundated during floods up to the 1% AEP. Areas within the village which would be affected by the project include the existing basement car park and below-ground storage facilities, which currently have existing flood mitigation measures in place, including a bund prior to the basement entry and a pump system. Increases of up to 16 millimetres would occur along the rear of several residential terraces located along Hipwood Street in Kirribilli. As per environmental management measure F1 (refer to Table D2-1 of this submissions report), 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 (including the James Milson Village property) 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.

Fall Street, Park Avenue, Grafton Street, Cammeray Road Warringa Road, and Creek Lane

Section 4.3.9 of Appendix R (Technical working paper: Flooding) discusses the existing Willoughby catchment. During a 1% AEP storm event, a low and high hazard floodway would form to the north (downstream) of the road corridor near Cammeray Golf Course. The floodway area also extends east into existing residential development which is located along Fall Street and Grafton Street.

Section 6.2 of Appendix R (Technical working paper: Flooding) considers the area immediately downstream of the stormwater detention and reuse basin that is proposed on the northern side of the Warringah Freeway in the Willoughby Creek catchment. Flood modelling carried out as part of the present investigation shows that while the basin would surcharge during a 1% AEP, the resulting impacts are contained within the already flooded golf course and do not affect residential property.

B14.16.4 Mitigation measures – recommendations

Issue raised

Section 4.10.8 (pg 62)

Recommended mitigation measures include:

- Stormwater and flooding impacts should be satisfactorily resolved prior to any construction works commencing
- Adverse impacts identified should be satisfactorily addressed and further detailed analysis used to guide appropriate actions. Once the final design levels, details, impacts are known, a full design impact analysis needs to be undertaken with suitable management and mitigation measures.

Response

Council's recommendations are generally already covered by environmental management measures outlined in Table D2-1 of this submissions report.

Table 28-4 of Chapter 28 (Synthesis of the environmental impact) of the environmental impact statement identifies the desired performance outcomes for flooding are:

- The project minimises adverse impacts on existing flooding characteristics
- Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards and dam failure.

To achieve these outcomes, 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
- Construction support sites and construction sites would be laid out such that flows are not significantly impeded (environmental management measures F5 and F6)
- The project would maintain or reduce flood levels within and adjacent to the alignment.

B14.17 Biodiversity

B14.17.1 General comments

Issue raised

Section 4.10.4 (pg 59)

Twenty four hour construction activity at Berrys Bay construction support site (WHT7) may impact on the lifecycles of native species (both terrestrial and marine), in the vicinity of Berrys Bay and North Sydney's largest remnant bushland, Balls Head Reserve.

Response

As noted in Chapter 6 (Construction work) of the environmental impact statement, spoil haulage at the Berrys Bay construction site (WHT7) would be carried out during standard construction hours only. Spoil handling and loading of the barges within the acoustic shed on the site would be carried out outside of standard construction hours. Tunnel construction would be carried out up to 24 hours per day, seven days a week either within an acoustic shed or underground. This would minimise the potential for impacts to terrestrial and marine species.

Chapter 19 (Biodiversity) of the environmental impact statement considers impacts to species lifecycles as a result of the project. A risk assessment was carried out to assess the potential hazards to Type 1, 2 and 3 key fish habitats within the marine biodiversity study area, including altered hydrodynamics, elevated turbidity and sedimentation from dredging, mobilisation of contaminants, introduction of marine pests and underwater noise from dredging and piling (summarised in Table 19-15 of the environmental impact statement). The assessment of potential noise impacts on marine species concluded that impacts to marine species would not affect the broader ecological functioning or viability of local populations due to the temporary nature of underwater noise impacts, with any changes in species assemblages recovered through natural processes of recruitment and immigration. The impacts on key fish habitats during construction and operation of the project are not considered to be significant and would be adequately managed by the measures in Table D2-1 of this submissions report. Further discussion of potential impacts to marine fauna as a result of the project is included in Section B6 of this submissions report.

Table 19-14 of the environmental impact statement advises that potential noise, vibration, dust and light spill impacts to any threatened fauna species are not expected to be significant given that most construction areas would occur in already highly urbanised areas. The affected species are also likely to be mobile, and the majority would be able to relocate voluntarily if required. This includes works next to Balls Head Reserve.

A discussion regarding potential impacts on terrestrial fauna (including the Large Bent wing-bat (*Miniopterus orianae oceanensis*) near the Berrys Bay construction site (WHT7)) is provided in sections B14.17.3 and B14.17.4. Potential impacts would be further minimised through the implementation of environmental management measures B1, B6, B8, B9, B11, B12, B28 and B30 (refer to Table D2-1 of this submissions report).

B14.17.2 Terrestrial flora

Issue raised

Sections 4.10.4, 4.10.5 (pg 59, 60)

The following concerns were raised regarding the bushland in Balls Head Reserve:

- Balls Head Reserve is classified as Category 1 bushfire prone land. The placement of the Berrys Bay construction support site (WHT7) on the north east boundary of Balls Head Reserve presents a potential risk to the site, particularly if rock blasting explosives are planned for storage at the facility
- A beach located between the Old Quarantine Station and Woodleys marina is accessed via the Woodleys driveway, and the beach is used as an access point for mooring holders in Berrys Bay. This access should be retained as part of the Berrys Bay construction support site (WHT7)
- The project will not construct an access track through bushland in Balls Head Reserve.

Response

Bushfire risk

The bushfire risk assessment carried out for the project concluded that all areas of the project are considered to have a bushfire risk level of 'low', as per Section 23.2.6 of the environmental impact statement. However, the Berrys Bay construction support site (WHT7) is situated within 140 metres of Balls Head Reserve, which is Bush Fire Prone Land (BFPL) given the presence of Dry Sclerophyll Forests and is considered a potential bush fire hazard with a 'possible' likelihood of occurrence.

Balls Head Reserve is managed by North Sydney Council, including fuel management, as identified in the *Mosman North Sydney Willoughby Bush Fire Risk Management Plan 2017-2022* (Mosman North Sydney Willoughby Bush Fire Coordinating Committee, 2008). North Sydney Council management of Balls Head Reserve would contribute to the bushfire protection measures for the Berrys Bay construction support site (WHT7).

The adoption of controlled blasting as a construction method is largely a decision for the construction contractor (when engaged). If controlled blasting is proposed, the contractor will develop a blast management strategy in accordance with environmental management measure CNV9 (refer to Table D2-1 of this submissions report). The strategy will detail transport, storage and handling arrangements for explosive materials in accordance with all relevant regulatory requirements.

Berrys Bay access

During the construction period, Transport for NSW will improve access to the beach area next to the former quarantine station and work with North Sydney Council to provide boat and kayak storage options at that location before construction starts as per environmental management measure LP9 (refer to Table D2-1 of this submissions report).

The project will not construct an access track through bushland in Balls Head Reserve.

B14.17.3 Terrestrial fauna

Issue raised

Section 4.10.4 (pg 59)

Currently, a narrow band of dense weedy vegetation occupies the vacant foreshore land below No.3 Balls Head Road, Waverton. This vegetation provides a vital habitat link between Balls Head Reserve and Carradah/Waverton Park. Removal of this vegetation, as part of the construction

support site development, would interrupt this connecting wildlife corridor and create an impediment to wildlife movement between foreshore reserves.

Response

Environmental management measure B28 confirms that this vegetation buffer on the northern portion of the Berrys Bay construction support site (WHT7) will be retained (refer to Table D2-1 of this submissions report).

This vegetation buffer is habitat that is only of relevance to highly mobile fauna, adapted to urban areas (ie birds, bats and possums). While it is unlikely to be habitat for any threatened fauna species requiring conservation, connectivity is still recognised as important for mobile fauna.

B14.17.4 Endangered and protected species

Issue raised

Section 4.10.4 (pg 58, 59)

The following concerns were raised regarding impacts to threatened species from construction activities:

- Sydney Harbour north cofferdam (WHT6) and Berrys Bay construction support site (WHT7) key concerns:
  - Balls Head Bay is a known foraging habitat for two regularly occurring threatened species (Little Penguin and Large-footed Myotis), the latter of which occupies a permanent roost in Balls Head Bay which limits the range of its foraging habitat to local embayment's around Balls Head
  - Reduced water quality caused by suspended sediments or contamination could affect the availability and fitness of food resources for both the Myotis and the Little Penguin
  - Vibration and noise associated with the construction of the cofferdam may negatively affect the use of tunnel No. 4 under the coal loader platform by roosting Large Bent-wing bats (a listed threatened species). Eastern Bent-winged Bats are known to be sensitive to noise and vibration and would vacate roosts where these factors are present
  - Tunnel access ramps, proposed for construction from the Berrys Bay support site (WHT7) to the main tunnels would result in noise and vibration (including the potential for rock blasting) in close proximity to a known autumn/winter roost of the Large Bent-wing Bat (a listed threatened species)
- Immersed tube tunnel key concerns:
  - Preparation of the seabed for tunnel installation involves dredging of an estimated 900,000m^3 of marine sediments (some which are known to be contaminated) which presents a risk to water quality in Balls Head Bay and therefore presents a risk to threatened species known to forage in Balls Head Bay
  - Other marine threatened species identified in Chapter 19 (Biodiversity) (Black Rockcod; White's seahorse etc) are also potentially placed at risk as a result of the project.

Response

<u>Sydney Harbour north cofferdam (WHT6) and Berrys Bay (WHT7)</u>

The threatened Little Penguin (*Eudyptula minor*) could be susceptible to collisions with watercraft or barges carrying out construction within Sydney Harbour; however, this species typically forages in shallow waters at the shoreline, which the project largely avoids (refer to Section 19.4.2 of the environmental impact statement). Sydney Harbour is subject to high levels of water traffic and the species may be adapted to avoiding water vessels. An observer qualified to spot Little Penguins will be used during marine construction activities, as per environmental management measure B13

(refer to Table D2-1 of this submissions report). A stop-work procedure would be implemented upon sighting of the species in the proximity of the works area.

Table 19-7 of the environmental impact statement advises construction works within Sydney Harbour would have the potential to result in water quality impacts which could result in potential adverse impacts to foraging habitat for threatened fauna species such as the Little Penguin (*Eudyptula minor*). However, the selected methodology for the project has identified dredging methods and controls to limit the potential for turbidity impacts and mobilisation of sediment, in order to minimise the impact on the surrounding marine environment. This includes, but is not limited to, the installation of floating silt curtains and other management measures. Accordingly, any potential increase in turbidity and sedimentation of marine waters near construction activities would be minimal, localised and temporary.

Direct impacts to man-made structures and the built environment would be limited to some structures at Yurulbin Park and Berrys Bay, which offer limited and marginal potential roosting habitat for some bat species including the Southern Myotis (*Myotis macropus*). These works would be unlikely to adversely impact such species. Pre-clearing surveys for bat roosts would be carried out by a suitably qualified person on all buildings or structures with potential roosting habitat that are to be demolished or refurbished. If microbats are identified as roosting in these structures, individuals would be appropriately managed and excluded from these areas prior to works commencing (as per environmental management measure B12 (refer to Table D2-1 of this submissions report)).

Table 19-14 of the environmental impact statement confirms that there are potential noise and vibration impacts to roosting Large Bent wing-bats (*Miniopterus orianae oceanensis*) within the coal loader tunnels at Waverton, particularly during autumn and winter when this roost is known to be occupied. As discussed in Section B5 of this submissions report, adaptive management measures to minimise impacts on the Large Bent-winged bat will be developed in consultation with the Department of Planning, Industry and Environment (Environment, Energy and Science), Department of Planning, Industry and Environment (Regions, Industry, Agriculture and Resources), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour. These commitments are incorporated by environmental management measures B8, B9, B28, B29 and B30 included in Table D2-1 of this submissions report.

As noted in Section A4.2 of this submissions report, the Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*) referred to in the environmental impact statement and Appendix S (Technical working paper: Biodiversity development assessment report) has been renamed to the Large Bent-winged Bat *(Miniopterus orianae oceanensis*). This change has been adopted in this submissions report and the updated environmental management measures presented in Table D2-1 of this submissions report.

Immersed tube tunnel

The dredging of marine sediment and the associated potential for water quality impacts due to mobilised sediment is addressed in Section B14.15.1 above. In addition, dredging contractors would develop a dredge management plan to outline procedures to minimise the area of impact to marine water quality, vegetation and habitat (refer to Section D1 of this submissions report). The plan would incorporate an adaptive management approach that utilises ongoing monitoring and assessment of triggers to provide early warning of potential ecosystem stress. In addition to silt curtains, mitigation may include adjustments to the dredging activities such as moving the dredge to other areas, changing the dredging method (eg dredging on ebb tide only), and ultimately cessation of dredging for a period to reduce stress to the environment. These responses would be tailored to the conditions observed and to minimise risks of any long term impact on the marine environment. Refer to Section D1 of this submissions report for details.

Section 19.4.4 of the environmental impact statement notes that removal of medium/high relief rocky reef habitat would occur during the installation of the Sydney Harbour south (WHT5) and Sydney Harbour north (WHT6) cofferdams. This has the potential to provide habitat for the Black

Rockcod species and White's seahorse, although only a very few individuals of this species would occur in the small areas of this habitat where individuals would potentially be harmed. As the removal of this habitat would be limited to less than 0.01 hectares, impacts would be small relative to the extent of the habitats in Sydney Harbour so as to not compromise the functionality, long-term connectivity or viability of habitats, or ecological processes beyond the affected areas.

Environmental management measures B16 to B21 and B27 (refer to Table D2-1 of this submissions report) will mitigate impacts to sensitive marine habitat. This includes rehabilitation and restoration of subtidal rocky reef and intertidal rocky shore habitat as close as possible to pre-construction conditions where feasible and reasonable. Further detail of potential impacts to Whites seahorse and Black Rockcod, and mitigation measures, are provided in Section B6 of this submissions report.

B14.17.5 Mitigation measures – recommendations

Issue raised

Section 4.10.5 (pg 59, 60)

Recommended mitigation measures include:

- A bushfire hazard assessment should be undertaken in relation to WHT7 with recommended protection measures incorporated within the WHT7 site design (not the adjoining Balls Head Reserve)
- Consideration should be given to community access to the foreshore of Berrys Bay, just north of the Old Quarantine Depot. This area is currently used by mooring holders in Berrys Bay and is accessed via the old Woodleys Marina driveway. If the operation of WHT7 results in restricted access, an alternative access point should be provided that does not negatively impact Balls Head Bushland Reserve (ie no new tracks in bushland)
- Assessment of potential water quality impacts affecting the food resources/foraging habitat of the Large-footed Myotis colony that roosts in Balls Head Bay and feeds on marine invertebrates and small fish etc
- Measures should be set in-place to monitor vibration/noise in the coal loader microbat roost (Tunnel No.4) during the known roosting period (Autumn and Winter). Where levels exceed a specified tolerance level, vibration-related works must cease, and an alternate non-impacting construction methodology adopted
- WHT7 should be designed to retain a dense vegetated link between Balls Head Reserve and Carradah/Waverton Park, immediately below No.3 Balls Head Road.

Response

<u>Bushfire risk</u>

The bushfire risk assessment concluded that all areas of the project are considered to have a bushfire risk level of 'low'. The bushfire risk assessment is described further in Section B14.17.2 above.

<u>Berrys Bay access</u>

During the construction period Transport for NSW will improve access to the beach area next to the former quarantine station, in accordance with environmental management measure LP9 (refer to Table D2-1 of this submissions report). The project will work with North Sydney Council to provide boat or kayak storage racks at the beach before construction starts.

The Berrys Bay construction support site (WHT7) would require the temporary relocation of about 10 swing moorings in Sydney Harbour which would be impacted by the works, as outlined in Table 6-19 of the environmental impact statement. Relocations would be required for the duration of construction. The relocation of moorings will be carried out in accordance with environmental management measure LP4 (refer to Table D2-1 of this submissions report). Transport for NSW will

consult with the owners and/or leaseholders and/or licence holders of moorings that require temporary relocation to determine alternative arrangements. All efforts will be made to relocate facilities as close to their original locations as possible.

The project has no plans to construct an access track through bushland in Balls Head Reserve.

Large-footed Myotis colony

Refer to Section B14.17.4 above.

Coal loader microbat roost

Impacts associated with noise and vibration to the Large Bentwing-bat habitat at the Coal loader will be managed in accordance with environmental management measures B8 and B9 (refer to Table D2-1 of this submissions report). This includes:

- Monitoring of Large Bent-winged bats in the coal loader tunnel prior to and during construction (in the months of March to September) will be carried out. The frequency and methods of the monitoring will be provided in an adaptive management plan developed prior to the commencement of construction that could affect the bats and in consultation with the Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour (environmental management measures B8)
- Prior to the commencement of construction of the Sydney Harbour north cofferdam (WHT6) excavation of the mainline tunnel and any rock hammering works within close proximity to the Coal loader roosting site, adaptive management measures to minimise impacts on the Large Bent-winged bat will be developed in consultation with Department of Planning, Industry and Environment (Environment, Energy and Science, and the Regions, Industry, Agriculture and Resources divisions), North Sydney Council and an appropriately qualified expert in microbat biology and behaviour. These measures, including the timing of their implementation will be detailed in an adaptive management plan (environmental management measure B9).

Balls Head Road vegetation

Refer to Section B14.17.3 above.

B14.18 Land use and property

B14.18.1 Loss of open space impacts

Issue raised

Sections 4.6.1, 4.6.2, 4.8.5 (pg 41, 42, 51)

Council raised concerns about construction and operational impacts to areas of public open space and noted that, negotiation of financial and open space offset compensation is warranted. Council resolved at its meeting on 24 February 2020, that it seeks assurances that the NSW Government guarantee that there will be no net loss of public recreation space as a result of the project. Key concerns include:

- The qualitative impact of the prolonged (over five years) and permanent loss of open space would be profound. Open space provides a vital role in the social, mental, physical health and well-being of the population, which is vital in North Sydney where there are increasing residential flat buildings with no private open space
- Permanent loss of over 2.89 hectares of much valued land in Cammeray Park along with removal of North Sydney Council stormwater harvesting scheme at Cammeray Golf Course

- The occupation of a large portion of St Leonards Park during construction. The return state is unknown due to lack of clarity in the plans; final designs may reveal areas of parkland would not be returned in acceptable or useable state.

Response

The majority of open space used for construction of the project would not be required to operate the project. In accordance with environmental management measure SE1 (refer to Table D2-1 of this submissions report), where feasible and reasonable, the extent of permanent impact on public open space areas will be minimised during further design development. Public open space areas not required for operation would be rehabilitated and returned to an equivalent state. Land subject to temporary use, including areas of public open space, will be rehabilitated as soon as practicable to an appropriate land use (refer to environmental management measures SE2 and LP2, Table D2-1 of this submissions report).

The project has been designed and developed to minimise impacts to Cammeray Golf Course and Transport for NSW will continue its collaborative engagement with Cammeray Golf Club to maintain the long term viability of the Cammeray Golf Course. The project would not impact on the site's feasibility as a nine hole golf course and for public recreation and open space purposes, either during construction or operation. As outlined in Chapter 20 (Property and land use) of the environmental impact statement, the adjoining Cammeray Park sports ground, tennis club, croquet club and skate park would not be directly impacted and would remain operational during construction and operation. A concept masterplan for Cammeray Park is shown on Figure 22-4 of the environmental impact statement.

Part of Cammeray Golf Course would be permanently acquired for permanent operational facilities for both the project and the Beaches Link and Gore Hill Freeway Connection project (outlined in Table 20-3 of the environmental impact statement). The acquisition of open space at Cammeray Golf Course was conservatively presented as 25,000 square metres in the environmental impact statement (this also included loss due to Beaches Link and Gore Hill Freeway Connection). Refined analysis shows that the permanent loss of open space at Cammeray Golf Course associated with the project is about 15,000 square metres. The location of operational infrastructure has been developed in consideration of existing land uses and future development to minimise permanent impacts. Open space impacts as a result of the Beaches Link project would be assessed as part of the Beaches Link and Gore Hill Freeway Connection environmental impact statement.

While the project operation would require the permanent use of some existing public open space, it would also present opportunities to increase public open space. The environmental impact statement presented a conservative view by only reporting the largest single parcel of open space proposed to be acquired (at Cammeray Golf Course). The environmental impact statement did not provide any details on the size of opportunities to increase public open space.

Additional public open space opportunities currently considered in the design include provision of new public open space at Berrys Bay (about 15,800 square metres – refer to Section B14.18.4 below for further details), resulting in significantly improved public amenity in this area. Additionally, the project provides a new Ernest Street shared user bridge (about 1800 square metres), which would link Cammeray Golf Course with ANZAC Park; a clarification has been provided in Section A4 of this submissions report. Further opportunities to increase public open space would be investigated during further design development.

The existing stormwater harvesting facility at Cammeray Golf Course is addressed in Section B14.16.2 above.

Table 20-3 of the environmental impact statement indicates that the south-eastern portion of St Leonards Park would be temporarily required for use as the Ridge Street north construction support site (WHT9). This site would not be required on a permanent basis to operate the project and would be rehabilitated in consultation with North Sydney Council and returned as soon as practicable at the completion of construction, per environmental management measures SE2 and LP2 (refer to Table D2-1 of this submissions report) discussed above.

Kerb and footpath adjustment works would occur on Miller Street southbound around the intersection with Falcon Street. These works would provide a new dedicated lane for left turning traffic from Falcon Street westbound to Miller Street southbound. Further review of the impacts in this area is currently being carried out and permanent impacts to St Leonards Park would be minimised or, where possible eliminated.

An assessment of land use and property impacts of the project, including impacts to open space during construction and operation is provided in Chapter 20 (Land use and property) of the environmental impact statement.

B14.18.2 Property acquisitions

Issue raised

Section 4.8.2 (pg 48, 49)

Council is concerned that the acquisition of the following privately owned lands does not have adequate regard to impacts upon affected community members:

- Sections of private non-residential property on Falcon Street would be permanently acquired for road corridor works on the Warringah Freeway. 172 Falcon Street currently functions as Hare Krishna Catering and the Hare Krishna Movement place of worship. Whilst specific areas (in square metres) are not identified, it is expected that the current uses of this property would be able to continue
- Detailed addresses (Lots/DP descriptions) are not provided in the environmental impact statement, however, a location plan and description are provided:
  - A residential flat building comprising twelve (12) units on Morden Street at Cammeray would be fully acquired and demolished for use during construction. Following construction, the site would be re-habilitated with an undetermined future use and ownership
  - Two (2) residential dwellings on Bellevue Street Cammeray would also be fully acquired and demolished for use during construction. Following construction, the sites would be re-habilitated with an undetermined future use and ownership
- A section of privately owned residential property on Ernest Street would be permanently acquired for the permanent road works. The area the subject of acquisition is not specified but is described as being around five per cent of the total property area. No qualitative description has been provided with respect to impact.

Response

The project has been designed and developed to minimise property acquisitions and has prioritised the use of Transport for NSW land. Properties discussed in Section 20.4.1 of the environmental impact statement are properties that are anticipated to be acquired. Discussions are currently underway with affected property owners concerning the purchase, lease or licence of land.

As noted in Section 20.4.1 of the environmental impact statement, the acquisition of land for construction activities may result in residual land that would not be required for operational infrastructure or activities. In accordance with environmental management measure LP2 (refer to Table D2-1 of this submissions report), land subject to temporary use will be rehabilitated as soon as practicable to an appropriate land use, taking into consideration the location, land use characteristics, area and adjacent land uses. This will be carried out in consultation with the relevant council and/or the land owner.

Property acquisitions will be carried out in accordance with environmental management measure LP1 (refer to Table D2-1 of this submissions report). Section 7.2.5 of the environmental impact statement indicates that Transport for NSW has appointed a Personal Manager - Acquisition to help land owners and residents who may be affected by acquisition for the project. The Personal

Manager - Acquisition is in regular contact with these individuals to provide updates on the project and respond to questions and queries. Should acquisition for the project be confirmed for a particular property, the Personal Manager - Acquisition will work with the affected land owners and residents to offer assistance and support throughout the acquisition and relocation process, in accordance with environmental management measure LP1 (refer to Table D2-1 of this submissions report).

B14.18.3 Property impacts

Issue raised

Sections 4.8.5, 4.6.1 (pg 41, 51)

Evidence from *The Impact of the WestConnex Project report* (Public Accountability Committee, 2018) shows that impacts to property from tunnelling works are not typically satisfactorily resolved for residents, property and business owners. Financial compensation has been shown to be problematic and inadequate. It is unclear how the State government will meaningfully address these concerns during and post construction.

Response

In accordance with environmental management measure CNV8 (refer to Table D2-1 of this submissions report) prior to the commencement of construction, building condition surveys will be offered along with vibration and blasting trials where there is a potential for construction activities to cause cosmetic or structural damage.

In accordance with environmental management measure SG3 (refer to Table D2-1 of this submissions report) 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 and vibration monitoring requirements. In accordance with environmental management measure SG4 (refer to Table D2-1 of this submissions report), any property damage caused by the project will be rectified.

The enquiries and complaints handling procedures can be found in Section 3 of Appendix E (Community consultation framework).

B14.18.4 Mitigation measures – recommendations

Issue raised

Sections 4.6.3, 4.8.5 (pg 45, 51)

Recommended mitigation measures include:

- A comprehensive open space and compensation/damage mitigation strategy needs to be negotiated in order to plan for and ameliorate the lost and degraded utility of all impacted areas of open space. This strategy requires inter-governmental support and sign off prior to progression of the project. The strategy or 'Terms of Reference' need to be binding and would then inform more detailed matters relating to consultation, detailed design, project timing, land tenure, maintenance and the like
- Provision of adequate and readily navigable systems for redress in the event of severe impacts, particularly those the subject of acquisitions.

Response

<u>Open space mitigation strategy</u>

Land subject to temporary use, including areas of public open space, will be rehabilitated as soon as practicable to an appropriate land use, taking into consideration the location, land use characteristics, area and adjacent land uses (as discussed in Table 28-3 of the environmental

impact statement). This will be carried out in consultation with the relevant council and/or the land owner (per environmental management measure LP2, refer to Table D2-1 of this submissions report).

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 V12, 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.

As discussed in Section B14.18.1 above, the project would include both loss of, and opportunities for additional, public open space. This includes government-owned waterfront land at Berrys Bay in Waverton, which would be temporarily required for use as a construction support site (Berrys Bay construction support site (WHT7). This site would not be required on a permanent basis to operate the project and would be rehabilitated as soon as practicable at the completion of the project and would be returned to the public as open space.

Transport for NSW and the Department of Planning, Industry and Environment would jointly establish a reference group, to include representation of key stakeholders, the community and independent experts, to support the development of the final layout, as outlined in Section B14.6.5 above. This process would be carried out prior to the start of construction works.

Transport for NSW is also working with North Sydney Council to develop an Interface Agreement for the Western Harbour Tunnel and Beaches Link program of works. This agreement would provide more details regarding obligations between both parties, including with respect to all impacted areas of open space.

Property acquisitions

Property acquisitions will be carried out in accordance with environmental management measure LP1 and SG3 (refer to Table D2-1 of this submissions report), as discussed above in sections B14.18.2 and B14.18.3. This includes carrying out land acquisition for the project in accordance with the *Land Acquisitions (Just Terms Compensation) Act 1991* (NSW).

Transport for NSW has appointed a Personal Manager – Acquisition to help land owners who may be affected by acquisition for the project. The Personal Manager – Acquisition is in regular contact with these individuals to provide updates on the project and respond to questions and queries. Should acquisition for the project be confirmed for a particular property, the Personal Manager - Acquisition would work with the affected land owners and residents to offer assistance and support throughout the acquisition and relocation process (refer to Chapter 20 (Land use and property) of the environmental impact statement).

Section 20.4.1 of the environmental impact statement also notes that landowners and tenants of landowners affected by acquisition will be supported by access to counselling services throughout the process and a community relations support toll-free telephone line (1800 931 189) will be established to respond to any community concerns.

B14.19 Socio-economic

B14.19.1 Adequacy and accuracy

Issue raised

Section 4.12.2 (pg 79)

The level of participation by businesses in the survey conducted in November 2017 (Appendix A (Business impact assessment) of Appendix U (Technical Working Paper: Socio-economic assessment) is too low to be a statistically representative sample for the nine local centres that may be more susceptible to direct or indirect effects of construction and/or operation. Further

engagement activities with business stakeholders during the environmental impact statement exhibition period were not detailed.

Response

Business surveys were conducted during a three-week period in November 2017 in nine local centres that may be more susceptible to direct or indirect effects of construction and/or operation (refer to Section 7.2.4 of the environmental impact statement). Businesses were approached at random within these local centres, with every effort made to survey a range of business types across the study area. Local business owners also attended community information sessions. Section 2.1.1 of Appendix U (Technical working paper: Socio-economic assessment) also notes that the survey covered a wide variety and representative sample of business types including retail shops, industrial premises, real estate agencies, cafes, pubs, restaurants, auto service centres and professional service businesses.

Businesses within the impacted areas received postcards promoting the environmental impact statement, information sessions, the interactive portal and information on how to make a submission. Transport for NSW attended the Business Buzz 2020 event on 6 March 2020 and presented to North Sydney businesses on the benefits of the project and how impacts would be managed in the North Sydney area. This event was organised by North Sydney Council.

B14.19.2 Local business

Issue raised

Section 4.8.5 (pg 51)

The project would result in a loss of revenue, relocation and business closure from acquisitions and leasing during construction (eg Cammeray Golf Course and The Greens).

Response

The project has been designed and developed to minimise property acquisitions and has prioritised the use of Transport for NSW land. Notwithstanding this, some temporary use and permanent acquisition of properties would be required.

The significance of property acquisition or lease cessation on businesses would vary in scale, depending on the number of business properties to be acquired, their associated contribution to the local economy and the ability of the remaining local business catchment to absorb the change. Although the impact on individual businesses may be significant, the compensation process is generally designed to reduce this impact (as per Section 21.4.7 of the environmental impact statement).

The project has been designed and developed to minimise impacts to Cammeray Golf Course and Transport for NSW will continue consultation with Cammeray Golf Club to address impacts of the project and maintain the long term viability of the Cammeray Golf Course in accordance with environmental management measure LP5 and LP7 (refer to Table D2-1 of this submissions report). The configuration of the construction support sites and the permanent operational infrastructure for both projects, whether implemented at the same time or at different times, would allow for the site to remain operational as a nine hole golf course for the duration of the construction and operation of both projects. Transport for NSW have engaged and consulted with the golf course operator and land holder and this would continue during further design development and implementation of the project to ensure that the operation of the golf course site during construction and operation of the project is possible.

Table 20-3 of the environmental impact statement notes that parts of the golf course would also be temporarily required for use as a construction support site (WHT10 and WFU8). The temporary use of land will be managed and rehabilitated in accordance with environmental management measure LP2 (refer to Table D2-1 of this submissions report). Parts of the Cammeray Golf Course would also be permanently acquired for permanent operational facilities for both the Western Harbour Tunnel

and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project. Land that would not be required to support the Beaches Link and Gore Hill Freeway Connection project would be rehabilitated and returned as soon as practicable at the completion of construction.

The Greens (North Sydney Bowling Club) is next to the Ridge Street north construction support site (WHT9). This construction site would be rehabilitated and returned as soon as practicable at the completion of construction. The North Sydney Bowling Club would remain operational during construction and would not be directly impacted during construction (as per Table 20-4 of the environmental impact statement).

Environmental management measure BU1 (refer to Table D2-1 of this submissions report) advises that 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* (NSW) as relevant. Environmental management measures BU2 and BU3 (refer to Table D2-1 of this submissions report), provide that consultation will continue to be carried out with businesses impacted by the project and that, where necessary, measures will be taken to address business issues including maintaining business access, visibility and parking and other potential impacts as they arise. This will include specific consultation with The Greens with the objective of identifying ways to minimise impacts of the project on their business.

B14.19.3 Health and wellbeing

Issue raised

Sections 4.8.2, 4.8.3, 4.8.5 (pg 50, 52)

The following concerns were raised regarding health and wellbeing impacts not incorporated by the environmental impact assessment:

- Compulsory acquisitions associated with projects of this nature, whilst having a legislative process, do not have adequate regard to and impact upon affected community members in varying ways including:
  - Mental health issues such as ongoing stress, anxiety and uncertainty
  - Ongoing engagement with State Government and the Justice system over a long period of time, in some cases lasting years
  - Forced relocation to potentially distant locations due to unaffordability to remain in the local community from inadequate compensation
  - Physical health issues
  - Loss of connection to their local community, social infrastructure and in certain cases family networks
- Whilst difficult to quantify, it is highly likely that some residents or businesses would move out of the area due to the impact of construction.

Response

Socio-economic impacts associated with property acquisitions have been addressed in Section 21.4.1 of the environmental impact statement. Some residents and communities near the project may experience a level of stress and anxiety due to uncertainty about potential property impacts, property acquisition and proposed changes that may be associated with the project. These concerns were raised by community members during consultation for the project.

Section 13.4.3 of the environmental impact statement discusses heath related social impacts during construction, including property acquisition. The project has been designed and developed to

minimise the need for property acquisition. Wherever possible, construction support sites have been located to minimise the overall property acquisition requirements, as well as impacts on heritage items and ecologically sensitive areas. Impacts associated with property acquisition would be managed through a property acquisition support service and in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) and the land acquisition reforms announced by the NSW Government in 2016 (refer to environmental management measure LP1 of Table D2-1 of this submissions report).

Transport for NSW has appointed a Personal Manager - Acquisition to help land owners and residents who may be affected by acquisition for the project. The Personal Manager - Acquisition is in regular contact with these individuals to provide updates on the project and respond to questions and queries. Should acquisition for the project be confirmed for a particular property, the Personal Manager - Acquisition would work with the affected land owners and residents to offer assistance and support throughout the acquisition and relocation process (refer to Chapter 20 (Land use and property) of the environmental impact statement).

Consultation for the project will be carried out in accordance with the Community Consultation Framework provided as Appendix E of the environmental impact statement, as per environmental management measure SE4 (refer to Table D2-1 of this submissions report).

Section 20.4.1 of the environmental impact statement also notes that landowners and tenants of landowners affected by acquisition will be supported by access to counselling services throughout the process and a community relations support toll-free telephone line (1800 931 189) will be established to respond to any community concerns.

B14.19.4 Mitigation measures – recommendations

Issue raised

Section 4.8.5 (pg 51, 52)

Council are concerned that North Sydney residents, workers and visitors would suffer disproportionate health, wellbeing and economic impacts. Recommended mitigation measures include:

- Impacted businesses should be compensated where indirectly and financially impacted by the project (ie not be limited to just those impacted by acquisitions)
- Provision of counselling and support services to those impacted by the project by way of financial, physical or emotional distress.

Response

Environmental management measure BU1 (refer to Table D2-1 of this submissions report), advises that 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* (NSW) and the land acquisition reforms announced by the NSW Government in 2016 as relevant. Commitments to consultation with local businesses is incorporated by environmental management measures BU2 and BU3 (refer to Table D2-1 of this submissions report).

Consultation for the project will be carried out in accordance with the Community Consultation Framework provided as Appendix E of the environmental impact statement, as per environmental management measure SE4 (refer to Table D2-1 of this submissions report).

The provision of counselling services is discussed in Section B14.18.3. In addition, as per environmental management measure BU3 (refer to Table D2-1 of this submissions report), a phone hotline will be established which will allow impacted businesses to register any issues experienced in the lead up to and during construction. In accordance with environmental management measure AQ2 (refer to Table D2-1 of this submissions report), dust and air quality complaints will be

managed with the overarching complaints handling process for the project. Cumulative complaints fatigue will be managed as outlined in Chapter 7 (Stakeholder and community engagement) of the environmental impact statement. Complaint management tools for the project are outlined in Appendix E (Community consultation framework) (refer to environmental management measure CI4 in Table D2-1 of this submissions report).

B14.20 Urban design and visual amenity

North Sydney Council considers that the project will have a major and lasting adverse impact on the visual amenity, character and quality of the North Sydney local government area and will not achieve the placemaking and urban design performance outcome of the secretary's environmental assessment requirements.

B14.20.1 Adequacy and accuracy

Issue raised

Section 4.10.2 (pg 71)

The classifications of long-term landscape character and visual impacts to areas along the freeway are underestimated. Particularly six locations of "High" or "Moderate/High" visual impacts at the Whaling Road Conservation Area, Ridge Street Lookout, Jeaffreson Jackson Reserve, towards Cammeray Park and Anzac Park.

Many of these classifications are downgraded on the basis that surrounding residential areas, parks and conservation areas are already impacted by the freeway. This rationale is not supported. These are sensitive land uses that have little to no tolerance for larger, more intensive road infrastructure. The removal of mature vegetation that currently mitigates many of the environmental effects of the freeway will be acutely felt by the community.

Response

The location of impacts that are likely to have been underestimated in the environmental impact statement shown on Figure 13, page 70 of the North Sydney Council submission have been noted.

The operational landscape character and visual impacts would be managed through the preparation and implementation of urban design and landscape plans in line with the strategic urban design framework for the project as per environmental management measure V12 (refer to Table D2-1 of this submissions report). Construction impacts would be managed through the environmental management measures in Table D2-1 of this submissions report.

The landscape character and visual impact assessment provided in 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) has been carried out in accordance with *Environmental Impact Assessment Practice Note – Guidelines for Landscape Character and Visual Impact Assessment* (Roads and Maritime, 2013). This document sets out a clear and systematic approach in documenting the baseline conditions, impacts and mitigation.

The assessment is concerned with how the surroundings of individuals or groups of people may be specifically affected both quantitatively (with regards to the physical extent of change) and qualitatively (with regards to the change to the qualities of the view or landscape).

Judgement as to the level of the effects is arrived at by a process of reasoning, based upon analysis of the baseline conditions, identification of landscape character zones and visual receivers (viewers of the scene), and assessment of their sensitivity. This is combined with an assessment of the magnitude and nature of change that may result from the project.

Section 4.1.4 of Appendix V (Technical working paper: Urban design, landscape character and visual impact) outlines key assumptions used in the assessment. This includes that proposed landscape treatments are assessed as being at an early stage of growth (day one of project

operation) to ensure a reasonable, conservative approach to any beneficial effects of vegetative screening on the project. It can also be expected that the landscape character and visual impact assessment ratings derived within this report would improve when:

- Buildings and infrastructure are architecturally designed and rendered in accordance with the requirements contained in the strategic urban design framework that is included in Appendix V (Technical working paper: Urban design, landscape character and visual impact)
- The project landscape works mature.

In accordance with environmental management measure V9 (refer to Table D-2 of this submissions report), where possible, trees will be trimmed rather than removed. Works will be carried out by a qualified arborist.

Further, as stated in environmental management measure B4, trees removed by the project will be replaced at a ratio equal to or greater than 1:1. The replacement trees will consist of local native provenance species from the vegetation community that once occurred in this locality (rather than plant exotic or non-local native trees) where available and subject to the urban design and landscape plan.

B14.20.2 Construction visual impact

Issue raised

Section 4.10.2 (pg 68)

Landscape character and visual amenity of residential areas, parks and conservation areas would be heavily impacted by construction support sites, including major works at Berrys Bay.

Response

As described in Section 22.4.2 of the environmental impact statement, the visibility of the Berrys Bay construction support site (WHT7) is relatively limited from many locations in the locality due to the enclosed nature of the bay. Temporary Moderate/High visual impacts are limited to receivers that would have local views of the site, including Carradah Park and several residential dwellings off Larkin Street and Balls Head Road (as per Appendix V (Technical working paper: Urban design, landscape character and visual impact)).

As a result of construction activities and removal of vegetation at the Berrys Bay construction support site (WHT7), there are likely to be temporary and localised landscape character impacts on the public open space, residential dwellings and open water surrounding the construction support site. The increase in built form would be congruous with the existing undeveloped landscape character of the bay.

Impacts associated with the proposed construction support sites would be managed using the environmental management measures outlined in Table D2-1 of this submissions report, including:

- Construction support sites developed to minimise visual impact for adjacent receivers (environmental management measure V1)
- Storage area and associated works located in cleared and otherwise disturbed areas away from residential receivers (environmental management measure V2)
- Neutral coloured site hoarding (environmental management measure V3)
- Site hoarding and perimeter sites areas maintained (environmental management measure V4)
- Site lighting designed to minimise glare and light spillage (environmental management measure V5)

- Use of high quality fencing for construction support sites located in close proximity to sensitive receivers (environmental management measure V7)
- Existing trees to be maintained for screening (environmental management measure V8).

Transport for NSW and the Department of Planning, Industry and Environment would jointly establish a reference group, to include representation of key stakeholders, the community and independent experts, to support the development of the final layout of Berrys Bay, as outlined in Section B14.6.5 above. It is expected this process would be carried out prior to the start of construction works. Temporary use of land will be managed and rehabilitated in accordance with environmental management measure LP2. Refer to Section B14.6.5 above for more details.

B14.20.3 Operational visual impact

Issue raised

Sections 4.6.3, 4.10.2 (pg 43, 67, 68, 72)

Landscape character and visual amenity of residential areas, parks and conservation areas would be heavily impacted by:

- Overall expansion of the freeway network that would further divide the communities of North Sydney, Neutral Bay and Cammeray with no new infrastructure proposed to address the divisive nature of the project
- Major vegetation loss that would remove the existing landscaped buffer between the freeway and dwellings/parks that currently ameliorate the impacts of the transport infrastructure
- Reduction in open space, vegetation removal and likely construction of fenced barriers around the entry portal near Hampden Street, exit portal in St Leonards Park and Western Harbour Tunnel motorway facility in Cammeray Park:
  - The Western Harbour Tunnel motorway facility is estimated to have 'Moderate/High' impacts on the landscape character of Cammeray Park due to the height and scale of the buildings in the park and consequent reduction in public open space. There is little information provided to comment on the visual impact of the facility
- Large, new overhead bridge structures for the Alfred Street and Miller Street overpasses:
  - The Alfred Street overpass that is proposed to be constructed along the western side of the Whaling Road Conservation Area which would have visual, overshadowing, noise and amenity impacts on surrounding residences
  - There is limited information or diagrams of the Miller Street overpass to show possible impact on the Cammeray Conservation Area. Impacts are likely to be greater than outlined in the environmental impact statement
- New bridge structure at the Falcon Street interchange, including the raised bus lane would affect high density residential area in Neutral Bay. There are no photomontages for this area
- Proximity to new and heightened noise barriers and fast-moving heavy vehicles
- Views and proximity to the ventilation outlet.

Response

<u>Division of communities</u>

Table 20-5 of the environmental impact statement notes that the existing scale of the Warringah Freeway creates a barrier between the eastern and western sides of North Sydney. The Warringah Freeway Upgrade component of the project would provide a positive contribution to the local area by providing new and upgraded active transport infrastructure that would improve connectivity

across the Warringah Freeway including connections to and from the North Sydney commercial centre. This would include the replacement of the Ridge Street shared user bridge, a new shared user path along the southern side of the High Street bridge at North Sydney, an active transport link north of Ernest Street, and an improved dedicated cycleway between Ernest Street and Miller Street (assessed in Section 6.8.2 of Appendix U (Technical working paper: Socio-economic assessment). There would not be any decrease in the number of east west crossing points when compared to before construction.

Loss of landscaped buffer

Section 22.4.2 of the environmental impact statement describes a band of vegetation along the eastern boundary with the Warringah Freeway that separates the St Leonards Park from the road, screening views towards the road infrastructure and associated traffic. The impact of the removal of this vegetation may reduce over time with the maturing of replacement planting throughout the construction period. Environmental management measure V11 (refer to Table D2-1 of this submissions report) notes that early planting works will be considered.

As noted in Section A4.2 of this submissions report, the location of the tunnel interface on the project website portal flyover video was incorrect. The location of the portal, and where driven tunnel changes to surface road, is shown in Figure 5-4 of the environmental impact statement and Figure 4-8 of Appendix V (Technical working paper: Urban design, landscape character and visual impact). The project website portal flyover has since been updated and corrected.

The landscape character zone along Ridge Street (LCZ 2) is expected to be impacted to a 'moderate–high' degree as a result of construction works taking place in proximity to several dwellings, while there is also likely to be the requirement for temporary built structures and vegetation removal. Similar to above, this impact may reduce over time with the maturing of replacement planting throughout the construction period.

The residential landscape character zones (LCZ 3, 4, 5 and 6) have a high to moderate sensitivity to change due to the importance of maintaining their spatial integrity. Direct character impacts would be limited to the fringes of these character zones where vegetation removal would be required, reducing the existing spatial buffer between dwellings and road. However, the project has a limited magnitude of impact within these areas (as per Section 22.6.1 of the environmental impact statement).

Environmental management measures V8 and V9 (refer to Table D2-1 of this submissions report) commit retaining and trimming vegetation where possible.

Motorway facilities in Cammeray

The landscape character impact assessment for the North Sydney precinct identified the potential for a moderate to high landscape character impact for Cammeray Park open space (LCZ 7). This is due to vegetation removal and new project elements being introduced near, but not encroaching, public open space receptors (refer to Section 22.6.1 of the environmental impact statement).

Table 28-2 of the environmental impact statement indicates that refinement of the architectural design of the project ventilation outlet would be confirmed during further design development. A design for the ventilation outlet would be developed that aims to incorporate the ventilation outlet as an integral component of surrounding land use in accordance with the project's strategic urban design framework.

Alfred Street and Miller Street overpasses

Within the North Sydney precinct, visual impacts as a result of the project at viewpoint 27 (Kurraba Road/Alfred Street north residential) are incorporated in Table 22-25 of the environmental impact statement as Moderate-High during the day. Viewpoint 27 is an illustration of the worst case scenario, at close proximity to the road traffic and adjacent residences (sensitive receivers). This Alfred Street overpass would also be located within the Warringah Freeway corridor landscape character zone (LCZ 1) which is unlikely to be considerably impacted by the project due to its lower

sensitivity to change and greater ability to absorb the proposed operational structural elements of the project.

Opportunities to reduce the impact of the Alfred Street North overpass are discussed in Section 4.7.7 of Appendix V (Technical working paper: Urban design, landscape character and visual impact). These include:

- Landscape treatment to residual area beneath and alongside overpass to reduce visual scale of structure
- Investigate potential activation of area beneath viaduct as an area of local public open space.

The Miller Street overpass would be located within the Warringah Freeway corridor landscape character zone (LCZ 1) which is unlikely to be considerably impacted by the project due to its lower sensitivity to change and greater ability to absorb the proposed operational structural elements of the project.

Potential indirect impacts (including visual) to the Cammeray Conservation Area are incorporated in Table 5-26 of Appendix J (Technical working paper: Non-Aboriginal heritage).

Falcon Street interchange

Upgrading the Falcon Street interchange would involve bridge widening, reconfigured signalisation of the interchange, and replacement/upgrade of the shared user bridge. These upgrades will be located within the Warringah Freeway corridor landscape character zone (LCZ 1) which is unlikely to be considerably impacted by the project due to its lower sensitivity to change and greater ability to absorb the proposed operational structural elements of the project.

A figure showing the proposed works can be found in Appendix V (Technical working paper: Urban design, landscape character and visual impact) (Figure 4-8).

New/heightened noise barriers and fast-moving heavy vehicles

Noise barriers would be visually integrated into the road corridor and urban/landscape setting as part of a coordinated whole-of-corridor design (as per Section 22.2.2 of the environmental impact statement). Section 11.5.4 of the environmental impact statement advises that the maximum allowable height of the noise barriers would consider its function in noise abatement, urban design, visual impacts, impacts to private land and engineering constraints. The urban design intent for noise barriers and retaining walls include (refer to Section 8.2.3 of Appendix V (Technical working paper: Urban design, landscape character and visual impact)):

- Use of sandstone for retaining walls to match Warringah Freeway cutting. This would be re-used from site where possible
- Use of signature patterning/project motif where appropriate to add visual interest and aid linear integration
- Transparent noise barriers to be used where retaining sightlines is important – such as near residential receptors along the Warringah Freeway.

Section 8.2.2 of Appendix V (Technical working paper: Urban design, landscape character and visual impact) notes that requirements and locations for noise barriers within the North Sydney Precinct would be confirmed during further design development. Refer to Section D1.6 of this submissions report for details on the strategic urban design framework, including principles for design of noise barriers.

Ventilation outlet

As part of the operational visual impact assessment, the zone of visual influence of the ventilation outlets has been assessed to identify areas from which these built form elements of the project would be potentially visible (refer to Section 22.3.2 of the environmental impact statement). This assessment takes into account topography and built form but excludes natural landscape features

above ground level that would affect visibility such as trees, hedgerows or fences. Therefore, the zone of visual influence included as part of this assessment provides a worst-case scenario.

The motorway facility has the greatest potential for adverse visual impact within the North Sydney precinct. This is due to a large magnitude of change (with a current lack of built form in this area) and the tall nature of the ventilation outlet (as per Section 22.6.2 of the environmental impact statement). The retention of screening vegetation along the boundary of Cammeray Park would be crucial in reducing the visual impacts of this new built from street level viewpoints Appendix W (Technical working paper: Arboricultural impact assessment) identifies that the trees along the boundary of Cammeray Park are likely to be retained. Environmental management measure V9 would minimise visual impacts by trimming trees rather than removing them wherever possible.

The impact of wider, district views of the ventilation outlet would be somewhat reduced by the presence of existing vertical elements within the view frame, including the North Sydney sewer outlet and CBD towers (as per Section 5.9.3 of Appendix V (Technical working paper: Urban design, landscape character and visual impact)).

B14.20.4 Ventilation outlet design

Issue raised

Section 4.10.2 (pg 71)

Images of the proposed ventilation outlet in the environmental impact statement, included within Chapter 22 (Urban design and visual amenity) and Appendix V (Technical working paper: Urban design, landscape character and visual impact) do not give a clear indication as to the potential final height, footprint or shape of the ventilation outlet making it difficult to comment on the visual impact of the structure. Images are taken either at a distance, obscured by trees or signage or suggest a different form and therefore are misleading.

Response

The ventilation outlet architectural design has been developed to reduce the perceived scale of the structure and aid its integration with the surrounding context, as discussed in Section 4.7.7 of Appendix V (Technical working paper: Urban design, landscape character and visual impact). This has been achieved through the profiling and tapering of the outlet to reduce its perceived bulk, as well as the use of contextual materials for the cladding.

Development of the design for the ventilation outlet is ongoing and it would (as per Section 4.7.7 of Appendix V (Technical working paper: Urban design and visual amenity)):

- Ensure the ventilation outlet is architecturally designed to reduce perceived height and bulk
- Ensure the ventilation outlet is well integrated with the Ernest Street bridge structure including landscape treatment to the base of the outlet.

While the specific dimensions of the ventilation outlet at the Warringah Freeway would be determined during detailed design, it can be expected that the footprint (including both Western Harbour Tunnel and Beaches Link outlet structures) would be around the size of a tennis court.

Refinement of the architectural design of the project ventilation outlets would be confirmed during further design development (as per Table 28-2 of the environmental impact statement) and preparation of the urban design and landscape plans. Refer to Section D1.6 for discussion regarding the strategic urban design framework for further detail of the design principles and urban design requirements for the motorway facilities and ventilation outlets.

B14.20.5 Mitigation measures – recommendations

Issue raised

Section 4.6.3 (pg 43)

Cammeray Park specific recommendations:

- Construct a substantial land-bridge to link the south west comer of Cammeray Park with the western side of Anzac Park. The environmental impact statement only proposes a narrow green 'median' as part of the 'shared user path' section of the reconstructed Ernest Street bridge. The land-bridge should seek to create a generous reconnection of open space parcels that were severed by the construction of the Warringah Freeway in the 1960s
- Construct a smaller section of land-bridge (if feasible) where the Ernest Street off-ramp joins Ernest Street linking to the existing open space along the western side of the corridor. A crossing point should be established across Ernest Street at this point to the new land-bridge. This would facilitate continuous pedestrian and open space corridor through to Jeaffreson Jackson Reserve to the south and towards St Leonards Park
- The proposed ancillary facilities structure shown to be located on north side of Ernest Street, opposite Merlin Street should be re-designed where possible to be under Cammeray Park
- The permanent motorway facilities at Cammeray Park should be set down into the landscape such that the roof of the building is in the order of 500 millimetres below the height of the Ernest Street footpath level. The roof of the motorway facility building is to be designed as a slab suitable for a green roof over, thus allowing the park to extend over the building. This would allow for the view to the north to be unhindered by the building envelope, enabling the open space to flow from the proposed green connection across the freeway north of the Ernest Street bridge. Any additional excavation or construction disturbance associated with this approach would be offset by the benefits of enabling the park landscape to extend over the buildings at (Ernest) street level, and better enable some view preservation and open space connections.

St Leonards Park specific recommendations:

- That a substantial contribution be sought from the project towards the realising of the St Leonards Park Master Plan.

Response

Cammeray Park land-bridge

The project design includes a new shared user bridge, north of the existing Ernest Street overpass. The proposed shared user bridge would be approximately ten metres wide and include wide shared user paths and landscaping edges including shade tree plantings and seating opportunities. This would improve connectivity and amenity for pedestrians and cyclists traveling across the Warringah Freeway corridor and add approximately 1800 square metres of public open space to the project.

During design development, Transport for NSW considered several options to expand the shared user bridge proposed at Ernest Street to create a land-bridge. The most viable of these was a widening to the north similar to that proposed by North Sydney Council in their submission. This option included:

- A land bridge north of the existing Ernest Street bridge providing an additional 13,000 square metres of open space
- Lowering the Western Harbour Tunnel and Beaches Link motorway facilities to around seven metres above the Warringah Freeway level to receive the new land-bridge

- Land bridge structures across the roofs of the Western Harbour Tunnel and Beaches Link motorway facilities to connect to Cammeray Park
- Large fill embankments and retaining walls to return the land bridge to the existing surface level either side of the freeway.

Refer to Figure B14-6 below for an indicative representation of the option.

Figure B14-6 Indicative option for expanded land-bridge at Ernest Street considered by the project

While the land bridge design option would improve urban design outcomes by reducing permanent visual impacts associated with the Western Harbour Tunnel and Beaches Link motorway facilities and increasing public open space, the limited amenity due to location (over a busy road), environmental impacts and cost of delivering this option would be considerable (refer to Table B14-1 below).

Table B14-1 Benefits and impacts of land bridge option

Likely benefits of land bridge option	Impacts of the land bridge option
• An additional 13,000 square metres of public open space compared with the project design	• An additional 200 nights of work required for construction of large bridge within Warringah Freeway Upgrade corridor • Approximately 25,000 additional heavy vehicle movements required in the Cammeray area for spoil transport and deliveries, for the

Likely benefits of land bridge option	Impacts of the land bridge option
• Reduced permanent visual impact associated with the Western Harbour Tunnel and Beaches Link motorway facilities.	bridge works and modifications to the Western Harbour Tunnel and Beaches Link motorway facilities • Significantly increases project costs • Increased noise and vibration impacts associated with the large quantities of rock excavation to lower the motorway facilities, bridge construction at night, and crushing and screening spoil removed from the tunnel for use as fill in the embankments. Unlike tunnelling activities, excavating basements for the motorway facilities would not be underground and cannot be viably mitigated by acoustic sheds • Temporary construction footprint increased by approximately 10,000 square metres within Cammeray Golf Course and 6000 square metres within ANZAC Park • Increase in the construction programme by six to nine months • Increased clearing of established trees within ANZAC Park required to transition the land bridge back to surface level.

While the land bridge option would deliver some amenity benefits to the area, these were not considered commensurate to the increase in duration and intensity of construction impacts and cost. For this reason, it was decided not to proceed with this option. However, while such an option does not form part of the project for which this approval is sought, North Sydney Council may choose to engage with other relevant branches within NSW Government to pursue the merits of the land bridge option and any relevant funding.

The project provides for an accessible and useable community public open space along the Ernest Street shared user bridge (refer to Figure B14-7). This would include seating, improved pathways, lighting, and landscaping that connects to the adjacent public space. Further information on the Ernest Street shared user bridge is included in Appendix V (Technical working paper: Urban design and visual amenity).

Figure B14-7 View north east over Warringah Freeway from Jeaffreson Jackson Reserve towards Ernest Street shared user bridge

In response to the North Sydney Council submission, during further design development the project will investigate opportunities for additional pedestrian connections across Ernest Street that would improve connectivity between paths and public open space in the area.

Recessing the Western Harbour Tunnel and Beaches Link motorway facilities

As identified above, the creation of a land bridge would have required the Western Harbour Tunnel and Beaches Link motorway facilities to be lowered and recessed into the open space of Cammeray Park. This would have a substantial environmental impact including:

- Increased 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 10,000 square metres within Cammeray Golf Course
- Additional heavy vehicle movements required in the Cammeray area for spoil transport and deliveries
- Increased project costs
- Limited access to the motorway facilities rooftop for public use as this would be an active maintenance area - although part of the roof area could be vegetated, access by the general public would be prohibited and the area fenced off.

St Leonards Park

Transport for NSW will continue to consult with North Sydney Council around the final form of the southeast corner of St Leonards Park following completion of construction of the project.

B14.21 Resource use and waste management

B14.21.1 Resource use

Issue raised

Section 4.10.9 (pg 63)

The following concerns were raised regarding the project water and electricity consumption proposed:

- The average total water demand during construction is estimated to be 1327 kilolitres per day. Around 837 kilolitres per day would be sourced from mains supply (potable water) with the remainder coming from treated groundwater or harvested rainwater (non-potable water). While the significant component of non-potable water use is supported, the remaining use seems excessive given the current drought and climatic conditions. The proponent is urged to look for further ways to reduce the potable water intensity of this project. For example, install an additional stormwater collection and filtration scheme to the one that would be replaced in Cammeray, elsewhere in the North Sydney local government area in consultation with Council
- The indicative temporary power requirements of the construction support sites and the anticipated operational electricity consumption of the project are too high. Given the current climate emergency, the NSW government is urged to ensure that the project is powered by 100 per cent renewable energy, including onsite generation at the construction sites (eg solar PY systems) and the ongoing operation of the project itself.

Response

Water use during construction

Measures to avoid and minimise water consumption, particularly of potable water, have been included in the design and construction planning for the project (refer to Section 24.3.1 of the environmental impact statement). Examples include:

- Use of dust extraction and ventilation systems to control dust in tunnels during construction to minimise the use of water as a dust suppressant
- Capture, treatment and use of wastewater and rain water at construction sites to minimise the use of potable water during construction.

The project would seek to achieve an ‘Excellent’ Design and ‘As Built’ Infrastructure Sustainability rating under Version 1.2 of the Infrastructure Sustainability Council of Australia rating scheme. A core component of achieving this rating relates to water use and will require the implementation of measures during construction and designing the project to minimising and avoid water usage.

Water for construction of the project would be sourced according to the following hierarchy, where feasible and reasonable, and where water quality and volume requirements are met:

- Stormwater harvesting (non-potable water)
- On site construction water treatment and reuse, including groundwater (non-potable water)
- Mains supply (potable water).

Electricity consumption during construction and operation

Measures to avoid and minimise electricity consumption have been included in the design and construction planning for the project (refer to Section 24.3.1 of the environmental impact statement). Examples include:

- Use of guidance systems for tunnel excavation and rock bolting to ensure efficient use of tunnelling equipment to minimise excessive electricity consumption

- Use of energy efficient site buildings and equipment on construction support sites, including use of solar powered lights and signage where feasible and reasonable
- Efficient design of electricity transmission systems to supply power as efficiently as possible.

During operation, measures to minimise energy consumption and maximise energy efficiency have also been included in the project design. Examples of these measures include:

- Use of low heat emission LED lighting to reduce operational energy requirements
- Efficient and effective longitudinal ventilation system design with outlets located in close proximity to tunnel portals, taking advantage of the movement of vehicles within tunnels to reduce fan usage and reducing energy needed to move exhaust to outlet locations
- Opportunities to install solar panels at the tunnel portals and on tunnel support and traffic control facility buildings to supplement non-renewable power sources where feasible and reasonable.

Opportunities to further minimise energy consumption and maximise energy efficiency would be considered during further design development, where feasible and reasonable.

A sustainability framework has been developed for the project. The sustainability framework has been prepared to ensure that sustainability is embedded in project planning, design, construction and operation. The sustainability framework provides the overarching vision, objectives, targets and implementation approaches for the project (refer to Figure 25-1 of the environmental impact statement for key elements). The sustainability framework is underpinned by sustainability principles outlined in applicable legislation, policies and guidelines. Activities to implement the sustainability framework, including requirements from the Infrastructure Sustainability rating scheme, will be implemented through a sustainability management plan. The management 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 of Australia rating scheme (refer to environmental management measure SU2 in Table D2-1 of this submissions report).

In accordance with environmental management measure WM6 (refer to Table D2-1 of this submissions report), the project will be operated in accordance with the relevant aims of the project’s Sustainability Framework to optimise resource efficiency.

B14.21.2 Environmental impacts

Issue raised

Section 4.10.9 (pg 64-65)

Council would not be able to access recycled water continuously during the construction of the project if the proposed new, relocated storage dam is not constructed until the Beaches Link and Gore Hill Freeway Connection project construction support site at Cammeray Golf Course is no longer be in use. The Cammeray stormwater reuse dam was constructed as a result of the millennium drought and helps Council and the golf course significantly reduce their potable water consumption. This is critical infrastructure given that NSW is again in drought and that Council has declared a climate emergency and committed to meeting ambitious water reduction targets. The loss of North Sydney Council stormwater harvesting scheme at Cammeray Golf Course renders the project inappropriate from an environmental perspective.

Response

As discussed in Section A3.3 of this submissions report and as required by revised environmental management measure WQ8 (refer to Table D2-1 of this submissions report), subject to a timely agreement with Cammeray Golf Club and North Sydney Council regarding a suitable alternative location, Transport for NSW will install a new permanent replacement storage dam (and associated

infrastructure) within the golf course prior to decommissioning of the existing dam, in order to maintain ongoing operational functionality of the water harvesting scheme.

If a suitable location cannot be agreed prior to the commencement of construction, Transport for NSW will come to an interim arrangement with Cammeray Golf Club and North Sydney Council regarding compensation for additional water usage, for the period until the replacement dam is operational.

B14.21.3 Adequacy and accuracy

Issue raised

Sections 4.10.6, 4.10.9 (pg 60, 61, 65)

The following concerns were raised regarding the adequacy and accuracy of waste management information in the environmental impact statement:

- About 2.1 million cubic metres of soil and rock would be produced from the land-based construction components of the project. Depending on the bulking factor applied, which for sandstone can be as high as 1.7 times, the volume of extracted material may be closer to three million cubic metres. An estimated 900,000 cubic metres of dredging spoil would also be generated. These volumes require considerable resource use (energy to extract, store and transport) which would come with amenity impacts. Further detailed waste management plans are necessary to mitigate impact with respect to waste
- Contaminated sediments are highly likely to be disturbed during dredging activities for the immersed tube tunnel and establishment of the cofferdam near Balls Head. Some sediment would be disposed of in a designated landfill via road transport. A definitive disposal point for sediments must be identified to determine likely impacts on the environment, and amenity impacts for local residents at interim stockpiling sites. Similarly, it is necessary to be made aware of the quantity of contaminated material that would be stored/stockpiled, the anticipated length of time that material would be stockpiled and the steps that would be undertaken to ensure that material is kept in such a condition that would pose no risk to the environment, local residents and construction personnel.

Response

A waste management plan for the project would be prepared as part of a construction environmental management plan prior to construction. The plan would include procedures for handling and storing all project spoil, including potentially contaminated substances (environmental management measure SG10 in Table D2-1 of this submissions report).

Unexpected and unidentified contaminated material will be managed in accordance with an unexpected contaminated lands discovery procedure, as outlined in the *Guideline for the Management of Contamination* (Roads and Maritime, 2013a) in accordance with environmental management measure SG11 (refer to Table D2-1 of this submissions report).

The management and disposal of dredged soft sediment material that is not suitable for offshore disposal is described in Appendix P (Technical working paper: Hydrodynamics and dredge plume modelling) and summarised in Section B14.14.1 above. This material would be loaded onto hopper barges and transferred to the White Bay construction support site (WHT3). Dredged material would be subject to waste classification under the *Waste Classification Guidelines 2014* (NSW Environment Protection Authority, 2014a) and would be treated to make the material spadeable (a consistency which allows the material to be spaded or shovelled). During this process, additives such as lime or absorbent polymers would be mixed into the dredged material to assist in mitigating any potential odour and to neutralise any potential acid sulfate soils. Further information is provided in Section 4 of Appendix C.2 of this submissions report. This process is widely understood and has been applied on recent projects in Sydney Harbour, including Garden Island dredging works completed in 2010 and 2019.

Once treated, materials would be loaded into covered trucks for transport to a suitably licensed waste disposal facility.

Waste would be transported, stored and handled according to their waste classification and in a manner that prevents pollution of the surrounding environment (as required by environmental management measure WM4 in Table D2-1 of this submissions report).

B14.21.4 Mitigation measures – recommendations

Issue raised

Sections 4.10.7, 4.10.10 (pg 61, 66)

Recommended mitigation measures include:

- A greater commitment be sought from the State Government to reduce water use, impacts on water quality and energy consumption throughout the construction and operation of the project
- The Cammeray Dam facility should remain operational throughout and after construction and operation, or be replicated and operational elsewhere in the North Sydney local government area at the expense of the NSW Government to achieve the same potable water savings prior to the existing system going offline
- Further details should be provided on the final disposal point for contaminated material that is proposed to be removed from existing terrestrial contaminated sites and/or from aquatic dredging from the harbour floor. Confirmation of the final disposal point of the contaminated material would dictate the transportation needed to reach that disposal point and hence the likely impacts on the local community ie truck and/or barge movements
- Details be provided on the quantity of contaminated material would be stored/stockpiled and the anticipated length of time that material would be stockpiled for
- Appropriate waste management plans must be prepared. These plans must include:
  - Procedures for classifying waste streams, including testing regime
  - Procedures for the safe handling, storage and disposal of hazardous wastes
  - Procedures for the management of each waste stream and policies encompassing the use of recycled/recovered materials
  - Procedures for managing spills and cross-contamination, including incident reporting.

Response

Transport for NSW has committed to implementing a range of measures to reduce water use, water quality impacts and energy consumption throughout the construction and operation of the project. These measures are described in Section B1.21.1 of this submissions report.

As required by revised environmental management measure WQ8 (refer to Table D2-1 of this submissions report, subject to a timely agreement with Cammeray Golf Club and North Sydney Council regarding a suitable alternative location, Transport for NSW will install a new permanent replacement storage dam (and associated infrastructure) within the golf course prior to decommissioning of the existing dam, in order to maintain ongoing operational functionality of the water harvesting scheme.

If a suitable location cannot be agreed prior to the commencement of construction, Transport for NSW will come to an interim arrangement with Cammeray Golf Club and North Sydney Council regarding compensation for additional water usage, for the period until the replacement dam is operational.

In accordance with environmental management measure SG7 (refer to Table D2-1 of this submissions report) all spoil material will be classified in accordance with the *Waste Classification*

Guidelines (NSW Environment Protection Authority, 2014a) and any contaminated material would be disposed of at an appropriately licenced waste management facility. The specific licensed waste management facility would be determined by the construction contractor.

Details on the waste management plan, expected quantity of contaminated materials, as well as the handling and storage procedure are provided in Section B1.21.3 of this submissions report.

B14.22 Sustainability

B14.22.1 Environmental sustainability

Issue raised

Section 4.10.9 (pg 63-64)

Council recommend the following adjustments to sustainability objectives and target themes:

- Minimise energy use and greenhouse gas emissions: Rather than limiting the target theme to energy efficient lighting, this should be broadened to "energy efficiency" of the entire project and "renewable energy" should be added as a target theme
- Optimise resource efficiency and waste management: Given the current waste and recycling crisis, the state mandate to support a circular economy, and the federal 80 per cent average resource recovery target by 2030, rather than limiting recycled content to road
- Maximise sustainable procurement: Include "Recycled content" and "Australian made" as target themes
- Efficiently manage water: Ensure the stormwater harvesting scheme at Cammeray Golf Course, or equivalent, remains operational through and after construction. Include "Retain existing non-potable water capture, treatment and supply" in the target theme.

Response

A sustainability framework has been developed for the project and is consistent with the intent of North Sydney Council's suggested objectives and themes. The sustainability framework has been prepared to ensure that sustainability is embedded in project planning, design, construction and operation. The sustainability framework provides the overarching vision, objectives, targets and implementation approaches for the project (refer to Figure 25-1 of the environmental impact statement for key elements). The sustainability framework is underpinned by sustainability principles outlined in applicable legislation, policies and guidelines.

In accordance with environmental management measure SU2 (refer to Table D2-1 of this submissions report), activities to implement the sustainability framework, including requirements from the Infrastructure Sustainability rating scheme, will be implemented through a sustainability management plan. The management 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 of Australia rating scheme.

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 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.

As outlined in Section 24.3.3 of the environmental impact statement, about 2.1 million cubic metres of spoil would be produced from land-based construction activities (terrestrial spoil) during construction, made up of:

- Soil and rock from construction of the project tunnels underground
- Soil and rock from bulk excavation works on the surface.

The majority of land-based spoil generated by the project would be crushed sandstone from tunnelling. This material is generally considered as a desirable engineering fill and is typically reused in development sites and major earthworks projects across Greater Sydney.

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).

The existing storage dam at Cammeray Golf Course would be removed and replaced as part of the project construction. This is discussed further in Section B14.16.2 above.

B14.23 Greenhouse gas and climate change

B14.23.1 Greenhouse gas emissions during operation

Issue raised

Section 4.10.1 (pg 53)

Greater road capacity generally leads to 'induced demand' as motorists take advantage of such increased capacity and the congestion problems, over time, continue to be replicated on an increasing scale. This would lead directly to an increase in greenhouse gas emissions and particulate matter. Considering the recent declaration of a National Climate Emergency by many jurisdictions, including North Sydney Council, the project is unacceptable from an environmental perspective.

Response

As discussed in Appendix F (Technical working paper: Traffic and transport), the traffic forecasting model considered all factors influencing traffic growth including induced demand. Consequently, the forecast traffic volumes have been considered in the assessment of greenhouse gas emissions associated with fuel consumed by vehicles using the road network during operation.

The SMPM used to model the traffic performance of the project includes changes in traffic as a result of induced demand, with induced demand equating to about 0.3 per cent additional daily trips in the Sydney metropolitan area in 2037.

As outlined in Section 26.2.4 of the environmental impact statement, greenhouse gas emissions are projected to increase as traffic numbers across the road network grow regardless of the minor increase in induced demand resulting from the project. However, the expected reduction in congestion as a result of the project and expected improvements in fuel efficiency and increases in electric vehicles are 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 assist in reducing emissions.

B14.24 North Sydney Council meeting

Issue raised

Following North Sydney Council's submission lodged 26 March 2020, a meeting was held on 6 April 2020. The meeting minutes highlighted the following additional concerns and items not incorporated by the submission:

- The Combined Precincts Committee voted to oppose the project

- Local residents are distracted by the Coronavirus pandemic and unlikely to respond to the environmental impact statement
- The NSW Government is aware of North Sydney Council's plans, it is unclear why they have allowed Berry Street to be the access point for the Western Harbour Tunnel
- Due to lack of open space in the local government area, the two permanent structures should be placed underground instead of on open space
- North Sydney Council are undertaking their own baseline data on air quality due to resident concerns about air pollution on community health. A monitoring station has been installed in St Leonards Park and the results will be published on the Council's website
- If the NSW Government will not commit to air filtration of the ventilation outlets, the NSW Premier should guarantee that the infrastructure will be built in a way that will allow it to be adapted/retrofitted in the future if need be.

Response

The additional issues raised in the North Sydney Council meeting minutes from 6 April 2020 have been addressed in the following sections:

- Combined Precincts Committee voting – noted
- Coronavirus pandemic – noted. Extension of public exhibition period addressed in Section B14.6.3 of this submissions report. During this time, the environmental impact statement continued to be available digitally on the interactive portal and the community were offered a phone or video call discussion with a member of the project team in lieu of the last community information session, which was cancelled
- Conflict North Sydney Council plans – addressed in Section B14.2.3
- Motorway facilities within Cammeray Golf Course – addressed in Section B14.20.5
- Baseline air quality monitoring – noted
- Ventilation outlet filtration – addressed in Section B14.11.1.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B15 – Willoughby City Council

SEPTEMBER 2020

B15 Willoughby City Council

Contents

B15.1 Assessment process

B15.1.1 Beaches Link and Gore Hill Connection project

Issue raised

Pages 5 and 6

Limited information is provided in the environmental impact statement about the Beaches Link and Gore Hill Connection project.

The environmental impact statement refers to the Gore Hill Connection, however a full risk assessment has not been carried out. It is stated in the environmental impact statement that 'Should timeframes for the Beaches Link component of the Beaches Link and Gore Hill Freeway Connection project be advanced, some elements of the Beaches Link component may be delivered as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project...'. Council objects to any construction to commence until the Beaches Link and Gore Hill Freeway Connection environmental impact statement is published, consulted on and assessment completed. The environmental impact statement notes that this area is a sensitive environment and has contamination risks.

A detailed assessment will be carried out as a separate environmental impact statement, however information provided indicates there would be construction and operational impacts on the Willoughby Local Government Area. Within the environmental impact statement, the traffic assessment indicates reduced operational performance of the Gore Hill Freeway and road network within Artarmon.

Council requests construction and operation of the Beaches Link and Gore Hill Freeway Connection project should have minimal impacts on existing traffic and provide a positive transport system for all users including public and active.

Response

The 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 known as the Western Harbour Tunnel and Beaches Link program.

A combined delivery of the Western Harbour Tunnel and Beaches Link program of works would unlock a range of benefits for freight, public transport and private vehicle users. It would support faster travel times for journeys between the Northern Beaches and south, west and north-west of Sydney Harbour. For example, with the combined program of works, journeys from Dee Why to Sydney Kingsford Smith Airport are expected to be 56 minutes faster in the AM peak by 2037 (via the proposed Beaches Link, Western Harbour Tunnel and WestConnex). Delivering the program of works would also improve the resilience of the motorway network, given that each project provides an alternative to heavily congested harbour crossings.

The project and the Beaches Link and Gore Hill Freeway Connection project are subject to separate and coordinated environmental assessment and approval processes. Potential environmental impacts associated with the Beaches Link and Gore Hill Freeway Connection project, including potential contamination risks, will be provided in the environmental impact statement for that project. No construction of any elements of the Beaches Link and Gore Hill Freeway Connection project would be commenced prior to its planning approval, irrespective of whether or not the components are delivered under construction contracts for the Western Harbour Tunnel and Warringah Freeway Upgrade project.

B15.2 Strategic context and project need

B15.2.1 Project demand

Issue raised

Pages 2, 3, 6, 11, 23 and 33

Willoughby City Council is concerned that the project does not provide benefits to all modes of transport despite the environmental impact statement objectives stating benefits to all modes of transport. All projects should provide a comprehensive whole-of-transport solution and acknowledge all transport modes. Project planning should consider and apply policies and practices such as the safe system approach and movement and place to ensure the development of a sustainable road. The project is not consistent with strategic plans as it focuses on vehicles and does not consider public transport or active transport. The North District Plan focuses on a 30-minute city with the use of public transport to be the most efficient. Council is concerned that principles applied to the design need to be reviewed to minimise the impact on local roads and State roads with a high place function.

The project has the potential to impact the urban domain within East Chatswood, Penshurst Street, Willoughby South and Naremburn local centres as a result of increased regional traffic using Willoughby Road and Penshurst Street to access the project. The local centres are important within the Willoughby local government area as they provide commercial, retail and residential land uses that provide services and products to the local community. It is understood that NSW Government also supports the Movement and Place Framework that recognises the differing roles and functions of land use along all roads by time of day and day of week.

The project would significantly impact the strategic planning Willoughby City Council and other Eastern Harbour councils are completing in response to directions set out in the Greater Sydney Region and District Plans. Willoughby City Council's strategic planning aims to create liveable cities and strong communities supported by public and active transport to minimise traffic and promote healthier transport. The project would negate Willoughby City Council’s efforts to invest in a healthy and economically vibrant future.

Response

Relevant NSW Government policies have been considered and applied in the environmental impact statement including the *Future Transport Strategy 2056* (NSW Government, 2018) (Future Transport). The project is consistent with Future Transport, as it improves transport customer journeys, enables growth, and would improve place outcomes in many locations, as outlined in Section 3.6 of the environmental impact statement.

The project contributes to all three objectives and would deliver the opportunity to shift significant volumes of surface traffic underground. In addition to the direct benefit of moving bypass traffic underground, reduced congestion on the arterial network offers flow-on benefits to the adjoining local network, reducing the impact of queuing on local high streets and local roads. Reduced congestion on the arterial road network would result in further improvements in amenity related to physical safety, air quality and noise levels. This is consistent with the aims of Willoughby City Council’s strategic planning including the aim of creating liveable cities and strong communities supported by public and active transport to minimise traffic and promote healthier transport.

Future Transport identifies road based transport, including improvements to bus services, as important modes to support the development of the 30-minute city. The 30-minute city is a guiding principle that provides people with access to education, jobs and services within 30 minutes of travel by public and active transport, regardless of where they live. The project, as part of an integrated multi-modal transport network, would increase the number of people and places that are able to be reached within 30 minutes. The project fulfils the strategic vision presented for the future strategic road network for Greater Sydney by supporting key movements by road for public transport, private vehicles and freight. Figure 3-11 of the environmental impact statement outlines the change in the

percentage of jobs accessible within 30 minutes in the AM peak as a result of the project by 2037. The project would also improve strategic road connectivity for the Willoughby local government area, which will continue to be one of the key enablers of ongoing growth and support the accessibility of residents to employment centres.

The planning and design of the project has adopted a holistic network traffic performance approach, focussed on maximising benefits for the majority of overall customer journeys. Traffic forecasting and analysis indicates it is unlikely that the project would lead to a significant increase in traffic on lower order roads. The planning and design process is also cognisant of broader aspects and constraints including adopting a Movement and Place philosophy, minimising the potential to induce traffic on lower order roads by focusing on upgrades to strategic routes. As required by environmental management measure OT1 (refer to Table D2-1 of this submissions report), a review of operational network performance will be carried out 12 months and five years from the opening of the project, respectively, to confirm the operational impacts of the project on surrounding arterial roads and major intersections.

Further, Future Transport promotes the development of integrated multi-modal network solutions identifying that investment in motorways is needed in addition to investment in public transport such as Sydney Metro, light rail, and bus projects which are being rolled out throughout Sydney. The project is one part of a complementary integrated multi-modal strategy being implemented by the NSW Government to deliver an integrated transport network. The project would reduce congestion on strategic bus corridors, including the ANZAC Bridge, Warringah Freeway and Sydney Harbour Bridge, improving travel time reliability for public transport customers on these routes. The Western Harbour Tunnel and Beaches Link program of works is identified in the strategy as a 'committed' project forming part of the vision for the future strategic road network for Greater Sydney that will support key movements by road, including public transport, private vehicles and freight.

Chatswood and surrounds are already serviced by metro, heavy rail and strategic bus routes. As outlined in Section B15.7.1, traffic changes in the Willoughby City Council area are anticipated to be minimal. Section 7.2.2 of Appendix F (Technical working paper: Traffic and transport) outlines that in the 'Do something' scenario, the project would have minimal impact on road accessibility from Chatswood. Impacts to the Chatswood area and surrounds are therefore not anticipated.

Further discussion regarding strategic context and consistency with strategic plans is provided in responses to other councils' submissions including Inner West Council, City of Sydney Council and North Sydney Council (sections B12 to B16 of this submissions report).

B15.3 Project development and alternatives

B15.3.1 Public and active transport

Issue raised

Pages 2, 8, 11, 25 and 30

Willoughby City Council is concerned that a public transport alternative was not assessed and suggested it should be modelled, assessed and considered. The project also provides limited new opportunities for active transport. The project is an opportunity to introduce safe, efficient and reliable improvements for active and public transport and would make them more attractive modes of transport and a positive impact for users.

Bus routes to railway stations should also be considered to create a more pedestrian friendly environment and sustainable use of public transport.

Response

The project forms part of an integrated multi-modal network solution being delivered by the NSW Government as part of Future Transport, and is complimentary to investments in the metro, light rail and bus networks.

Giving consideration to future land use, population density and transport requirements, Future Transport 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 and Sydney Harbour was identified as key to development of an appropriate multi-modal Sydney transport network. Further, Future Transport 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 additional transport capacity, to relieve pressure on existing crossings and to improve the efficiency and reliability for journeys across Sydney Harbour, as outlined in Section 4.3 of the environmental impact statement. These included:

- Do nothing: this option was discounted as none of the project objectives would be achieved impacting on the future economy and amenity of Sydney
- Travel demand management: demand management measures require considerable changes in social attitudes, behaviour and government policy and can take years to achieve and would be unlikely to cater for the population growth projected for Sydney over the next 40 years
- Improvements to the existing harbour crossing capacities and road network: this option was discounted as substantial new improvements to existing harbour capacities are not feasible. The impact of substantial capacity increases to either connection is unlikely to be acceptable
- A new motorway crossing of Sydney Harbour (the project): this option would address the project need of providing additional transport capacity across Sydney Harbour to relieve congestion and improve reliability on existing crossings, including for public transport customers, and was therefore considered further
- Improvements to alternative transport modes including:
    - The Sydney bus network: this option was discounted as improved bus services alone would not be sufficient to provide the level of additional cross-harbour capacity that is required
    - The rail network: this option was discounted as modelling completed by Transport for NSW indicates that there would still be a need for additional road transport capacity across Sydney Harbour to cater for future demand post Sydney Metro City & Southwest
    - 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 project footprint 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 Sydney Harbour (the project) was the preferred solution to achieve the project objectives.

The design of the project has been considered in a Movement and Place context, as outlined in Section B15.7.4. Due to a general reduction in traffic and congestion, the project would provide the opportunity for other divisions of Transport for NSW and other stakeholders, including Willoughby City Council, to investigate alternative uses for road space or carry out additional surface road improvements including the delivery of further Movement and Place initiatives.

As part of an overarching integrated transport network, the project includes the development of new or improved 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. To support growth in active transport, the project would include the construction of new and upgraded pedestrian and cyclist infrastructure, including replacement of the Ridge Street shared user bridge, a replacement of the Falcon Street shared user bridge, a new shared user bridge to the north of Ernest Street, a new shared user path at High Street and a new dedicated cycleway between Ernest Street and Miller Street.

Further, 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, and enabling direct bus access to North Sydney and an efficient transfer to the new Metro station. Travel times for buses from the Gore Hill Freeway to the Sydney Harbour Bridge would be substantially reduced, particularly southbound in the morning peak due to the continuous southbound bus lane from Miller Street to the Sydney Harbour Bridge. Travel times for buses travelling to and from Falcon Street and travelling along the ANZAC Bridge corridor would also improve.

B15.3.2 Sydney Harbour Bridge adjustments

Issue raised

Pages 25, 26 and 32

Willoughby City Council suggested upgrading the Sydney Harbour Bridge as part of the project because the Sydney Harbour Bridge and the Warringah Freeway's traffic management systems operate as one system. Willoughby City Council suggested the following upgrades:

- Address safety issues by providing permanent barriers to separate both directions of traffic, which would be supported by the reduction of traffic demand
- Remove tidal lane management system on the Warringah Freeway
- Improve bus efficiency and reliability with a designated northbound bus lane. The bus lane could link with the northbound bus lane on the Warringah Freeway to Miller Street. Reducing road capacity with the dedicated bus lane would:
  - Promote the use of the Western Harbour Tunnel
  - Encourage higher use of more sustainable transport modes
  - Minimise congestion at peak times, on the westbound approach to the Gore Hill Freeway.

Willoughby City Council also suggested introducing a toll northbound on the Sydney Harbour Bridge that would be higher than the proposed toll of the Western Harbour Tunnel and higher for heavy vehicles to encourage use of the Western Harbour Tunnel. Tolling should consider vehicle specific, time of day and distance based tolling. Additionally, congestion charging as part of toll fees could minimise commuter traffic and maximise the level of service on the Sydney Harbour Bridge.

Response

The project has been developed over many years by a team of national and international experts with direct experience in the design and construction of major infrastructure within urban environments. As determined through extensive investigations carried out by a variety of subject matter experts, the preferred option has not required adjustments to the Sydney Harbour Bridge, and consideration of upgrades is outside the scope of the project. Chapter 4 (Project development and alternatives) of the environmental impact statement and this submissions report provides an overview of the development process and options considered as part of this process.

The inclusion of permanent barriers is not possible due to the narrow cross section of lanes and the need to maintain the existing lane capacity on the Sydney Harbour Bridge. The project would not

facilitate a reduction in lanes, despite experiencing reduced traffic demand during peak times as a result of the project. Similarly, the removal of tidal flow arrangements on the Sydney Harbour Bridge is not feasible due to the important function the corridor currently provides and would continue to provide following construction of the project.

The Warringah Freeway Upgrade component of the project would include the provision of new and reconfigured traffic lanes along the Warringah Freeway (refer to Section 5.3.2 of the environmental impact statement). The improved functionality of the Warringah Freeway corridor with a new western bypass of Sydney CBD provided by the Western Harbour Tunnel, in conjunction with the reconfiguration of the Warringah Freeway traffic lanes, would allow for the removal of the current tidal flow arrangements along the Warringah Freeway, along with those at the Mount Street and Ernest Street interchanges. These arrangements would simplify access arrangements, making it easier, faster and safer to access Sydney Harbour crossings.

As the Sydney Harbour Bridge, Sydney Harbour Tunnel and Western Harbour Tunnel would serve different origins and destinations, the addition of a designated northbound bus lane on the Sydney Harbour Bridge would be unlikely to influence the greater use of the Western Harbour Tunnel. As outlined above, the project would result in improvements to the efficiency of the city's critical bus network, by reducing pressure on key surface roads. As a result of improved travel times and reliability provided by the project, there would be direct benefit to northbound bus services without the need for a northbound bus lane. The project also includes the provision of a dedicated southbound bus lane along the Warringah Freeway from near Miller Street to the southernmost extent of the project near the Sydney Harbour Bridge, removing the need for buses and general traffic to weave.

The Warringah Freeway, which forms part of the main M1 corridor, links the Sydney Harbour crossings through to the Gore Hill Freeway and beyond. The performance of the Warringah Freeway and Gore Hill Freeway are complementary, and the arrangements proposed as part of the project alongside the Beaches Link and Gore Hill Freeway Connection project have been designed to collectively enable change in connectivity and reliability for the northern transport network.

The decision to apply tolls to roads is a NSW Government decision and is not made at the project level. While no decision on tolls has yet been made, the project includes provision for tolling gantries for northbound traffic should the government elect to introduce a northbound toll.

B15.4 Project description

B15.4.1 Active transport design changes

Issue raised

Pages 8, 14, 30 and 31

<u>Cycle routes</u>

Willoughby City Council supports the cycle route improvements as part of the project, and they should not be changed. The cycle route design results in the extension of existing cycle infrastructure on the Warringah Freeway.

However, the western section of the project, Miller Street, Cammeray to Willoughby Road, Naremburn has been overlooked in regard to active and public transport improvements. The project is a vehicle focused infrastructure upgrade to support movement across Sydney Harbour. Willoughby City Council's *Integrated Transport Strategy (Draft)* highlights the desire to reduce congestion, improve accessibility and increase transport choice.

In addition, Willoughby City Council requests a connected, reliable and safe cycle transport link between Gore Hill Freeway and Milsons Point, including:

- Bridges across major roads should be considered to accommodate active transport users once operational

- Dedicated cyclist only bridge connecting to existing cyclist facilities along the Gore Hill Freeway, west of Willoughby Road to the northern side of the Gore Hill Freeway/Warringah Freeway and Slade Street Naremburn
- Dedicated two-way cycle only lanes with physical separation barriers, in the following locations:
  - Along the Gore Hill Freeway/Warringah Freeway between Willoughby Road and Brook Street to ensure safety and amenity
  - Along the northern side of the Gore Hill Freeway/Warringah Freeway between the new cycle only bridge across the Brook Street on-ramp, to connect with the proposed dedicated two-way cycle lanes between Miller Street and Ernest Street
- Cycle network within Willoughby local government area that is connected, safe and an acceptable design standard
- Ensure that the opportunity for the future delivery of The Northern Link and Harbour Link projects is retained through road and land reservation, acquisition and/ or designation of airspace above the motorway.

Pedestrian

Provide a separate pedestrian bridge that connects the existing footpath on Slade Street to Willoughby Road, including ramps to be compliant with accessibility standards.

Willoughby City Council requested additional measures to separate pedestrians travelling through the project area due to the project being located near a number of schools. Council suggested ramps, pedestrian tunnels and shared paths for pedestrians crossing at Brook Street into Cammeray.

Consideration should be given to land bridges across major roads with the purpose of accommodating active transport. Associated with this suggestion, Willoughby City Council raised concern that safety of school students using a bus stop close to the Willoughby Road exit ramp, and that a solution would be provision of a bus stop on a land bridge at Merrenburn Avenue that would to allow children to be relocated from construction sites and increased traffic. A land bridge solution may reduce other impacts from the project such as noise and pollution, and it would return to Naremburn some of the visual amenity and access that was lost when the Warringah Freeway was built.

Response

As part of an overarching integrated transport network, the project includes the development of new or improved active transport links in a number of locations, generally associated with surface works for the project. This includes new and upgraded active transport infrastructure, including replacement of the Ridge Street shared user bridge, a replacement of the Falcon Street shared user bridge, a new shared user bridge to the north of Ernest Street, a new shared user bridge at High Street and a new dedicated cycleway between Ernest Street and Miller Street. These components would improve connectivity across the Warringah Freeway including connections to and from the North Sydney commercial centre and more generally improve connectivity between communities, open space areas, public transport modes and the existing active transport network.

The existing Merrenburn Avenue bridge across the Gore Hill Freeway contains pedestrian facilities along both sides which would not be affected by the project. The existing bridge would continue to provide east-west connectivity across the Gore Hill Freeway corridor through both construction and operation of the project. Provision of a land bridge at this location is out of scope.

During development of the design, Transport for NSW considered several concepts to expand the land bridge proposed at Ernest Street. Whilst the alternate land bridge design would improve urban design outcomes by reducing permanent visual impacts associated with the Western Harbour Tunnel and Beaches Link motorway facilities and increasing public open space, the construction

impacts and cost of delivering this alternative would be significant. For this reason, it was decided not to proceed with this option. Further detail on the benefits and impacts of an expanded land bridge are provided in Section B14.20.5 of this submissions report.

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.

The proposed scope of the project complements other active transport planning being carried out by Transport for NSW including the Sydney Harbour Bridge Cycleway. While they are outside the scope of the project, the active transport connections suggested by Willoughby City Council would not be precluded by the project. As council is aware, 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 *transport.nsw.gov.au*.

B15.4.2 Motorway features

Issue raised

Pages 17, 23, 30, 32, 33, 34 and 35

Willoughby City Council is concerned the project's alignment does not consider the tunnel as part of the overall state road network, specifically freight access to major transport facilities including Port Botany and Sydney Airport. The project when combined with WestConnex, Lane Cove Tunnel, M2 Motorway and NorthConnex could become a route in the Urban National Land Transport Network in Sydney. Willoughby City Council suggested an extension of the project to Wahroonga to provide an important north-south motorway connection for vehicles to connect to Port Botany, Sydney Airport, regional centres and north of Sydney as part of the Urban National Land Transport Network.

Willoughby City Council opposes the reconfiguration of the Warringah Freeway at Brook Street and Willoughby Road. The reconfiguration would increase traffic on Willoughby Road by removing northbound access to Miller Street and Brook Street exit ramps from the Sydney Harbour Tunnel and to the Sydney Harbour Tunnel from the Brook Street on ramp southbound.

Council requests the reconfiguration of the Brook Street and Miller Street on and off ramps is not included in the project as they are major routes for traffic that would not use the Beaches Link Tunnel. This comprises a significant amount of traffic heading to East Chatswood, Northbridge, Castlecrag, Castle Cove, Roseville, Lindfield and north to St Ives, as well as the areas of Forestville, Killarney Heights, Frenchs Forest, Belrose, Davidson and Terrey Hills. Willoughby City Council notes that the existing traffic configuration is adequate as traffic using the Sydney Harbour Bridge has the option to use either the Brook Street or Miller Street ramp. Shifting traffic from the Sydney Harbour Tunnel onto Willoughby Road would add traffic to a road that is operating at full capacity in peak hours.

Council suggested improvements and further studies to ensure the project is multi modal and improves safety, connectivity, accessibility, efficiency and reliability outcomes for all transport users. Council suggests the following improvements:

- Minimise road capacity on the Warringah Freeway to promote the use of the project
- Discourage use of the Western Distributor and Sydney Harbour Bridge
- Minimise congestion, queues and travel time delays on Warringah Freeway, Sydney Harbour Tunnel, Gore Hill Freeway and Willoughby Road during peak weekday traffic periods

- Maximise safety and amenity on State and local roads networks that provide feeder routes to/ from the Warringah Freeway, Western Harbour Tunnel, Sydney Harbour Bridge and Sydney Harbour Tunnel
- Introduce access limitations for heavy vehicles on the Western Distributor to monitor and mandate the use of Western Harbour Tunnel by heavy vehicles.

Response

The Western Harbour Tunnel and Beaches Link program of works would form part of a connected and integrated road and public transport network. 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 project has been designed to meet the project objectives outlined in Section 3.3 of the environmental impact statement which include:

- Reduce congestion on distributor roads around the Harbour CBD, including the Sydney Harbour Bridge, Western Distributor and ANZAC Bridge
- Create faster, safer and more reliable journeys across Sydney Harbour, particularly for traffic bypassing the Harbour CBD to the west
- Improve productivity by allowing commuters and freight to reach their destination faster, safer and more reliably
- Increase the ability for the Harbour CBD road network to cope with traffic incidents
- Reduce travel times, delays and queuing on the Warringah Freeway by improving cross-harbour capacity and reducing merges and weaves, supporting long-term increased demand
- Improve streetscapes, sustainability and liveability across the Eastern City and North Districts by reducing congestion.

As outlined in Section 3.2.2 of the environmental impact statement, the road corridors around the Harbour CBD were developed during a period where traffic demands were CBD focused. Since this time traffic patterns have evolved, with demands to bypass the CBD now larger than those looking to access the CBD (see Figure 3-3 of the environmental impact statement). One of the core purposes of the project is to complete a strategic route within the Sydney motorway network and complete an important Sydney CBD bypass as part of the Urban National Land Transport Network.

Existing arterial roads surrounding the Harbour CBD, including the Sydney Harbour Bridge, the Sydney Harbour Tunnel, ANZAC Bridge, Western Distributor and the Warringah Freeway, serve a conflicting function through providing access into the Harbour CBD road network while also serving as a bypass route for through traffic.

Potential extensions of the project to the north are considered out of scope for this project which aims to provide additional cross-harbour motorway capacity. Vehicles would be able to access the M1 Motorway towards regional areas north of Sydney via the Lane Cove Tunnel, Hills M2 Motorway and NorthConnex (all of which are motorway standard) or via the Pacific Highway (designated A1). The requested north-south motorway connection for vehicles to connect between Port Botany, Sydney Airport and regional centres north of Sydney will be served by Sydney Gateway, the WestConnex Motorway network, the Western Harbour Tunnel and NorthConnex.

Access between the Sydney Harbour Tunnel northbound and the Miller Street off ramp would be removed. The Ernest Street interchange would provide similar, alternate connectivity between the Sydney Harbour Tunnel northbound and Cammeray. The project would result in changed traffic patterns that would include an overall improved access to Miller Street and a reduction in traffic demand to the Willoughby Road and Falcon Street ramps. Traffic demand on Willoughby Road is not expected to change significantly as a result of the project as vehicles currently using Willoughby Road would continue to do so. The project would substantially reduce congestion at the Willoughby

Road and Gore Hill Freeway interchange, with a reduction in delay of about 90 seconds in the morning peak anticipated.

At this stage, restrictions on vehicle movements in the surrounding road network to encourage use of the Western Harbour Tunnel (beyond local adjustments included in the environmental impact statement) are not considered necessary. Each of the three harbour crossings (Sydney Harbour Bridge, Sydney Harbour Tunnel and Western Harbour Tunnel) have distinct uses and serve a range of unique origins and destinations. Optimising the use of all three crossings would provide a greater improvement to overall cross-harbour movement. Notwithstanding, the performance of the project will be monitored over time and adjustments made to the surrounding road network as deemed appropriate.

B15.4.3 Public transport

Issue raised

Pages 25 and 30

Willoughby City Council does not support the conversion of transit lanes to regular traffic lanes on the Gore Hill Freeway. Willoughby City Council considers transit lanes an important part of public transport to provide an efficient and reliable public transport system that makes public transport more desirable.

Willoughby City Council recommends the provision of an efficient, reliable and safe public transport link between the Gore Hill Freeway and Sydney CBD at York Street, including:

- Connect the eastbound T2 Transit Lane on Gore Hill Freeway to the proposed southbound bus lane, west of Miller Street
- Provide a transit lane or bus lane (preferred) between Miller Street interchange connecting to the existing westbound T2 Transit Lane on Gore Hill Freeway
- Retain the T2 Transit Lane on Gore Hill Freeway and Lane Cove Tunnel at all times
- Bus service routes and frequency should be mandated so the project provides improved public transport between the lower north shore/northern beaches and the inner west. It is not considered acceptable to ‘provide the opportunity’ only.

Bus stop adjustments must be consulted with bus operators and notification provided for bus customers. The location must be as close as possible to existing location.

Response

Existing capacity constraints related to Gore Hill Freeway is outside of the scope of the project; the T2 Transit Lane on the Gore Hill Freeway is subject to review as part of the Beaches Link and Gore Hill Freeway Connection project (subject to a separate environmental impact statement and approval process).

The environmental impact statement outlines opportunities to improve public transport services and integration. While not included as part of the scope of the project itself, other divisions of Transport for NSW will progress further detailed planning for service improvements based on the preliminary work carried out, and will identify and confirm opportunities for introducing enhancements to support the project upon opening to improve bus service connectivity and reliability. This work will also take into account other known planned changes in land use and public transport demand in the broader area, such as (but not limited to) Sydney Metro West and the Bays Precinct, which may influence final bus service options for the project and connections between the inner west and lower north shore.

Through increased use of pavement space currently used for transit, the project would provide substantial benefits to public transport travel times. Further adjustments to the surrounding road network to improve public transport performance, or changes to public transport operations are not

within the scope of this project. They may however be considered as appropriate by Transport for NSW, with Western Harbour Tunnel contributing to opportunities for future initiatives.

Transport for NSW will continue to collaborate on the planning of future bus networks and services with Councils and other key stakeholders as appropriate.

As required by environmental management measure CTT10 (refer to Table D2-1 of this submissions report) any adjustments to existing bus stops will be determined in consultation with relevant stakeholders including other divisions of Transport for NSW and advanced notification will be provided to affected bus customers. Relocations will be as close as feasible and reasonable to their existing position.

B15.4.4 Warringah Freeway design changes

Issue raised

Page 32

Council requested the following changes on the Warringah Freeway:

- Provide the appropriate number of traffic lanes on the Warringah Freeway between Sydney Harbour Bridge, Sydney Harbour Tunnel and Gore Hill Freeway noting the introduction of new motorway capacity with the Western Harbour Tunnel
- Implement intelligent transport systems (ITS) to manage and optimise road capacity. The ITS would be operated in conjunction with the Sydney Harbour Bridge, Western Harbour Tunnel, Gore Hill Freeway, interchanges and surrounding state roads.

Response

The Warringah Freeway Upgrade component of the project would include the provision of new and reconfigured traffic lanes along the Warringah Freeway (refer to Section 5.3.2 of the environmental impact statement):

- A northbound outer carriageway which would comprise:
  - An outer western carriageway carrying northbound traffic from the Sydney Harbour Bridge to the proposed Beaches Link northbound on ramp and facilitating local distribution to local destinations such as North Sydney and Crows Nest
  - Inner western carriageways carrying northbound traffic from the Sydney Harbour Bridge and the Sydney Harbour Tunnel
- A central carriageway, carrying northbound and southbound motorway traffic between the Western Harbour Tunnel, Gore Hill Freeway and Willoughby Road
- A southbound outer carriageway which would comprise:
  - Inner eastern carriageways carrying southbound traffic to the Sydney Harbour Tunnel and facilitating distribution to local destinations such as Neutral Bay
  - An outer eastern carriageway carrying southbound traffic to the Sydney Harbour Bridge (both the Bradfield Highway and Cahill Expressway) and facilitating distribution to local destinations such as North Sydney and Kirribilli
  - A dedicated bus lane between Miller Street, Cammeray and the Sydney Harbour Bridge, which would carry southbound buses and other permitted bus lane vehicles.

The improved functionality of the Warringah Freeway corridor with a new western bypass of Sydney CBD provided by the Western Harbour Tunnel, in conjunction with the reconfiguration of the traffic lanes, would allow for the removal of the current tidal flow arrangements along the Warringah Freeway, along with those at the Mount Street and Ernest Street interchanges. These arrangements would simplify access to and from the Freeway, making it easier, faster and safer to access Sydney Harbour crossings.

The project scope includes intelligent transport systems (ITS) required to manage the proposed future motorway network and would form part of a wider coordinated ITS network implemented by Transport for NSW.

B15.4.5 Motorway numbering and naming

Issue raised

Pages 23 and 24

The project is an opportunity to reconfigure Sydney's alpha-numeric route numbering system to be consistent with Australia's wayfinding systems and confirm the importance of the project for vehicle movement in Sydney and NSW.

The project, WestConnex, Lane Cove Tunnel, M2 Motorway and NorthConnex could be numbered as 1 to provide a continuous motorway between the Pacific Highway and the Princes Highway with the opportunity to extend to the M6 Stage 1.

Consider implementing new motorway names to improve understanding and use of the motorway network. Potential to apply a new motorway name for the Sydney Harbour Tunnel, Eastern Distributor, Southern Cross Drive route such as the 'Eastern Motorway' or 'Harbour Motorway'. An Aboriginal name may also be a consideration.

Response

Potential numbering and future renaming of the project components and other motorways within NSW is out of scope for the project.

Notwithstanding, Transport for NSW completed an update of road signs in New South Wales as part of the introduction of the new alpha-numeric road numbering system to bring NSW into line with other states and territories.

The system includes a combination of a letter and a number between 1 and 99 to identify a route and has:

- 'M' – motorway standard road
- 'A' – route of national significance
- 'B' – routes of State significance.

The updated road numbering system provides an easier way for road users to find their way around NSW roads, helping to make road journeys more efficient, safe and enjoyable.

The New M5 component of WestConnex has been designated M8 and the project is likely to be considered an extension of that route.

B15.5 Stakeholder and community engagement

B15.5.1 Environmental impact statement

Issue raised

Pages 2, 3, 4 and 5

Willoughby City Council acknowledged community engagement has generally been appropriate for this phase of the project. However, there was no direct engagement with Councillors and key Willoughby City Council personnel across the organisation in the lead up to, nor during the environmental impact assessment exhibition period. During the last meeting in May 2019, Transport for NSW committed to consult with Willoughby City Council prior to the display of the environmental impact statement. Consultation also did not occur with heavily impacted suburbs of the Willoughby local government area, specifically Naremburn. 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.

While it is acknowledged that some meetings have been held with Willoughby City Council, there was no traffic or transport specialist involved or specialist information provided in any meetings.

Consultation arrangements and stakeholder submissions have not been considered in light of the impact of State and Federal Government advice and legislation arising from COVID-19. Willoughby City Council's Traffic and Transport Team Leader proactively attended a community drop in session, however meeting arrangements were cancelled due to implications of COVID-19.

Progress Associations were invited to attend environmental impact statement information sessions, however there were no formal consultation activities arranged with these stakeholder groups as part of the environmental impact statement public exhibition program.

Progress associations suggested the presence and inclusion of specialists during the information sessions, to provide more technical information where communications staff were unable to answer specific questions, but the response had to be deferred.

Willoughby City Council noted its active participation and engagement with the environmental impact statement, including:

- Environmental impact statement hard copies on display at Chatswood Library and Willoughby City Council's offices
- Promoting communication through council distribution lists
- Willoughby City Council's Have Your Say website project page linked with Transport for NSW resources.

Willoughby City Council noted that no consultation was carried out during the environmental impact statement display or meetings with specialists, specifically traffic and transport specialists, for the Willoughby local government area. Council considers there is a technical gap in the environmental impact statement past North Sydney Council.

Response

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
- Planning focus meeting on lodgment of State Significant Infrastructure submission.

In addition, engagement and consultation has been carried out with the community through multiple community feedback sessions prior to exhibition of the environmental impact statement, attended by the program team and technical specialists along with pop up information displays at shopping centres (refer to Table 7-5 and Table 7-6 of the environmental impact statement). Consultation was also carried out with key community and interest groups, including the Willoughby Progress Association and Willoughby South Progress Association, through activities such as briefings, meetings, presentations and workshops.

During exhibition, eight community information sessions were held, which were attended by the program team and technical specialists including engineers, traffic and transport planners, environmental experts and experts in noise, vibration, air quality and human health. During the exhibition period, email notifications were sent to project stakeholders, including progress associations, advertising the environmental impact statement, information sessions and encouraging the community to contact the project via phone or email.

Due to the circumstances around COVID-19 and the restrictions in place regarding large gatherings, the ninth and final information session was not able to proceed. The environmental impact statement was still available digitally on the interactive portal during this time, including other supporting materials, in addition to the project email address and contact number. An alternate option of one-on-one video meetings was offered to community members, in addition to engagement over the phone and email.

During the exhibition period, engagement with key Willoughby City Council personnel included correspondence and a briefing pack provided to council in February 2020, along with an offer of further meetings. A letter responding to specific concerns raised by Willoughby City Council in 2018 was included, outlining where further information could be found in the environmental impact statement. A subsequent meeting was scheduled for March 2020; however, due to COVID-19, Transport for NSW offered to meet via telephone/digital platform.

For more information on community consultation carried out prior, during and following exhibition of the environmental impact statement, refer to Section A2 of this submissions report.

B15.5.2 Complexity of document

Issue raised

Page 3

Willoughby City Council was concerned about the volume and density of information to be absorbed in a short period of time.

Response

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.

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 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 was placed on public exhibition on 29 January 2020. The public exhibition period for the environmental impact statement was initially scheduled to be 43 days. However, following community feedback the Department of Planning, Industry and Environment extended the exhibition closing date from 12 March to 30 March 2020 (equating to a total exhibition period of 61 calendar days).

During this time 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 A2.3 of this submissions report for details of the community engagement activities conducted during the exhibition period.

B15.5.3 Ongoing consultation with Council

Issue raised

Page 5

Willoughby City Council requested an opportunity to review the communication strategy outlining engagement activities through design, construction and operation.

Response

As required by the Secretary's environmental assessment requirements, a draft Community consultation framework was prepared (refer to Appendix D (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 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 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.

B15.6 Construction traffic and transport

B15.6.1 Traffic changes

Issue raised

Pages 34 and 36

Willoughby City Council expressed concern about traffic delays and how Transport for NSW would manage constantly changing information for residents to plan their journey.

Particular concern is raised with regard to active transport users as they are vulnerable and need to be managed due to adjustments and modifications to connections along the Warringah Freeway. Willoughby City Council requested timely and targeted flow of information to stakeholders about changing traffic conditions. Willoughby City Council also suggested time of day heavy vehicle access, reduced speed limits and the introduction of multi-agency traffic and transport meetings. Willoughby City Council requests involvement at all relevant construction traffic and transport meetings to support construction.

Response

During construction, information would be conveyed to drivers, cyclists and pedestrians with regard to potential delays, traffic diversions, speed restrictions, or alternative routes in accordance with environmental management measure CTT8 (refer to Table D2-1 of this submissions report).

This will include directional signage and line marking, supplemented by variable message signs. In addition, the community will be notified in advance of any network changes as required by environmental management measure CTT5 (refer to Table D2-1 of this submissions report).

Construction works would be appropriately managed and controlled as to not be detrimental to pedestrians and cyclists or result in unsafe situations. This will include requirements under environmental management measure CTT7 (refer to Table D2-1 of this submissions report) including manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence.

Construction heavy vehicles will be managed through environmental management measure CTT6, which requires scheduling of works such that movements during peak periods are minimised.

As required by environmental management measure CTT4 (refer to Table D2-1 of this submissions report), ongoing consultation will be carried out with (as relevant to the location) Transport Coordination within Transport for NSW, the Port Authority of NSW, local councils, emergency services and bus operators to minimise traffic and transport impacts during construction.

B15.6.2 Vehicle movements

Issue raised

Pages 8 and 36

Willoughby City Council is concerned that modelling and desktop analysis of construction impacts is not reflective of the actual construction impacts. The environmental impact statement notes that construction would be managed and that impacts would be minimised.

The project is located within a road network that is already complex, high volume, congested and multi-modal and would lead to temporary reduction in performance of the local road network within the Willoughby local government area and the Warringah Freeway.

Willoughby City Council is concerned about construction causing congestion, parking demand, road safety and accessibility issues.

Brook Street is the only access point to the Warringah Freeway for many residents. The use of Brook Street as a truck or traffic thoroughfare during construction should be avoided. Additional traffic controls along Brook Street should be considered to allow safe access to homes and schools during construction.

Response

Construction traffic modelling has been carried out using the best available methods and is generally considered to be conservative.

Commitments to managing construction traffic are incorporated in environmental management measures CTT4, CTT6, CTT7, CTT9 and CTT12 (refer to Table D2-1 of this submissions report). This includes minimising movements (road traffic during peak periods, scheduling road closures outside of peak periods where feasible and reasonable) and ongoing consultation with (as relevant to the location) Transport Coordination within Transport for NSW, the Port Authority of NSW, local councils (including Willoughby City Council), emergency services and bus operators. Traffic management measures will be outlined in a construction traffic management plan for each construction support site.

Depending on the location, manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence would be implemented to ensure pedestrian, cyclist and motorist safety.

Transport for NSW understands the importance of minimising impacts on local communities, including impacts of worker parking in streets. As outlined throughout Appendix F (Technical paper: Traffic and transport), an objective would be to provide sufficient onsite parking to accommodate the construction workforce. Where possible, the construction support sites for the project have been located to accommodate worker parking.

Where provision of construction on-site parking cannot accommodate the full construction workforce, feasible and reasonable management measures that minimise impacts on parking on local roads will be identified and implemented. Depending on the location, management measures may include workforce shuttle buses and the use of public transport (per environmental management measure CTT9, refer to Table D2-1 of this submissions report).

The use of Brook Street as a site access or haulage route is not proposed as part of the project. Potential impacts to Brook Street or Flat Rock Drive due to the proposed Beaches Link and Gore Hill Freeway Upgrade project would be assessed in the environmental impact statement for that project.

B15.7 Operational traffic and transport

B15.7.1 Traffic changes

Issue raised

Pages 11, 17, 21, 27 and 28

It is Willoughby City Council's view that the project would have a significant impact on traffic and transport movement within the Willoughby local government area. The project is a vehicle focused infrastructure upgrade to support movement across Sydney Harbour. The Willoughby City Council's Transport Strategy (Draft) highlights the aim to reduce congestion, improve accessibility and increase transport options. Willoughby City Council is concerned that the project could result in operational traffic impacts including safety, amenity, urban domain and financial that would impact the Willoughby City Council and community.

Willoughby City Council submits that the access restrictions proposed along the Warringah Freeway would have the highest impact on Willoughby City Council's road network. Specific concerns were raised about the impact to traffic flow and the proposed changes at Brook and Miller Streets. Willoughby City Council noted the project would result in access changes in Willoughby, including no direct access:

- Southbound or northbound to and from Miller Street and Brook Street
- Southbound to the Sydney Harbour Tunnel from Brook Street (currently no access from Miller Street to the Sydney Harbour Tunnel)
- Northbound to Miller Street and Brook Street from the Sydney Harbour Tunnel.

Traffic modelling predicts reduced performance and delays along Reserve Road north and south of the Gore Hill Freeway. The environmental impact statement proposes changes to retain a reasonable level of service, however the changes within the Artarmon Industrial Area have not had Willoughby City Council input. Future access and the operation of the road network within Artarmon Industrial Area must be collaborated with Willoughby City Council to ensure objectives and outcomes on all roads are met. Willoughby City Council requested information to understand the road network rationale and design, including options considered and analysis. Willoughby City Council is investigating initiatives that would impact road network management within the Artarmon Industrial area and these changes should be considered in conjunction with Reserve Road and other roads within the Industrial Area. Approval from Willoughby City Council is required on any change to its road network.

Intersection performance worsens or significantly worsens between 2016 and 2037 under the 'Do minimum' option and then is predicted to worsen further between 2027 and 2037 with the 'Do Something' option at the following intersections:

- Epping Road/Longueville Road/Parklands Avenue
- Longueville Road/Pacific Highway
- Pacific Highway/Howarth Road/Norton Lane
- Pacific Highway/Gore Hill Freeway interchange
- Reserve Road/Gore Hill Freeway interchange
- Reserve Road/Dickson Road
- Reserve Road/Barton Road.

In addition, intersection performance at the below intersections in Naremburn significantly worsen between 2016 and 2027 as well as 2037 under the 'Do minimum' option and then significantly improve in 2027 and 2037 with the 'Do Something' option:

- Willoughby Road/Gore Hill Freeway interchange
- Brook Street/Warringah Freeway on ramp
- Brook Street/Warringah Freeway off ramp
- Brook Street/Merrenburn Avenue

Intersection performance of the 'Do Something' option is worse than the 'Do minimum' option at some intersections, this is considered an unacceptable performance outcome. Willoughby City Council is of the view that the worsening of the performance of the intersections with the implementation of the project is of concern and unacceptable. The extreme change and worsening in performance is difficult to understand and accept given that the performance now (in 2020) is acceptable. Further explanation of the model design and operation and its results is requested.

Response

The project is not anticipated to have a significant impact on traffic and transport movement within the Willoughby local government area. Impacts would generally be confined to the Warringah Freeway and immediate surrounds.

The planning and design of the project has adopted a holistic network traffic performance approach, focused on maximising benefits for the majority of customers' overall journeys. The planning and design process including proposed interchange and intersection works are also cognisant of broader aspects and constraints, for example:

- Considering the effects that major intersection works can introduce on upstream and downstream network elements
- Adopting a Movement and Place philosophy, minimising the potential to induce traffic on lower order roads by focusing on upgrades to strategic routes
- Avoiding property impacts where possible.

Traffic modelling and analysis indicates there would be no material benefit for customers from catchments east of the Willoughby local government area to use the road network within Willoughby local government area to access Western Harbour Tunnel. With the project in operation, most of the existing access routes to the Warringah Freeway and the existing harbour crossings (Sydney Harbour Bridge and Sydney Harbour Tunnel) would remain. Traffic modelling carried out for the project shows that vehicles originating from catchments east of the Willoughby local government area would find greater efficiency in using these existing routes across the harbour, rather than to back track in order to access the Warringah Freeway and Western Harbour Tunnel from Willoughby Road or Reserve Road.

Primary metrics such as network and corridor speeds are provided in the environmental impact statement to demonstrate overall strategic customer benefits. Intersection metrics are provided in the environmental impact statement for completeness to demonstrate potential localised impacts, but do not capture the majority of strategic benefits of the project.

As outlined in Section 9.4.4 of the environmental impact statement, key outcomes of the assessment of the Warringah Freeway and surrounds area under the 'Do something cumulative' scenario (compared with the 'Do something' scenario) include:

- AM and PM peak travel demand through the Warringah Freeway and surrounds would increase by up to four per cent
- Average travel speeds through the Warringah Freeway and surrounds would further improve in both the AM and PM peak periods
- The number of stops would be generally unchanged in the AM peak but decrease in the PM peak.

The project would include a central carriageway, carrying northbound and southbound motorway traffic between the Western Harbour Tunnel, Gore Hill Freeway and Willoughby Road which would simplify traffic flow and improve wayfinding.

As outlined in Table 5-9 of the environmental impact statement, two ramps would connect Brook Street, Crows Nest/Cammeray, with the Warringah Freeway northbound and southbound:

- A long separated off ramp from the Warringah Freeway northbound that diverges from the outer Warringah Freeway northbound carriageway and connects to Miller Street, Cammeray and on to Brook Street at Crows Nest
- A long separated on ramp which connects from Brook Street at Cammeray, merges with the Miller Street on ramp and on to the Warringah Freeway southbound to the north of the Ernest Street bridge.

Two ramps would connect Willoughby Road, Naremburn, with Warringah Freeway northbound and southbound:

- An off ramp from Warringah Freeway northbound to Willoughby Road, Naremburn
- The on ramp from Willoughby Road to the Warringah Freeway southbound would not be directly affected by the project, and would remain as per the existing arrangement.

The project is not anticipated to result significant changes within the Artarmon Industrial Area as works would be limited to the construction of the Western Harbour Tunnel motorway control centre on Waltham Street. Potential additional impacts due to the construction of the proposed Beaches Link and Gore Hill Freeway Upgrade project would be assessed in the environmental impact statement for that project. Consultation would continue to be carried out with Willoughby City Council throughout further design planning for the proposed Beaches Link and Gore Hill Freeway Upgrade project.

B15.7.2 Impacts on local centres

Issue raised

Page 27

Local centres have a high place significance and the planning is underpinned by a transport system that is not impacted by high vehicle flows. Willoughby City Council is concerned that increases in traffic on local centres in Willoughby Road, Penshurst Street and High Street would lead to a reduction in safety and amenity. These roads are home to local centres including East Chatswood, Penshurst Street and Willoughby South and have a high place significance. Willoughby City Council is opposed to the introduction of new and extended clearways that would remove street parking, to increase road capacity on Willoughby Road, Penshurst Street, Willoughby South and Naremburn local centres.

Response

The project is not anticipated to have a significant impact on traffic and transport movement within local centres in the Willoughby local government area.

The project supports the ‘Successful places’ outcome of Future Transport, facilitating improvements to urban amenity by reducing through traffic movements and relieving pressure on arterial roads connecting the broader Eastern City and North Districts to the Harbour CBD. In addition to the direct benefit of moving bypass traffic underground, reduced congestion on the motorway and arterial network offers flow-on benefits to the adjoining local network, reducing the impact of queuing on local high streets and local roads. Reduced congestion on the arterial road network would result in further improvements in amenity related to physical safety, air quality and noise levels.

The reduction in congestion provided by the project would also provide the opportunity for other Transport for NSW divisions and other stakeholders including Councils to investigate other opportunities for local road improvements and adjustments.

The project is not expected to materially affect future traffic conditions within Willoughby City Council's jurisdiction, and therefore the project does not propose any new or extended clearways on Willoughby Road, Penshurst Street, or in the Willoughby South and Naremburn local centres. Similarly, the project is not expected to impact NSW Government strategies on clearways in Council's jurisdiction.

B15.7.3 Road safety

Issue raised

Pages 28 and 29

The capacity of the Warringah Freeway/Gore Hill Freeway between Brook Street and Willoughby Road is not proposed to be changed as part of the project. The project would result in higher westbound traffic demands during both weekday peak periods. The design indicates about five westbound lanes would be travelling to the Gore Hill Freeway as their destination.

Willoughby City Council is concerned that this would contribute to the potential of crashes and congestion during the weekday afternoon peak period. Traffic modelling indicates poor travel times and an increase in travel times between Sydney Harbour Tunnel and the Gore Hill Freeway/Pacific Highway interchange, Longueville Road to Gore Hill Freeway and Lane Cove Tunnel to Gore Hill Freeway in the weekday afternoon peak in 2027, with progressive traffic growth in the corridor worsening the situation.

Additional safety concerns relating to the project include:

- State (arterial) and non-State Road networks that experience increases in traffic due to redistribution of traffic and rat running during weekday peak periods
- Bicycle riders that use the link between Willoughby Road and Amherst Street.

It is recommended that the safety risks and safety performance at these locations are investigated and mitigation measures introduced.

Response

The project would result in peak period demand through the Gore Hill Freeway and Artarmon area increasing by three per cent in the morning peak and remaining generally unchanged in the evening peak by 2037. Notwithstanding this minor increase in demand, trips through the Western Harbour Tunnel on the motorway network would be made on a higher standard of road than urban arterials. The number of crashes across the network are estimated to reduce by up to 375 incidents a year (based on vehicle kilometres travelled) as a result of the Western Harbour Tunnel.

Planning and design of all works proposed by the project have been developed in accordance with appropriate design standards, safety in design assessments and road safety audits, cognisant of forecast future traffic volumes and patterns to ensure customer safety. The project is expected to operate safely and efficiently based on these inputs.

If approved, the project's detailed design development would include the preparation of further safety in design and road safety audits.

B15.7.4 Shifting bottlenecks

Issue raised

Pages 25 and 28

Willoughby City Council considers that Appendix F (Technical working paper: Traffic and transport) implies that the worsening of traffic performance in the local context is acceptable due to the overall benefits provided by the whole project. Willoughby City Council objects to this assessment, and believes it would lead to Willoughby City Council being required to resolve traffic issues caused by the project.

The environmental impact statement notes that intersections outside the scope of works and impacted by the project are expected to operate no worse than the 'Do minimum' scenario. Any works required to improve these intersections would be considered under Transport for NSW's wider program to ease congestion in Metropolitan Sydney. Willoughby City Council supports an equal or better performance than the 'Do minimum', however Willoughby City Council notes that the project must address the problems that arise and it is not acceptable to defer to other programs or for such problems to be a responsibility of Willoughby City Council.

Response

One of the key objectives of the project is to provide a viable alternative harbour crossing, and to create faster, safer and more reliable journeys across Sydney Harbour, particularly for traffic bypassing the Harbour CBD to the west, thereby improving traffic conditions on the road network over the short to medium term.

Ongoing multi-modal network improvement strategies would continue to be required to address the pressures of Sydney's growing population over the longer term. While the project would result in some localised impacts during operation, including potential incremental increases in demand on the Gore Hill Freeway to the north/west of the project, the project would result in significant improvements to the capacity and reliability of the critical cross harbour road corridors near the CBD, improving travel times and reducing the impacts of incidents on these links across the broader Sydney road network.

Given the multi-disciplinary and multi-stakeholder nature of changes to local streets, surface road improvements to streets and town centres are considered out of scope for the project. However, consultation with relevant councils would continue to ensure awareness of the project program and potential opportunities to implement supplementary surface road upgrades.

Road upgrades have been considered in a Movement and Place context. Through focusing upgrades on State roads the project aims to minimise the impacts on local streets, including potential 'rat running'. Due to a general reduction in traffic and congestion, the project would provide the opportunity for Transport for NSW and other stakeholders, including Willoughby City Council and other divisions of Transport for NSW, to investigate alternative uses for road space or carry out additional surface road improvements.

As required by environmental management measure OT1, 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 this assessment. Any proposed updates arising from this review would be carried out in consultation with relevant stakeholders including Council.

B15.7.5 Impacts on local roads

Issue raised

Page 28

Due to performance reductions and delays for eastbound and westbound traffic during both weekday peak periods on the Warringah Freeway between Lane Cove and Naremburn and on approach routes including Lane Cove Tunnel, Gore Hill Freeway, Pacific Highway, Longueville Road and Reserve Road, Willoughby City Council is of the view that there is the potential for rat running that would reduce safety and amenity on roads including Mowbray Road, Mowbray Road West, Hampden Road and Herbert Street and is unacceptable.

Response

The planning and design of the project has adopted a Movement and Place philosophy, minimising the potential to induce traffic on lower order roads by focusing on upgrades to strategic routes.

Traffic forecasting and analysis carried out for the project indicates it is unlikely that the project would lead to a significant increase in traffic on lower order roads.

For the Gore Hill Freeway and Artarmon area, the project has the potential to result in increases to the peak period traffic demand of up to three per cent in the AM peak by 2037 (refer Section 9.4.5 of the environmental impact statement). As a consequence, average travel speeds through the Gore Hill Freeway and Artarmon area would decrease by around 9 km/h in the 2037 AM peak and around 5 km/h in the 2037 PM peak. However, it is recognised that in reality the growth in traffic demand along the Gore Hill Freeway corridor is constrained at either end at the Lane Cove Tunnel and the Warringah Freeway. These constraints mean that the forecast peak hour demands used in the assessment have been adopted as a conservative case; peak hour throughput is likely to be lower than the forecast demand due to these constraints, leading to network performance under the project being more likely to be closer to the 'Do minimum' performance than the operational modelling outcomes.

It is also noted that modelling for the Warringah Freeway and surrounds identifies that the project would result in improved motorway and travel conditions on the Warringah Freeway and harbour crossings south of the Willoughby local government area, as identified in Section 9.4.4 of the environmental impact statement.

Many of the roads listed by Council are currently operating at capacity during peak periods, and therefore provide limited scope for increased traffic throughput, nor present attractive alternative routes to the motorway network.

Environmental management measure OT1 (refer to Table D2-1 of this submissions report) requires 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.

Appendix F (Technical working paper: Traffic and transport) also states that road integration works associated with the Beaches Link could facilitate additional traffic travelling through the corridor at a generally similar or reduced level of delay than under the 'Do minimum' scenario. These works could be brought forward (subject to planning approval) and carried out as part of the Western Harbour Tunnel scope to improve traffic conditions under the 'Do something' scenario. Consequently, a network conditions monitoring approach is proposed for this area to identify any realised impacts. This would be used to determine if and when the network integration works proposed by the Beaches Link program of works should be delivered to maintain efficient network operations in this area.

B15.7.6 Modelling and planning

Issue raised

Pages 2, 18, 34 and 35

Concern was raised by Willoughby City Council that traffic modelling has projected only 10 years into the future after opening. Council considers 30 years after opening as more appropriate as the project will be in operation for 50 plus years.

Additional traffic impact assessment should be carried out to assess local, regional and state road networks so effective safety, access and amenity mitigation measure are implemented. The study area should be:

- Miller Street/Strathallen Avenue/Eastern Valley Way in the east
- Falcon Street/River Road in the south
- Longueville Road/Epping Road/Centennial Avenue in the west
- Mowbray Road West/Mowbray Road/High Street/Edinburgh Road in the north.

Willoughby City Council is concerned that the traffic and transport assessment did not include an assessment of the following areas:

- Impact to Willoughby Road and feeder roads of Penshurst and Mowbray Road
- Impact to the local streets surrounding Willoughby Road from rat running
- Impact on the local centres of the increased traffic on Willoughby Road, and the Penshurst Street extension that passes about three of seven local centres in the Willoughby local government area
- The Willoughby Road and Penshurst intersection also bisects Willoughby Girls High School. Consideration needs to be given to student safety both pedestrian and in terms of access to public transport.

As some traffic use Willoughby Road as an alternate access to the Warringah Freeway this would be exacerbated by the Warringah Freeway reconfiguration. Additional assessment should consider the 700 apartments that would be constructed within three years on Artarmon Road and Walter Street, with traffic signals proposed at the Walter Street development access.

The traffic and transport assessment focuses on weekday morning and afternoon peaks and is difficult to understand in terms of improvements at other times. The Sydney Harbour Tunnel and Sydney Harbour Bridge typically operate with acceptable performance at other times therefore the primary benefit would be travel time savings provided by the Western Harbour Tunnel, as compared to the other routes, and this is likely to be relatively small. Traffic modelling indicates that the project would achieve operational performance southbound in the weekday morning and afternoon peak periods but little to zero improvement northbound. In some instances performance appears to worsen.

The 'Do minimum' includes projects under construction (NorthConnex and WestConnex) but does not consider Western Harbour Tunnel and Warringah Freeway Upgrade, Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and M6 Stage 1 projects. It also includes operational impacts of public transport projects under construction (Sydney Metro City & Southwest). The traffic modelling indicates that additional traffic, other than traffic that has transferred from the other harbour crossings, would use the Western Harbour Tunnel. This could be considered induced traffic which potentially could be users that have transferred from public transport.

Response

Modelling approach and land use forecasting

The environmental impact statement is informed by the NSW Government's standard integrated land use and multi-model transport forecasting approach. This is a typical four-stage transport forecasting approach which accounts for the trip generation, trip distribution, mode choice, and route assignment factors. The modelling approach carried out has been per industry standards and guidelines by subject matter experts and is in accordance with the Secretary's environmental assessment requirements for the project.

The potential impacts of the project on road network performance were assessed through strategic traffic forecasting and operational traffic modelling. The use of both regional and local scale modelling enabled existing and future traffic and transport conditions and road network performance to be characterised, both with and without the project. An overview of the modelling methodology and study area used in the assessment of the project is provided in Figure 9-1 of the environmental impact statement. It is noted that the Sydney Gateway and M6 (formerly known as F6 Extension) Stage 1 projects were not included in the 'Do minimum' or 'Do something' scenarios as they were not approved, under construction or complete at the time of assessment. They are however included in the 'Do something cumulative' scenario (refer to Table B15-1 below).

The land use, transport forecasting, and traffic modelling assumptions used for the environmental impact statement were the latest available for the purpose of the assessment. The additional cross-harbour (and broader strategic) public transport capacity which will be provided in the future by

Sydney Metro City & Southwest is explicitly reflected in the environmental impact statement transport forecasting process. Notwithstanding, recent sensitivity testing of alternative land use and transport scenarios has indicated little material difference in strategic transport demand.

An overview of the operational traffic modelling carried out is provided in Section 3.4 of Appendix F (Technical working paper: Traffic and transport) and Section 9.2 of the environmental impact statement.

Sydney Motorway Planning Model

The Sydney Motorway Planning Model (SMPM) provides a platform to understand changes in future traffic patterns under different land use, transport infrastructure and pricing scenarios. SMPM is a network-wide model that encompasses all existing and future road networks in the Sydney metropolitan area, principally developed to assess infrastructure improvements associated with the new motorway projects under planning and assessment individually and in combination. The SMPM calibrated to current observed travel behaviour.

The SMPM is linked to the Sydney Strategic Travel Model (STM), which carries out the trip generation, trip distribution and mode choice modules of the traffic forecasting process and incorporates demographic data related to land uses including population, employment and education enrolment projections. The SMPM modelling for the project is based on the latest population and employment projections (version LU16v1.3) provided by the Transport for NSW Transport Performance and Analytics Division. This data incorporates known major urban renewal projects and developments. The base vehicle demands from STM are consistent with these demographic assumptions and therefore provide a consistent base for the future demand assumptions used in the SMPM.

Traffic growth on new or upgraded roads is generally a result of the following influences:

- 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.

Even with no growth in regional population and economic activity, a new or substantially upgraded road can induce changes in trip patterns, which then appear as induced traffic demand. The SMPM includes the changes in traffic associated with all three of the above sources of traffic, with induced demand equating to about 0.3 per cent additional daily trips in the Sydney metropolitan area in 2037.

Assessment scenarios

The impacts during operation of the project with and without the addition of other major transport projects are included in all transport forecasting and modelling for the project as well as other assessments within the environmental impact statement. The environmental impact statement considered the following scenarios for 2027 (year of opening) and 2037 (year of opening plus 10 years) to assess future traffic network performance:

- Without the project (‘Do minimum’)
- With the project (‘Do something’)
- With the project and other planned proposed projects (‘Do something cumulative’).

These scenarios are summarised in Table B15-1.

Table B15-1 Operational road traffic modelling scenarios

Scenario	Description
'Do minimum'	Includes approved and under construction motorway projects (NorthConnex and WestConnex) but *without* the project, Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and M6 Extension projects. Also reflects operational effects of approved and under construction public transport projects (eg Sydney Metro City & Southwest).
'Do something'	Includes NorthConnex, WestConnex and the project but *without* Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and M6 Extension projects. Also includes Sydney Metro City & Southwest.
'Do something cumulative'	Includes NorthConnex, WestConnex, the project, Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and M6 Extension projects. Also includes Sydney Metro City & Southwest.

B15.7.7 Modelling clarifications

Issue raised

Page 26

Willoughby City Council acknowledges the modelling approach is comprehensive and appropriate, however has requested clarification on the following:

- If the latest land use information is reflected in the models such as changes to land use in Chatswood and St Leonards strategic centres including Willoughby and the North District
- The inclusion of existing and new mass transit modes such as Sydney Metro City & Southwest, B-Line, patronage and changes to transport mode splits
- Difference in traffic performance results of introducing a toll to the Sydney Harbour Bridge and Sydney Harbour Tunnel (the approach used in the environmental impact statement) as compared to the toll free situation
- Why forecast heavy vehicle numbers using the Sydney Harbour Bridge once the project is operational are high, and where they are going to
- The meaning of network measures, as many performance indicators get worse with the project; and how they relate to the model operation and what implications are provided in the environmental impact statement.

Response

The environmental impact statement is informed by the NSW Government's standard integrated land use and multi-model transport forecasting approach. This is a typical four-stage transport forecasting approach which accounts for the trip generation, trip distribution, mode choice, and route assignment factors. The land use, transport forecasting, and traffic modelling assumptions used for the environmental impact statement were the latest available for the purpose of the assessment and has been carried out per industry standards and guidelines and is in accordance with the Secretary's environmental assessment requirements for the project.

Tolling scenarios and implications are discussed in Section 7.2.4 of Appendix F (Technical working paper: Traffic and transport). Although no decision on tolling for the project has been made, 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 Western Harbour Tunnel and Beaches Link Tunnel. The differences in traffic performance with and without tolls can therefore be understood through

comparing the assessment outcomes for the 'Do minimum' and 'Do something' scenarios, respectively.

Heavy vehicle forecasts are developed as part of the NSW Government standard forecasting approach described above. Inputs to developing link-based forecasts include the overall volumes and origin-destination patterns of heavy vehicles, and the availability and cost of alternative routes to travel between these locations.

The network measures Vehicle Kilometres Travelled (VKT) and Vehicle Hours Travelled (VHT) provide an indication of the strategic benefits of the project. An increase in speed (VKT/VHT) indicates the improvement in the efficiency of travel. The metrics demonstrated in the environmental impact statement indicate that the project would improve the efficiency of travel while also accommodating forecast continued growth in travel demand when compared to conditions without the project.

B15.7.8 Cumulative impacts

Issue raised

Page 2

The cumulative traffic impacts have not been considered for infrastructure projects. Willoughby City Council suggested a cumulative traffic and transport impact assessment for the Western Harbour Tunnel and Warringah Freeway Upgrade, Beaches Link and Sydney Metro projects rather than each environmental impact statement assessing the impacts individually.

Response

Cumulative projects have been modelled at a strategic (SMPM) level, and consequently flow through into every key technical discipline as summarised in Chapter 27 (Cumulative impacts) of the environmental impact statement. Specific results relating to potential cumulative operational traffic impacts of the project are outlined in Chapter 9 (Operational traffic and transport) of the environmental impact statement under the 'Do something cumulative' scenario.

The cumulative impact assessment documented in Chapter 27 (Cumulative impacts) of the environmental impact statement is based on the Secretary's environmental assessment requirements. Projects included for transport forecasting and modelling for the project as well as other assessments within the environmental impact statement is provided in Table B15-1 above).

B15.7.9 Suggested inclusions to the environmental impact statement

Issue raised

Pages 36 and 37

Willoughby City Council suggests the following be included in the environmental impact statement Appendix F (Technical working paper: Traffic and transport):

- 2.5 – Information on the role and function of key road corridors should include Willoughby Road and Edinburgh Road/Alpha Road/Flat Rock Drive/Brook Street route
- 2.6.1 – Public transport users should be included in the list of target customers of the project
- 2.6.2 – Active transport users should be listed and considered as non-target customers of the project
- 4.2.2 – Consider use of the administrative road classification system agreed between Transport for NSW and Councils ie State, Regional and Local Road networks.

Response

While public and active transport are not specifically listed as target markets in Appendix F (Technical working paper: Traffic and transport), their importance is reflected in the assessment.

The project would result in safety and amenity improvements for active transport connections and encourage the use of alternative modes. The project would result in the following benefits for public and active transport users:

- Improved bus travel times along key routes including the ANZAC Bridge and Western Distributor, Gore Hill Freeway to the Sydney Harbour Bridge and to and from Falcon Street
- Inclusion of a dedicated bus lane between Miller Street, Cammeray and the Sydney Harbour Bridge, which would carry southbound buses and other permitted bus lane vehicles
- A number of new or replacement shared user path crossings of the Warringah Freeway providing improved east-west connectivity
- A new dedicated cycleway on the eastern side of Warringah Freeway between Miller Street and Ernest Street providing improved north-south connectivity.

Potential numbering and future renaming of the project components and other motorways within NSW is out of scope for the project. Further discussion regarding motorway numbering and naming is provided in Section B15.4.5.

B15.8 Construction noise and vibration

B15.8.1 Construction activity

Issue raised

Pages 6 and 7

Construction activities and traffic is likely to impact nearby sensitive receivers. Miller Street to Willoughby Road surface works are predicted to generate noise exceedances and out of hours noise disturbance, and vegetation removal would subject Cammeray Oval and St Leonards Park to noise throughout construction. The area is highly residential, and impacts would be concerning for educational outcomes and mental health. Willoughby City Council request a detailed analysis and plan for noise mitigation to confirm the following:

- No detrimental impacts from noise and vibration and construction traffic
- Additional mitigation outside standard construction hours
- Construction vehicles are limited to the Warringah and Gore Hill Freeway. Any use of surface roads should be agreed with Council via a transport plan and only considered as an exception during school hours.

Response

For the prediction of airborne noise impacts from construction support sites, consideration was given to reasonable worst case construction activities as required by the *Interim Construction Noise Guideline* (DECC, 2009), as outlined in Section 10.3.3 of the environmental impact statement. The reasonable worst case scenario is conservative because it assumes all equipment expected to be used at a given site would be operating simultaneously, at a worst case intensity, and with a worst case orientation during a 15-minute period. This scenario would not typically occur and therefore actual noise levels throughout the duration of construction are likely to be lower.

For the prediction of airborne noise impacts from surface road works outside construction support sites (eg surface road works in the Warringah Freeway), consideration was given to both reasonable typical and worst case construction noise impact scenarios. The typical impacts scenario was developed to represent the impacts from noise intensive construction activities when the loudest plant and equipment items (eg rock-hammers or road saws) are not being used.

The assessment of potential construction noise and vibration impacts is provided in Section 10.6 for the Western Harbour Tunnel component and Section 10.7 of the environmental impact statement for the Warringah Freeway Upgrade.

Where noise management levels are exceeded, there is a requirement to implement reasonable and feasible noise mitigation. Mitigation and management measures to be implemented for the Warringah Freeway Upgrade surface road works would assist to manage construction noise impacts on these receiver locations, and further on-site mitigation in and around the construction support sites would typically not assist in reducing the overall construction noise levels at these receivers.

A Construction Noise and Vibration Management Plan will be developed and implemented for the duration of construction of the project, as required by environmental management measure CNV1 (refer to Table D2-1 of this submissions report). This will ensure that impacts from noise and vibration, including from construction traffic, is minimised. The Construction Noise and Vibration Management Plan will be in addition to an out of hours work protocol required by environmental management measure CNV3 (refer to Table D2-1 of this submissions report), which will be prepared in consultation with the Department of Planning, Industry and Environment and the NSW Environment Protection Authority, and implemented for the duration of the project's construction.

Construction support sites and haulage roads have been selected to minimise the use of local roads where possible. Where possible, this has included the provision for immediate site access from the Warringah Freeway. As required by environmental management measure CNV5 (refer to Table D2-1 of this submissions report), 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. Community consultation, engagement and notification would be carried out throughout construction works and would include consultation with educational institutions as required.

Other environmental management measures to be implemented would further reduce potential construction noise and vibration impacts including CNV2, CNV4, CNV6 and CNV8 (refer to Table D2-1 of this submissions report).

B15.9 Operational noise and vibration

B15.9.1 Monitoring and mitigation

Issue raised

Pages 6 and 7

Willoughby City Council requested a detailed analysis and impact assessment for the Willoughby local government area outlining noise and vibration mitigation measures for impacted sensitive receivers and buildings.

The environmental impact statement identifies receivers in the local government area that would be eligible for at-property treatments, which suggests to Willoughby City Council that traffic impacts would be significant.

At property treatments should be included as a condition of approval in addition to noise barriers and road treatments.

Noise monitoring should be carried out to identify any buildings that might require further treatment once operational. Sensitive receivers such as Naremburn Library, childcare centres, schools, community facilities and churches should be offered noise mitigation as a priority.

Response

A detailed assessment of potential road traffic noise with and without mitigation (road pavement and noise barriers) is provided in Section 7.1 and Section 7.2 of Appendix G (Technical working paper: Noise and vibration) and summarised in Section 11.5.3 and Section 11.5.4 of the environmental impact statement. Only one per cent of receiver buildings within the study area for the project are predicted to experience increases greater than 2 dB(A) due to the project, with only 35 receiver

buildings at the Warringah Freeway and surrounds area experiencing such an increase during the day, and 39 experiencing such increases during the night period (under the 2037 'Do Something' scenario).

Receivers exceeding the traffic noise criteria established by the NSW Environment Protection Authority in the NSW Road Noise Policy can qualify for noise mitigation depending on the increase in noise and the extent of existing impact. Eligibility for the consideration of additional road traffic noise mitigation measures at an affected property is determined using the Noise Mitigation Guideline. Some receivers in the Willoughby City Council local government area have been identified as potentially being eligible for at-property noise treatment, to alleviate the high levels of existing traffic noise impact. Final decisions on at-property treatment would be determined during further design development.

Table 11-8 of the environmental impact statement identifies the number of receivers to be considered eligible for at-property treatment after low noise pavement and new and extended noise barriers have been included. At-property treatments may include but are not limited to ventilation, glazing, window and door seals, sealing of vents and underfloor areas.

Noise Catchment Areas 30.2 and 31.3 include a total of 11 and 18 buildings potentially eligible for consideration of additional noise mitigation in Naremburn (within the Willoughby local government area). The locations of these buildings are provided in Annexure R of Appendix G (Technical working paper: Noise and vibration). Noise mitigation options (including quieter pavement, noise barriers, at-property treatment or a combination of these) would be reviewed and confirmed as part of the further design development. Community consultation regarding noise and vibration would also be detailed in the Community communication strategy for the project (see Appendix E (Community consultation framework)). Where appropriate, this would include details on how community preferences would be identified and taken into account in the design of mitigation measures.

Specific conditions of approval relating to at-property treatments are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

As required by environmental management measure ONV2 (refer to Table D2-1 of this submissions report), following operation of the project, the actual noise performance will be compared to predicted operational noise performance 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 under the Noise Mitigation Guideline (Roads and Maritime, 2015b).

B15.10 Air quality

B15.10.1 Construction dust

Issue raised

Page 7

Dust control is required, and dusty work should not be permitted during school pick up and drop off times. Cammeray Oval and St Leonards Park would also be subject to dust risks.

Response

The construction air quality (dust) assessment, outlined in Chapter 12 (Air quality) of the environmental impact statement, considered the risk of air quality impacts without mitigation. While the construction footprint for the project along the Warringah Freeway is considered to have a high risk of impact if un-mitigated, the management of dust is considered manageable through the implementation of standard dust mitigation measures (refer to environmental management measure AQ1 in Table D2-1 of this submissions report). With the implementation of these measures, restriction of works to outside of school pick up or drop off times is not considered necessary.

As outlined in Appendix E (Community consultation framework), several local schools have been identified as key stakeholders and would receive work notification letters, along with formalised information from the project team at key project milestones.

B15.10.2 Adequacy and accuracy

Issue raised

Page 7

Willoughby City Council is of the view that air quality impacts have been underestimated as the environmental impact statement assumes Euro 6 vehicle standards that have not been legislated yet.

Response

Vehicle emission standards assumed in the ventilation analysis are consistent with the NSW Advisory Committee on Tunnel Air Quality (ACTAQ) technical paper *TP-01 Trends in Motor Vehicles and their Emissions*, prepared by the NSW Environment Protection Authority in November 2018.

Conservatively, the ventilation analysis assumes that ADR80/04 (Euro VI for Heavy vehicles) would not be implemented in Australia and does not consider the continued shift towards alternative fuelled low emission vehicles such as hybrids and battery electric vehicles.

To assess the impact of a potential delay in widespread adoption of ADR/79/04 (Euro 6) in NSW on the ventilation system, a sensitivity analysis was included in Annexure K of Appendix H (Technical working paper: Air quality). This sensitivity analysis demonstrates the capability of the ventilation system to manage in-tunnel air quality, should the assumed Euro 6 emission standard not be implemented by the year 2027.

In all cases, the ventilation system would be designed and operated to maintain in-tunnel air quality under all traffic scenarios, including breakdown and congested scenarios.

Given the small contribution that outlets make to the total ambient concentrations at ground level, when considered in conjunction with surface roads and background concentrations, there is likely to be no difference in outcomes when applying more conservative Euro 5 assumptions for tunnel emissions. Even when the maximum allowable emissions are used (as shown in the regulatory worst case analysis), the outlets are not predicted to generate exceedances of air quality assessment criteria.

B15.10.3 Ventilation outlets

Issue raised

Page 7

Unfiltered ventilation stacks and operations buildings would be built to service the tunnels close to schools, homes and hospitals. Sensitive receivers may be exposed to unacceptable levels of air pollution.

Response

The independent NSW Chief Scientist and Engineer has recently released a report in relation to road tunnel air quality. The report 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 discussion on tunnel ventilation and filtration in the environmental impact statement reflects the outcomes of the review completed by the Advisory Committee on Tunnel Air Quality (ACTAQ, 2018b). The review concluded that:

- Decisions on how to best manage tunnel air can only be made at the project level. Health-based air quality standards must be a priority; however, engineering and economic factors also need to be taken into account
- Air filtration systems in tunnels are rare around the world. They have high infrastructure, operating and maintenance costs
- Although filtration for particulates or NO_2 is technically feasible, the available technologies will not lower concentrations of other air pollutants
- Alternatives such as portal air extraction (ie no portal emissions) and dispersion via ventilation outlets may achieve the same outcomes as filtration at a lower cost.

Emissions from the project tunnels would be discharged at the ventilation outlets in Rozelle and Cammeray. The modelling carried out for the project demonstrates that the contributions to air quality at ground level due to emissions from the ventilation outlets would be minimal. Chapter 12 (Air quality) and Chapter 13 (Human health) of the environmental impact assessment demonstrates that the ventilation outlets would operate in a manner that would result in negligible to small contributions to the local air quality at sensitive receivers during expected traffic conditions, and that the potential community health impacts associated with changes in air quality within the local community are considered to be tolerable/acceptable.

The proposed motorway control centre at Waltham Street in Artarmon would not be a source of operational emissions.

The Western Harbour 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. Further, the monitoring of ventilation outlet emissions during operation would be regulated under an Environment Protection Licence prescribed under the POEO Act.

It is further noted that due to the reduction in surface road traffic caused by diversion to the tunnels, the project would generally result in a better outcome for ambient air quality than conditions without the project.

B15.11 Heritage

B15.11.1 Non-Aboriginal

Issue raised

Page 9

Naremburn is a conservation area with historical significance. Residents are invested in maintaining and preserving the area's character due to the age of buildings and existing ground movement. Willoughby City Council is concerned that increased truck movements and construction would cause damage to the buildings.

The church located on the corner of Merrenburn Avenue and Willoughby Road has been identified for potential historical significance but buildings of the same age surrounding the church have not been identified. Willoughby City Council requested further investigation on the historical significance on buildings throughout Naremburn.

Response

The non-Aboriginal heritage assessment has been informed by searches of NSW and Commonwealth heritage registers and supplemented by a literature review of previous assessments and heritage studies. Heritage items and areas of archaeological potential not already identified on registers were also identified as part of the assessment. Field surveys were carried out in May, June, September and December 2017 by qualified heritage specialists to inspect items of known heritage value and areas of potential heritage value.

The existing historical context for the Naremburn area is described in Section 3.1.3.2 of Appendix J (Technical working paper: Non-Aboriginal heritage). The location of all heritage items and potential heritage items within the study area is provided in Figure 14-1 to Figure 14-4 of the environmental impact statement.

The St Cuthbert's Anglican Church, located at the corner of Merrenburn Avenue and Willoughby Road was identified as having local significance and is listed in the Willoughby Local Environmental Plan 2012 (I792). Other buildings within the study area and in proximity to the church have been included in the assessment, including the group of shops located at 272-276 Willoughby Road (I174) and the shop located at 284 Willoughby Road (I775). Other potential heritage items are located outside of the study area for the non-Aboriginal heritage assessment show on Figure 14-4 of the environmental impact statement.

Construction works in the vicinity of Naremburn would generally occur within the Warringah Freeway corridor, and potential risks to heritage items would be primarily associated with construction vibration. Construction work would be carried out with consideration of the minimum working distances for vibration-intensive construction activities and other standard construction management measures (refer to environmental management measure CNV6 in Table D2-1 of this submissions report). Construction activities would have a negligible impact on heritage items within 25 metres of activities. Heritage items beyond 25 metres of construction would not be impacted. Settlement or ground movement would only occur in areas above the project tunnels, which do not extend into Naremburn. Impacts due to tunnelling associated with the Beaches Link would be considered in the future environmental impact statement for Beaches Link and Gore Hill Freeway Connection project.

B15.12 Geology, soils and groundwater

B15.12.1 Contamination

Issue raised

Page 10

Willoughby City Council requested further analysis of contaminants to be considered for Quarry Creek and Flat Rock Creek to minimise risk.

Response

The project would not result in direct impacts to either Quarry or Flat Rock Creeks. Section 16.4.3 of the environmental impact statement identifies potential areas of contamination that would require further investigation and management (if required) to manage contamination risk during construction. Areas of potential contamination risk includes Waltham Street, Artarmon. Based on the additional investigations, management measures will be implemented to ensure no risks to downstream environments, such as Flat Rock Creek.

Potential indirect impacts associated with potential erosion and sedimentation or surface water run-off have been discussed in Appendix M (Technical working paper: Contamination) and Appendix O (Technical working paper: Surface water quality and hydrology). With the implementation of environmental management measures outlined in Table D2-1 of this submissions report, potential indirect contamination impacts to either Quarry or Flat Rock Creeks are not anticipated.

Potential impacts on these waterways due to the proposed Beaches Link and Gore Hill Freeway Connection project would be assessed in the environmental impact statement for that project.

B15.12.2 Groundwater

Issue raised

Page 10

Council requested further analysis of groundwater changes to be considered for Quarry and Flat Rock Creeks to minimise risk.

Response

As outlined in Figure 16-10 and Figure 16-11 of the environmental impact statement, groundwater levels would not be affected by the project in the vicinity of Quarry and Flat Rock Creeks.

Potential impacts to groundwater quality or levels due to the proposed Beaches Link and Gore Hill Freeway Connection project would be assessed in the environmental impact statement for that project.

B15.13 Hydrodynamics and water quality

B15.13.1 Construction discharge water quality

Issue raised

Page 9

Willoughby City Council queried what the water testing and treatment process would be prior to discharge of wastewater generated during construction, and if there would be a remediation plan.

Response

The project would implement standard erosion and sediment control measures for all work sites and surface works areas. As outlined in Section 17.4.3 of the environmental impact statement, with the implementation of these controls, pollutant loading to the receiving waterways is considered to be low compared to the existing pollutant loading from Willoughby Creek, Quarry Creek and Flat Rock Creek catchments.

Discharge from construction wastewater treatment plants will be required to meet specific discharge criteria as required by revised environmental management measure WQ3 (refer to Table D2-1 of this submissions report).

Should any of the criteria be exceeded, a management response will be triggered. The management response will be documented within the construction environmental management plan.

These plants would be located at construction support sites that support tunnelling (such as Cammeray Golf Course construction support site (WHT10), which would discharge to Willoughby Creek).

The treatment of construction water prior to discharge means that a remediation plan is not required.

Chapter 17 (Hydrodynamics and water quality) of the environmental impact statement provides an assessment of the construction impacts associated with surface water quality.

B15.14 Biodiversity

B15.14.1 Marine

Issue raised

Page 9

Willoughby City Council queried what impact dredging would have on the marine environment as a result of 900,000 cubic metres of dredged material for the installation of the immersed tube tunnel and how would it be mitigated.

Response

The dredging methodology has been designed to minimise impacts on the marine environment depending on the material being dredged, as described in Chapter 6 (Construction work) and Table 6-4 of the environmental impact statement. This would involve using a backhoe dredge with closed environmental clamshell bucket for removal of the surface layer of material with elevated levels of contaminants to avoid the spread of potentially contaminated material into the water column. Dredging operations would also be carried out within a floating silt curtain enclosure to a depth of two to three metres. An additional shallow silt curtain would also be installed adjacent to ecologically sensitive areas to provide additional protection.

This methodology, in conjunction with the behaviour of sediment-bound contaminants, means it is unlikely that water quality would be significantly impacted by contaminants mobilised from dredging and marine construction activities. Further information regarding mitigation for dredging impacts is provided in Section B1.7 and Appendix C.2 of this submissions report.

An assessment of potential impacts to marine biodiversity is provided in Section 19.4.4 of the environmental impact statement. Dredging for the installation of the immersed tube tunnels would result in the removal of about 10.51 hectares of deepwater soft sediment habitat. These areas are expected to recover quickly through natural processes of recruitment, immigration of marine flora and fauna species and reinstatement of habitat after construction is completed.

Turbidity and sedimentation caused by dredging during the construction of the project has the potential to impact on about 0.01 hectares of rocky reef habitat. It also has the potential to impact on two small patches of seagrass, totalling about 0.03 hectares. The modelled predicted sedimentation load carried out for the project indicated that the project is unlikely to substantially impact these habitats.

Potential impacts would be minimised through the implementation of environmental management measure B19, which outlines that 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.

B15.14.2 Tree removal

Issue raised

Page 10

Willoughby City Council is concerned about urban heating due to the proximity to residential and other buildings from the Warringah Freeway. Willoughby City Council requested that trees are retained or replaced as close as possible to the existing trees around the Warringah Freeway and no net loss of tree canopy.

Response

The urban heat island effect results from the replacement of natural surfaces, including the tree canopy, with hard surfaces. The majority of the project is underground in tunnels or involves

replacing existing hard surfaces with new or upgraded hard surfaces. The project therefore is likely to have only a minor impact on the urban heat island effect in the long term.

In the short term, approximately 7.29 hectares of vegetation would be removed during construction activities, comprising of native plantings, planted medians, non-native species or weeds. This may result in highly localised impacts (in terms of the urban heat island effect) to residents directly adjacent to the vegetation, mostly due to the loss of shading that the trees provided.

Transport for NSW will replace trees removed by the project at a ratio equal to or greater than 1:1 to ensure there is no net loss (as outlined in revised environmental management measure B4, 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 developed as part of the detailed design. As the detailed design would confirm the required extents of disturbed areas within the construction footprint, replacement at each site can be more accurately quantified.

Based on the development of the reference design for the project, a likely net increase in vegetation has been identified at the following locations:

- Yurulbin Park
- Berrys Bay
- High Street Reserve
- Arthur Street Reserve
- Anzac Park
- Ernest Street southbound on ramp
- Cammeray Park
- Warringah Freeway on cut and cover structures.

Transport for NSW would minimise potential impacts to vegetation, with clearing of vegetation to be minimised, trees trimmed rather than removed, and that existing trees adjacent to the works retained and protected, where possible. This would be achieved through the implementation of environmental management measures V8 to V11 (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.

B15.15 Land use and property

B15.15.1 Loss of open space amenity

Issue raised

Page 7

Willoughby City Council states that “7.29 hectares of green space would be lost along the route” such as at Cammeray Golf Course and St Leonards Park, which would put more pressure on green space in the Willoughby local government area.

Response

No public land or open space within the Willoughby local government area would be directly impacted by the project’s construction or operation. Any impacts as a result of the Beaches Link and Gore Hill Freeway upgrade project, would be assessed in the environmental impact statement for that project.

Section 19.4.1 of the environmental impact statement identifies that construction of the project would require the removal of 7.29 hectares of vegetation (not open space or green space), which

comprises of native plantings, planted medians, non-native species or weeds. As outlined in Section B15.14.2, Transport for NSW will replace trees removed by the project at a ratio equal to or greater than 1:1 to ensure there is no net loss. Potential impacts due to the loss of vegetation would be minimised through the implementation of environmental management measures V8 to V11 and B4 (refer to Table D2-1 of this submissions report).

An assessment of land use and property impacts of the project, including impacts to open space during construction and operation is provided in Chapter 20 (Land use and property) of the environmental impact statement. As outlined in Section 20.4 of the environmental impact statement, there would be both temporary and permanent land impacts as a result of the project. The majority of open space used for construction of the project would not be required to operate the project and would be rehabilitated and returned to an equivalent state as soon as practicable at the completion of construction. The project would not impact on the long term viability of these areas as public open space.

With regards to operational impacts, while the project would result in both loss and opportunities to increase public open space, the environmental impact statement presented a conservative view by only reporting the largest permanent loss in open space.

Part of Cammeray Golf Course would be permanently acquired for permanent operational facilities for both the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project, as outlined in Table 20-3 of the environmental impact statement. The permanent loss of open space at Cammeray Golf Course was conservatively presented as 25,000 square metres in the environmental impact statement (this also included loss due to Beaches Link). Refined analysis shows that the permanent loss of open space at Cammeray Golf Course associated with the project is about 15,000 square metres.

The project has been designed and developed to minimise impacts to Cammeray Golf Course. Transport for NSW will continue its collaborative engagement with Cammeray Golf Club to maintain the long term viability of the Cammeray Golf Course in accordance with environmental management measure LP7 (refer to Table D-1 of this submissions report. The project would not impact on the site's feasibility as a nine hole golf course and for public recreation and open space purposes, either during construction or operation. It is noted that the Cammeray Park sports ground (oval), tennis club, croquet club and skate park would remain operational during construction and would not be directly impacted during construction or operation of the project.

The Ridge Street north construction support site (WHT9) would not be required on a permanent basis to operate the project and would be rehabilitated and returned as soon as practicable at the completion of construction. In addition, a review of the Falcon Street/ Miller Street intersection is currently being carried out to minimise or, where possible, eliminate permanent impacts to St Leonards Park. Should the project require the permanent acquisition of a small area of St Leonards Park to accommodate upgrades to the Falcon Street/Miller Street intersection, this is not expected to impact on the ongoing use or functioning of the park, or facilities within the park.

Additional public open space opportunities currently considered in the design include provision of new public open space at Berrys Bay (about 15,800 square metres) and the new Ernest Street shared user bridge (about 1800 square metres), linking Cammeray Golf Course with ANZAC Park. In addition, further opportunities to increase public open space would be investigated during further design development.

B15.16 Socio-economic

B15.16.1 Cumulative impacts

Issue raised

Pages 2 and 7

The cumulative impacts have not been considered for infrastructure projects. A cumulative impact assessment on socio-economic impacts is suggested for the Western Harbour Tunnel and Warringah Freeway Upgrade, Beaches Link and Gore Hill Freeway Upgrade, and Metro rail projects rather than each environmental impact statement assessing impacts individually.

Reduced economic productivity and liveability, induced traffic, declining air quality, mode-shifting from public transport and the equity impact of tolls are perpetuated by the cumulative effect of the Western Harbour Tunnel and Warringah Freeway Upgrade, Beaches Link and Gore Hill Freeway Upgrade, and Metro rail projects. Each project has been assessed individually and the cumulative impact for the Willoughby local government area has not been assessed. Willoughby City Council suggested a cumulative socio-economic assessment is completed.

Response

In accordance with the Secretary's environmental assessment requirements, the environmental impact statement includes an assessment of cumulative impacts of the project taking into account other projects. Potential cumulative impacts during construction and operation for key issues are discussed in chapters 8 to 26 of the environmental impact statement. Chapter 27 (Cumulative impacts) of the environmental impact statement provides an overview of potential cumulative impacts during both construction and operation of the project.

The screening criteria shown in Table 27-2 of the environmental impact statement were applied to determine whether a project or strategic plan should be included in the cumulative impact assessment. Projects and plans that satisfied all of these criteria were included in the cumulative impact assessment. These included (as relevant):

- Beaches Link and Gore Hill Freeway Connection project
- Sydney Metro City & Southwest (Chatswood to Sydenham)

Table 27-8 of the environmental impact statement provides a summary of potential cumulative construction impacts in the North Sydney and Cammeray area. Potential cumulative socio-economic, land use and property impacts include:

- Beaches Link and Gore Hill Freeway Connection:
  - Additional and prolonged increase in passing trade for local businesses and services in North Sydney and Cammeray, particularly along Miller Street
  - Additional and prolonged land use impacts at Cammeray Golf Course due to consecutive construction periods
  - Additional temporary and permanent loss of open space, parks and recreational facilities at Cammeray Golf Course
  - Additional and prolonged amenity impacts for receivers around the Warringah Freeway and for residential and recreational receivers at Cammeray
  - Additional and prolonged impacts to community perceptions of public health and safety due to increases in construction traffic for residential and recreational receivers at Cammeray
  - Additional and prolonged increased demand for construction workers, providing benefits for local workers.

- Sydney Metro City & Southwest:
  - Additional and prolonged increase in passing trade for local businesses and services in North Sydney and Crows Nest
  - Additional and prolonged amenity impacts for commercial receivers in the North Sydney CBD
  - Additional and prolonged impacts to community perceptions of public health and safety due to increases in construction traffic in the North Sydney CBD
  - Additional and prolonged increased demand for construction workers, providing benefits for local workers.

Potential impacts would be minimised through the implementation of environmental management measures CI1, CI2, CI3 and CI4 (refer to Table D2-1 of this submissions report) which require communication strategies for the project be managed consistently across the NSW Government transport portfolio and in accordance with the community consultation framework for the project, particularly with the Beaches Link and Gore Hill Freeway Connection project. In addition, multi-party engagement would be established prior to construction to minimise the potential for cumulative socio-economic impacts during construction of the project. Each of the study disciplines presented in chapters 8 to 26 of environmental impact statement also identified specific environmental management measures to reduce potential impacts to acceptable levels (included in Table D2-1 of this submissions report).

B15.16.2 Construction fatigue

Issue raised

Page 5

Concern was raised by Willoughby City Council about consultation fatigue due to a number of large development and infrastructure projects running simultaneously.

Response

Construction fatigue is discussed in Section 7.5.3 and Section 27.3.5 of the environmental impact statement. Construction fatigue may be experienced by receivers that are in the vicinity of concurrent or consecutive project construction activities where the activities overlap or have little or no break between the activities of one project, or multiple adjacent projects.

Potential issues considered most likely to contribute to construction fatigue include construction traffic and parking, construction noise and vibration, visual and amenity impacts, and impacts to community perceptions of public health and safety. As outlined in Section 27.3.5, work would be coordinated between the various project construction sites where feasible and reasonable, to minimise construction fatigue.

Consultation fatigue, including how the extent and impacts of consultation fatigue would be assessed, is discussed in Section 7.5.2 of the environmental impact statement. During construction of the project, the project would build a working relationship with the project teams for other major projects to identify stakeholders or community members who may be susceptible to construction or consultation fatigue. The project team would ensure the expectations of these stakeholders or community members are managed for the project. The project team would work to develop an integrated approach to contacting persons or organisations which may experience consultation fatigue, and would determine which communication mechanisms stakeholders prefer.

B15.16.3 Health and wellbeing

Issue raised

Pages 7 and 8

Willoughby City Council raised concerns about social well-being of residents including reduced economic productivity, liveability, induced traffic and mode-shifting from public transport, and air quality.

Response

Overall, the project would support improved access and connectivity to employment areas in the study area and the wider Sydney region. The project's introduction of an additional transport connection would improve the efficiency and capacity of the broader road, public and active transport network and assist in alleviating congestion and improving travel times. This would consequently result in improvements to productivity, employment and customer connectivity, enhancing road transport access to the North Sydney CBD, the St Leonards – Crows Nest Centre, the Artarmon Industrial Centre, and the metropolitan Harbour CBD. As discussed above in Section B15.2.1, the project also improves liveability through benefits associated with moving bypass traffic underground.

Potential economic impacts of the project are summarised in Section 21.5.5 of the environmental impact statement.

Section 3.3.2 of Appendix F (Technical working paper: Traffic and transport) acknowledges that new roads can induce changes in trip patterns. The SMPM used to model the performance of the project includes changes in traffic as a result of induced demand, with induced demand equating to about 0.3 per cent additional daily trips in the Sydney metropolitan area in 2037. Even with induced demand accounted for, the project is forecast to substantially reduce traffic demands and improve travel times on the Sydney Harbour Bridge, the Sydney Harbour Tunnel, ANZAC Bridge, and connecting road corridors.

The project would improve bus services currently operating on the Warringah Freeway and Sydney Harbour Bridge through reduced congestion and increased reliability during peak periods. The project would also allow new public transport routes to be developed in response to diverse travel demands and support new social and economic development. The new motorway tunnel would provide opportunities to introduce new express services, as well as improved travel times and reliability in peak periods on existing corridors, both of which would make buses a more attractive transport option, supporting future mode shift to public transport.

The potential for construction dust to impact on health and wellbeing of some sections of the community who may be more sensitive to changes in air quality (such as children or elderly people who suffer asthma or similar conditions), is likely to be of concern for some community members near to construction activities. The implementation of environmental management measure AQ1 (refer to Table D2-1 of this submissions report), requiring standard construction air quality mitigation and management measures is considered sufficient to minimise potential construction dust risks. Refer to Section B15.10.1 above for further information.

Section 21.5.4 of the environmental impact statement identifies that the operation of ventilation outlets at Rozelle and Cammeray may influence people's perceptions of air quality in surrounding areas. The health impact assessment carried out for the project found that potential health impacts associated with changes in air quality in the local community are considered to be acceptable and that tunnel ventilation outlets would be unlikely to result in adverse impacts on local air quality.

B15.16.4 Community cohesion

Issue raised

Page 8

The project may potentially impact community cohesion by restricting access to social infrastructure that could reduce social and community interactions. Engagement with managers of social infrastructure needs to be carried out near construction sites and support sites to mitigate impacts.

Response

Transport for NSW acknowledge construction activities have the potential to impact on community cohesion by temporarily restricting access or amenity to some social infrastructure and meeting places, as outlined in Section 21.4.5 of the environmental impact statement. This may impact opportunities for social and community interaction, temporarily impacting on community cohesion.

Increased construction noise, dust and traffic may impact on the amenity of the Cammeray Golf Course for some users and may deter some people from using the golf course during the construction phase. Construction works have potential to disrupt some social networks associated with the golf club. Overall, potential impacts to community cohesion as a result of construction of the project have been assessed as moderate-low, with meeting places being assessed as moderately sensitive to changes and the magnitude of the impact considered low. While alterations to the configuration of the golf course would be required, the project would not impact the site's operation as a nine hole golf course and for public recreation and open space purposes, during construction and operation. As required by environmental management measure LP7 (refer to Table D2-1 of this submissions report), Transport for NSW will continue to work with Cammeray Golf Club with a view to address the impacts of the project and maintain the long-term viability of Cammeray Golf Course.

Impacts on public open space and social infrastructure would be managed through the implementation of environmental management measures SE1 to SE3 (refer to Table D2-1 of this submissions report). Environmental management measure SE3 requires that ongoing engagement be carried out with managers of social infrastructure located near to 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.

During operation, the project would support improved travel and access to work, business and leisure activities in the precinct areas and wider Greater Sydney region. Regionally, improved accessibility and connectivity is likely to provide long-term benefits for community cohesion. In particular, travel facilitates social interactions and where access on major routes is constrained, some people may avoid making trips. Reduced travel times and improved travel time reliability may encourage some people to make trips they otherwise would not, helping to facilitate community cohesion.

Section 21.5.3 of the environmental impact statement outlines that a number of open spaces would be used during construction of the project. Most of the land required for construction would not however be required for operation of the project. At completion, land not required for operation would be rehabilitated and reinstated. Public access and ongoing use of parks including Cammeray Golf Course, St Leonards Park and ANZAC Park would not be affected as outlined in Section 21.5.3 of the environmental impact statement.

B15.16.5 Sensitive receivers

Issue raised

Pages 8 and 35

The environmental impact statement does not recognise that school children would need to traverse the project footprint due to school zoning (Cammeray Public, Anzac Park, Cammeray and

Willoughby Girls High School). Council is specifically concerned about the bus stop near the Willoughby Road exit.

Response

Ongoing engagement would be carried out with managers of sensitive social infrastructure, including schools, as required by environmental management measure SE3 (refer to Table D2-1 of this submissions report). This engagement would provide details about the timing and duration of construction works and management of potential impacts.

The environmental impact statement acknowledges that a number of schools and childcare facilities would be located near the project (refer to Section 21.4.4, Figure 21-3, Figure 21-4 and Figure 21-8 to Figure 21-11 of the environmental impact statement). Students, teachers and visitors at the schools may experience temporary amenity impacts due to increased noise and dust from construction activities at construction support sites and surface road upgrades.

Increased construction traffic and heavy vehicles using Ernest Street and Ridge Street could impact upon the perceptions of safety. Construction traffic will be managed appropriately in accordance with the environmental management measures including CTT7 (refer to Table D2-1 of this submissions report) which requires that vehicle movements to and from construction sites be managed to ensure pedestrian, cyclist and motorist safety. 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 project does not physically impact bus stops on Willoughby Road, nor is it expected to create adverse performance or safety issues on Willoughby Road.

B15.17 Resource use and waste management

B15.17.1 Construction water use

Issue raised

Page 9

The environmental impact statement indicates 1327 kilolitres of water per day required with 837 kilolitres from mains (potable) and the remainder from treated groundwater or harvested rainwater (non-potable).

Willoughby City Council requests Transport for NSW to investigate ways to reduce potable water use due to recent drought conditions.

Response

Section 24.3.1 of the environmental impact statement outlines water use for construction of the project. Water for construction of the project would be sourced according to the following hierarchy, where feasible and reasonable, and where water quality and volume requirements are met:

- Stormwater harvesting (non-potable water)
- On-site construction water treatment and reuse, including groundwater (non-potable water)
- Mains supply (potable water).

The average total water demand during construction is estimated to be 1327 kilolitres per day. About 837 kilolitres per day would be sourced from mains supply (potable water) with the remainder coming from treated wastewater from the project wastewater treatment plants or harvested rainwater (non-potable water). The use of non-potable water over potable would be preferred. However, this is dependent on the location and nature of the water use activity as well as the quantity and quality of available water at the time

Measures to avoid and minimise water consumption, particularly of potable water, have been included in the design and construction planning for the project, and reflected in environmental

management measure WM5 (refer to Table D2-1 of this submissions report). Examples of these measures include:

- Use of dust extraction and ventilation systems to control dust in tunnels during construction to minimise the use of water as a dust suppressant
- Capture, treatment and use of wastewater and rain water at construction sites to minimise the use of potable water during construction.

B15.17.2 Electricity use

Issue raised

Pages 9 and 10

Willoughby City Council requests 100 per cent renewable energy power purchase agreement to offset the electricity demand for tunnelling construction support sites. The opportunity to maximise solar panels to supplement non-renewable power should be encouraged to meet demand. Willoughby City Council requested more detail and focus on energy efficiency and renewable energy.

Environmental management measure GHG1 should ensure energy efficient systems are installed by default, rather than where reasonable and feasible.

Response

Measures to avoid and minimise electricity consumption have been included in the design and construction planning for the project. Examples of these measures include:

- Use of guidance systems for tunnel excavation and rock bolting to ensure efficient use of tunnelling equipment to minimise excessive electricity consumption
- Use of energy efficient site buildings and equipment on construction support sites, including use of solar powered lights and signage where feasible and reasonable
- Efficient design of electricity transmission systems to supply power as efficiently as possible.

Section 24.4.1 of the environmental impact statement identifies that during operation, opportunities to install solar panels at the tunnel portals and on tunnel support and traffic control facility buildings to supplement non-renewable power sources would be investigated where feasible and reasonable. Furthermore, additional measures to minimise energy consumption and maximise energy efficiency included in the project design include:

- Use of low heat emission LED lighting to reduce operational energy requirements
- Efficient and effective longitudinal ventilation system design with outlets located in close proximity to tunnel portals, taking advantage of the movement of vehicles within tunnels to reduce fan usage and reducing energy needed to move exhaust to outlet locations.

A sustainability framework has been developed for the project. The sustainability framework has been prepared to ensure that sustainability is embedded in project planning, design, construction and operation. The sustainability framework provides the overarching vision, objectives, targets and implementation approaches for the project (refer to Figure 25-1 of the environmental impact statement for key elements). The sustainability framework is underpinned by sustainability principles outlined in applicable legislation, policies and guidelines.

Activities to implement the sustainability framework, including requirements from the Infrastructure Sustainability rating scheme, will be implemented through a Sustainability Management Plan. The management 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

of Australia rating scheme (refer to environmental management measure SU2 in Table D2-1 of this submissions report).

B15.17.3 Waste management

Issue raised

Page 10

Landfill disposal should be the last option for waste management. The following should be implemented for waste management:

- All offsite disposal going to appropriate licensed processing and disposal facilities
- Hazardous wastes are sorted, stored and transported
- The development of a waste management plan prior to project commencement
- Contaminated waste should not be transported via local streets and when children are moving through areas
- Strict conditions for the transport for contaminated waste should be a condition of approval in agreement with Willoughby City Council.

Response

Section 24.5 of the environmental impact statement discusses the location 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.

Section 24.6.2 of the environmental impact statement outlines the approach to the management of waste. 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*. Where feasible and reasonable, resources would be managed according to the following hierarchy:

- Avoidance of unnecessary resource consumption through design, efficient construction methodologies and management
- Resource recovery, including reuse, reprocessing, recycling and energy recovery within the project
- Resource recovery, including reuse, reprocessing, recycling and energy recovery outside the project
- Where resource recovery is not feasible or reasonable, disposal would be the last resort.

Environmental management measures WM1 to WM6 provide for the requirement to manage the consumption of materials, implement reuse and recycling initiatives and to appropriately manage and transport waste (refer to Table D2-1 of the environmental impact statement). The construction environmental management plan, as outlined in Section 28.5 of the environmental impact statement and further detailed in Section D1 of this submissions report, would also provide more details on waste and resource management during construction. It is noted that the assessment and associated management of wastes at the proposed Beaches Link and Gore Hill Freeway Connection project Flat Rock Creek construction support site would be provided in the environmental impact assessment for that project.

Indicative construction vehicle routes are provided in Appendix F (Technical working paper: Traffic and transport). Waste will be appropriately transported according to their waste classification and in a manner that prevents pollution of the surrounding environment (refer to environmental management measure WM4 in Table D2-1 of this submissions report).

Specific conditions of approval for the project, including requirements for the transport of waste are a matter for the Department of Planning, Industry and Environment to consider in their assessment of the project.

B15.18 Sustainability

B15.18.1 Environmental sustainability

Issue raised

Page 9

Willoughby City Council requested that the project follows state and national objectives for sustainable procurement and have recycled content and Australian made as targets.

Response

The project would establish robust sustainability objectives and targets to achieve the sustainability vision for the project and to contribute to the desired outcomes of the relevant State and Transport for NSW policies and guidelines, as outlined in Section 25.2.3 of the environmental impact statement. Indicative objectives and targets (subject to later refinement to allow for incorporation of any relevant approval conditions) are outlined in Table 25-4 of the environmental impact statement and include the objective of maximising sustainable procurement.

It would be the responsibility for the contractor to determine how the sustainability objectives would be embedded into supply chain requirements. Notwithstanding this, environmental management measure WM1 (refer to Table D2-1 of this submissions report) will require that construction materials be sourced in accordance with the project's sustainability framework and with a preference for Australian materials and prefabricated products with low embodied energy, where feasible and reasonable.

As outlined in Section B15.17.2 above, activities to implement the sustainability framework, including requirements from the Infrastructure Sustainability rating scheme, will be implemented through a Sustainability Management Plan. The management 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 of Australia rating scheme (refer to environmental management measure SU2 in Table D2-1 of this submissions report).

B15.19 Greenhouse gas and climate change

B15.19.1 Greenhouse gas emissions during construction

Issue raised

Page 10

Willoughby City Council recently declared a climate emergency. Based on the climate and sustainability assessment the project is not consistent with that declaration nor does it satisfy the *Protection of the Environment Administration Act 1991*. The project would generate more than one million tonnes of carbon dioxide per year, an increase of over 31,000 tonnes of carbon dioxide per year compared to without the project.

Willoughby City Council requested that alternative solutions be considered to reduce climate change impacts consistent with climate change actions.

Response

As outlined in Section 26.2.5 of the environmental impact statement, greenhouse gas emissions would be managed and minimised as part of the Sustainability Management Plan which would be implemented to assist in achieving 'Design' and 'As Built' ratings of Excellent under the

Infrastructure Sustainability Council of Australia rating scheme. This commitment is aligned with the NSW Government stated intention to reduce net greenhouse gas emissions.

Section 26.2.4 of the environmental impact assessment identifies that the estimated operational greenhouse gas emissions would represent about 0.04 per cent and 0.05 per cent of projected NSW emissions in 2027 and 2037 respectively, and 0.01 per cent of Australia's projected national emissions in 2027 and 2037. These percentage contributions are considered small within the NSW and national contexts, and will be further minimised with the implementation of the following environmental management measures:

- GHG1: Energy efficiency will be considered during further design development with energy efficient systems installed where reasonable and practicable
- GHG2: Greenhouse gas emissions during construction 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 of Australia rating scheme.

NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

B16 – Mosman Council

SEPTEMBER 2020

B16 Mosman Council

Contents

B16.1 The project

Issue raised

Page 1

Mosman Council does not oppose the project in principle and understands that the Western Harbour Tunnel will connect the M4−M5 Link in Rozelle to the Warringah Freeway at North Sydney/Cammeray. From Cammeray, it will also connect to the Gore Hill Freeway and Beaches Link tunnel, if it were to proceed.

Response

Mosman Council's position on the project is acknowledged.

B16.2 Assessment process

B16.2.1 Environmental impact statement process

Issue raised

Page 1

Council is concerned about the failure to proceed with the Beaches Link Tunnel and the exclusion of improvements to the Spit−Military Road corridor. It is our view that the environmental impact statement for the Western Harbour Tunnel Project and the Beaches Link Tunnel Project should be prepared, published and considered together in order to achieve the cumulative environmental benefits.

Response

As discussed in Section 3.3 of the environmental impact statement, the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project have been developed as an integrated program known as the Western Harbour Tunnel and Beaches Link program of works but are being delivered as separate projects, which require separate environmental impact statements. The core capacity improvement offered by the project is key to enabling the proposed Beaches Link and Gore Hill Freeway Connection project and the associated significant change in connectivity and reliability for the northern Sydney transport network. Delivered together, the two projects would provide a range of benefits for freight, public transport and private vehicle users and improve the overall resilience of the transport network.

The NSW Government remains committed to the delivery of the Beaches Link and Gore Hill Freeway Connection project, and is finalising the environmental impact statement for this project following the release of an updated proposed reference design in November 2019.

The cumulative benefits of the Western Harbour Tunnel and Beaches Link program of works include bypassing 19 sets of traffic lights through The Spit, Mosman and Neutral Bay, reduced traffic pressure on key main roads such as Military Road, greater resilience to incidents and delays and faster and more reliable bus trips. The environmental impact statement for the project includes assessments of the cumulative impacts of the Western Harbour Tunnel and Beaches Link program of works on operational traffic, air quality and human health. These are provided in Chapter 9 (Operational traffic and transport), Chapter 12 (Air quality), Chapter 13 (Human health) and Chapter 27 (Cumulative impacts) of the environmental impact statement.

B16.3 Strategic context and project need

B16.3.1 Project demand

Issue raised

Page 1 and Page 2

The environmental impact statement states that a key benefit of the project will be supporting the sustainability of local town centres by returning streets to local communities. This is consistent with Council's vision for the Spit−Military Road corridor.

It is our view that the environmental impact statement lacks the means to achieve this benefit as it fails to address the road networks surrounding the proposed motorways. For the motorways to function as intended, it is essential to include practical measures to discourage traffic to use local road corridors. The project scope should be expanded to include local road corridors. This is the essence of the "Movement and Place" principle of transport planning that is currently being championed by Transport for NSW.

Response

The project has been developed to align with the objectives of a number of strategic plans that have been prepared at a national and State level, including the *Future Transport Strategy 2056* (NSW Government, 2018).

The *Future Transport Strategy 2056* identifies ‘Successful Places’ as one of the six outcomes for NSW and sets out a vision for better balancing ‘movement and place’ needs, particularly in major centres. Transport for NSW will continue to work closely with councils and other key stakeholders to develop plans for the future of State roads (including Military Road). Assessment of the changes to traffic on Military Road would be included in the environmental impact statement under preparation for the Beaches Link and Gore Hill Freeway Connection project, which is expected to provide significant demand reduction benefits for Military Road.

B16.4 Project description

B16.4.1 Motorway features

Issue raised

Page 2

Chapter 7 (Stakeholder and community engagement) of the environmental impact statement states that the ramps at Ernest Street interchange will remain. Mosman Council supports this design outcome and seeks confirmation. Council is concerned about the impact on Mosman residents if the ramps were permanently closed.

Response

The Ernest Street ramps in Cammeray would remain. However, as detailed in Section 5.3.3 of the environmental impact statement, the project would alter the functionality of these connections to and from Ernest Street as follows:

- An off ramp would be provided from the Sydney Harbour Tunnel northbound to Ernest Street eastbound and westbound
- An on ramp would be provided to the Sydney Harbour Tunnel southbound from Ernest Street eastbound and westbound
- Tidal flow arrangements at the Ernest Street ramps would be removed

- Direct access from Ernest Street to the Sydney Harbour Bridge southbound would be removed. Adjacent interchanges to the north and south of Ernest Street would provide connectivity to the Sydney Harbour Bridge
- Direct access to Ernest Street from the Sydney Harbour Bridge (Bradfield Highway) northbound would be removed. Adjacent interchanges to the north and south of Ernest Street would provide connectivity to Cammeray and Neutral Bay.

These changes form part of the Warringah Freeway Upgrade component of the project, which has been designed to improve wayfinding and separate traffic on the freeway depending on different trip functions, while also allowing for the connection and integration of the Western Harbour and Beaches Link tunnels.

B16.5 Air quality

B16.5.1 Health and wellbeing

Issue raised

Page 2

The effect of emissions from the tunnel's ventilation stacks on the health and wellbeing of surrounding community is a concern for Mosman Council. Council is seeking confirmation that air quality will be considered to ensure that health and amenity of surrounding local neighbourhoods is maintained.

Response

In relation to health risks to the community, the project would generally result in no change or a small improvement (ie decreased concentrations and potential health benefits); however, for some areas located near key surface roads, small increases in pollutant concentrations may occur. Potential health impacts associated with localised changes in air quality have been assessed and are considered to be acceptable.

The independent NSW Chief Scientist and Engineer has released a report in relation to road tunnel air quality. The report 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 Western Harbour 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. 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.*

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