

Part E

Environmental management measures and conclusion

E Environmental management measures and conclusion

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E1 Environmental management measures

This chapter presents the updated environmental management measures for the M4-M5 Link project.

The Environmental Impact Statement (EIS) for the M4-M5 Link project identified the environmental management measures that would be adopted to avoid or reduce environmental impacts (refer to Chapter 29 (Summary of environmental management measures) of the EIS). All measures identified would be incorporated into management plans.

After consideration of the issues raised in the public submissions, the environmental management measures for the project have been revised (**Table E1-1**).

The adjustments to the measures were made to:

- Make additional commitments based on the response to submissions within the report
- Make additional commitments based on the findings of further assessments provided within this report
- Make additional commitments based on the additional consultation carried out during the preparation of this report
- Modify the wording so that the outcome of the commitment is clearer to implement.

Where new commitments have been added or new text has been added to an existing measure, it is in bold text. Where a commitment has been deleted or text from the commitment deleted, it appears as strikethrough text.

Table E1-1 Revised summary of environmental management measures

Impact	Ref #	Environmental management measure	Timing
Traffic and transport			
Delays and disruptions to the road network during construction	TT01	<p>A Construction Traffic and Access Management Plan (CTAMP) will be prepared as part of the CEMP. The CTAMP will include the guidelines, general requirements and principles of traffic management to be implemented during construction. It will be prepared in accordance with <i>Austroads Guide to Road Design</i> (with appropriate Roads and Maritime 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 CTAMP will be prepared in consultation with relevant transport stakeholders and local councils.</p> <p>The overarching strategy of the CTAMP will be to:</p> <ul style="list-style-type: none"> • Ensure all relevant stakeholders are considered during all stages of the project • Provide safe routes for pedestrians and cyclists during construction • Design the permanent works and Develop construction methodologies so that interaction with existing road users is minimised thereby creating a safer work and road user environment 	Construction

Impact	Ref #	Environmental management measure	Timing
		<ul style="list-style-type: none"> • Plan and stage works to minimise the need for road occupancy, where possible • Develop project staging plans in consultation with relevant traffic and transport stakeholders • Minimise the number of changes to the road users' travel paths and, where changes are required, develop and implement an effective community communication strategy, coupled with temporary wayfinding signage to a high standard of traffic controls which effectively warn, inform and guide. This will aim to minimise confusion by providing clear and concise traffic management schemes • Comprehensively communicate changes in traffic conditions to roads or paths to emergency services, public transport operators, other road user groups and any other affected stakeholders • Identify measures to manage the movements of construction-related traffic to minimise traffic and access disruptions in the public road network • Minimise the use of local roads for heavy vehicles Propose a car parking strategy for construction staff at the various worksites, in consultation with local councils and stakeholders associated with any facilities adjacent to the project site. This will include the promotion of public transport and carpooling to reduce worksite-related vehicle movements. The strategy will be developed to limit impacts on the surrounding communities and will include the parking management measures that will be implemented on adjacent local streets. The strategy will also be developed in consultation with the M4 East and New M5 contractors to identify opportunities to use existing parking arrangements associated with those projects during their respective construction periods and once those periods are completed • Minimise the loss of on-road parking for local residents Describe a car parking strategy for construction staff at the various worksites and ancillary facilities. 	
Delays and disruptions to the road network during construction	TT02	Identify potential road user delays during the planning and consultation phases and include strategies within the CTAMP to reduce identified delays.	Construction
Impacts on road network performance (delays) and safety	TT03	Develop construction staging and temporary works that minimises conflicts with the existing road network and maximises spatial separation between work areas and travel lanes.	Construction
Parking on local streets around construction sites	TT04	<p>The car parking strategy described in the CTAMP will:</p> <ul style="list-style-type: none"> • Quantify construction workforce parking demand around project work sites and ancillary facilities during site establishment and the construction phase generally • Identify public transport options and other management measures (such as carpooling and shuttle-buses) to reduce construction workforce parking demand 	Construction

Impact	Ref #	Environmental management measure	Timing
		<ul style="list-style-type: none"> Identify all locations that will be used for construction workforce parking (including potential use of government owned land and other potential areas near to the construction ancillary facilities) Identify potential offsite areas that could be used for construction workforce parking that would be investigated and secured for use during construction where required and possible Identify parking exclusion zones, in consultation with potentially affected stakeholders, around construction sites and facilities where construction workforce parking would be restricted. <p>The strategy will also be developed in consultation with the M4 East and New M5 contractors to identify opportunities to use existing parking arrangements associated with those projects during their respective construction periods and once those periods are completed. Investigate potential offsite areas that could be used for construction workforce parking, including government owned land and other potential areas near to the construction ancillary facilities, and secure them for use during construction where required and possible</p>	
Impacts on road network performance (delays) and safety	TT05	Isolate work areas from general traffic through the implementation of appropriate traffic and access controls.	Construction
Impacts on road network performance (delays) and safety	TT06	Develop and implement alternative work methods to minimise delays and road user impacts, for example utilising more efficient plant and equipment, and applying different design solutions.	Construction
Impacts on road network performance (delays) and safety	TT07	Provide temporary closed-circuit television (CCTV) and Variable Message Signs (VMS) in consultation with the Traffic Management Centre (TMC) to link with the existing Transport Management Centre TMC network to facilitate real time monitoring and management of impacts and traffic safety in the vicinity of the project.	Construction
Impacts on road network performance (delays) and safety	TT08	During construction, work with the TMC to observe improve traffic flows conditions around work and incidents from CCTV footage and modify sites and activities where possible to address any identified issues wherever practicable.	Construction
Impacts on road network performance (delays) and safety	TT09	Provide a mechanism for the community to report incidents and delays, for example a project phone number. Advertise details along the construction site's interface with the road network.	Construction
Impacts on road network performance (delays) and safety	TT10	Schedule construction-related transport movements to avoid peak traffic periods and adversely affecting minimise project-related congestion, where possible.	Construction

Impact	Ref #	Environmental management measure	Timing
Impacts on road network performance (delays) and safety	TT11	Develop and adopt robust community and stakeholder communication protocols regarding altered traffic conditions.	Construction
Impacts on pedestrian and cycle paths	TT12	Minimise impacts on the pedestrian paths and cycle lanes, and provide timely alternatives during construction where practical and safe to do so.	Construction
Impacts on public transport	TT13	Identify impacts on bus stops and provide alternative locations and access in consultation with Transport for NSW.	Construction
Impact on property access	TT14	Manage local road closures and maintain adequate property access. This will be undertaken in consultation with Roads and Maritime, local councils and property owners likely to be impacted.	Construction
Impacts on road network from spoil transport	TT15	Identify spoil haulage routes and designated routes for other project-related heavy vehicles and communicate, along with site access requirements and restrictions, to all relevant drivers. Designated heavy vehicle routes will be identified with consideration of potentially affected stakeholders, such as schools, day care centres, nursing homes and places of worship, around project sites that might be adversely affected by project-related heavy vehicle movements. Routes and associated restrictions of use of the routes will be developed to minimise identified potential impacts. Project-related heavy vehicle routes and any associated restrictions of use will be documented in the CTAMP.	Construction
Impacts on road network from spoil transport	TT16	Develop and implement a truck management strategy (as part of the CTAMP) that: <ul style="list-style-type: none"> • Identifies truck marshalling areas that will be used by project-related heavy vehicles • Describes management measures for project-related heavy vehicles to avoid queuing and site-circling in adjacent streets and other potential traffic and access disruptions • Describes monitoring programs to demonstrate that project-related heavy vehicles are complying with the strategy. Identify potential truck marshalling areas and use where possible, to minimise potential queuing and traffic and access disruptions in the local area. 	Construction
Impacts on receivers from spoil transport during night time periods	TT17	Monitor and manage project-related heavy vehicle movements to and from sites with the aim of limiting any associated increases in road traffic noise levels during the night-time period to no more than 2 dBA. Any increases in road traffic noise of more than 2 dBA due to project-related vehicle movements will be managed in accordance with the <i>Construction Noise and Vibration Guideline</i> (Roads and Maritime 2016). Monitor heavy vehicle movements to and from sites to ensure compliance with road traffic noise criteria at night	Construction
Impacts on road infrastructure	TT18	Prepare a road dilapidation report, in consultation with relevant councils and road owners, identifying existing conditions of local roads and mechanisms to repair damage to the road network caused by heavy vehicle movements associated with the project.	Construction

Impact	Ref #	Environmental management measure	Timing
Cumulative traffic impacts at White Bay	TT19 (new)	Roads and Maritime will continue to consult with the Port Authority of NSW and other stakeholders as appropriate to ensure coordination between the operation of the White Bay civil site (C11) and other relevant projects in the vicinity, including existing operations associated with port activities.	Construction
Active transport strategy implementation	TT20 (new)	An Active Transport Network Implementation Strategy will be prepared for the project. The strategy will be consistent with the Active transport strategy in Appendix N of the EIS. The strategy will be prepared in consultation with relevant councils and Bicycle NSW and implemented prior to the commencement of project operations or as otherwise agreed to by the Secretary of NSW Department of Planning and Environment.	Construction
Road network performance constraints	OpTT1	A review of operational network performance will be undertaken 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. The assessment will be based on updated traffic surveys at the time and the methodology used will be comparable with that used in this assessment. The results of the review will be considered in future operational network performance planning carried out by Roads and Maritime.	Operation
Road network performance constraints	OpTT2	To manage potential performance constraints at the Wattle Street interchange, Roads and Maritime will investigate the implementation of the following in consultation with local councils: <ul style="list-style-type: none"> • Queuing and capacity monitoring and management on the Frederick Street/Milton Street corridor • Managing lane use and utilisation to improve the operation of the corridor. 	Operation
	OpTT3	Roads and Maritime will develop a strategy to ensure appropriate network integration in the areas surrounding the Rozelle interchange. The strategy will include a review of: <ul style="list-style-type: none"> • Capacity improvement measures • The interface with road based public transport on the Western Distributor and Victoria Road in consultation with Transport for NSW • Project staging options • Demand management measures. 	Operation
Air Quality			
Impacts on ambient air quality and human health from dust generation and plant	AQ1	A Construction Air Quality Management Plan will be developed and implemented to monitor and manage potential air quality impacts associated with the construction for the project. The management plan will include controls required to reduce the emission of dust out of the door openings of acoustic sheds. The Plan will be implemented for the duration of construction.	Construction

Impact	Ref #	Environmental management measure	Timing
emissions during construction Impacts on ambient air quality from dust generation and deposition during construction	AQ2	Regular communication to be carried out with other WestConnex projects under construction sites in close proximity to ensure that measures are in place to manage cumulative dust impacts.	Construction
	AQ3	Regular site inspections will be conducted to monitor for potential dust issues. The site inspections, required actions and ongoing issues arising, will be recorded and actioned appropriately within agreed timeframes by relevant project personnel.	Construction
	AQ4	Construction activities with the potential to generate dust will be modified or ceased during unfavourable weather conditions to reduce the potential for dust generation.	Construction
	AQ5	Measures to reduce potential dust generation, such as the use of water carts, sprinklers, dust screens and surface treatments, will be implemented within project sites as required.	Construction
	AQ6	Unsealed Access roads within project sites will be maintained and managed to reduce dust generation.	Construction
	AQ7	Where reasonable and feasible, appropriate control methods will be implemented to minimise dust emissions from the project site.	Construction
	AQ8	Storage of materials that have the potential to result in dust generation will be minimised within project sites at all times.	Construction
	AQ9	All construction vehicles and plant will be inspected regularly and maintained to ensure that they comply with relevant emission standards.	Construction
	AQ10	Engine idling will be minimised when plant is stationary, and plant will be switched off when not in use to reduce emissions.	Construction
	AQ11	The use of mains electricity will be favoured over diesel or petrol-powered generators where practicable to reduce site emissions.	Construction
	AQ12	Haul roads will be treated with water carts and monitored during earthworks operations, ceasing works if necessary during high winds where dust controls are not effective.	Construction
	AQ13	Suitable dust suppression and/or collection techniques will be used during cutting, grinding or sawing activities likely to generate dust in close proximity to sensitive receivers.	Construction
	AQ14	The potential for dust generation will be considered during the handling of loose materials. Equipment will be selected and handling protocols developed to minimise the potential for dust generation.	Construction
	AQ15	All loaded spoil haulage trucks and other project-related heavy vehicles carrying materials with the potential to result in dust generation will be covered to prevent dust emissions during transport in accordance with relevant road regulations. All vehicles loads will be covered to prevent escape of loose materials during transport.	Construction

Impact	Ref #	Environmental management measure	Timing
	AQ16	Demolition activities will be planned and carried out to minimise the potential for dust generation.	Construction
	AQ17	Adequate dust suppression will be applied during all demolition works required to facilitate the project.	Construction
	AQ18	All potentially hazardous material will be identified and removed from buildings in an appropriate manner prior to the commencement of and/or progressively during demolition and in accordance with all relevant codes of practice demolition.	Construction
	AQ19	Areas of soil exposed during construction will be minimised at all times to reduce the potential for dust generation.	Construction
	AQ20	Exposed soils will be temporarily stabilised during weather conditions conducive to dust generation and prior to extended periods of inactivity to prevent minimise dust generation.	Construction
	AQ21	Exposed soils will be permanently stabilised as soon as practicable following disturbance to minimise the potential for ongoing dust generation.	Construction
	AQ22	Ensure that stockpiles of materials with the potential to result in dust emissions are adequately protected and managed to reduce potential dust generation. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	Construction
	AQ23	Ensure fine materials are stored and handled to minimise dust.	Construction
	AQ24	All sealed surfaces within sites and site accesses will be managed to reduce dust generation and sediment tracking onto roads Deposits of loose materials will be regularly removed from sealed surfaces within and adjacent to project sites to reduce dust generation.	Construction
	AQ25	During At the commencement of establishment of project ancillary facilities, controls such as wheel washing systems and rumble grids will be installed at all site exits to prevent deposition of loose material on sealed surfaces outside project sites to reduce potential dust generation.	Construction
Impacts to air quality within project tunnels during operation	AQ26	Tunnel infrastructure will be designed in such a way that the generation of pollutant emissions by the traffic using the tunnel is minimised. The main considerations are minimising gradients and ensuring that lane capacity remains constant or increases from entry to exit point.	Construction
	AQ27	An in-tunnel air quality monitoring system will be included in the detailed design. The system will monitor oxides of nitrogen, nitrogen dioxide, carbon monoxide and visibility (as a minimum) throughout the tunnel. Monitoring of each pollutant will be undertaken throughout the tunnel. The locations of monitoring equipment will generally be at the beginning and end of each ventilation section. This will include, for example, monitors at each entry ramp, exit ramp, merge point and ventilation exhaust and supply point. The location of monitors will be governed by the need to meet the in-tunnel air quality criteria for all	Construction and operation

Impact	Ref #	Environmental management measure	Timing
		possible journeys through the tunnel system, especially for nitrogen dioxide. This will require sufficient, appropriately placed monitors to calculate a journey average.	
	AQ28	Velocity Air velocity monitors will be placed in each tunnel ventilation section and at portal entry and exit points. The specific location of air velocity monitors will be subject to the detailed design of the project. The velocity monitors in combination with the air quality monitors will be used to modulate the ventilation within the tunnel to manage air quality and to ensure net air inflow at all tunnel portals.	Construction
Ambient air quality during operation	AQ29 (new)	Ambient air quality monitoring will be carried out in the vicinity of the ventilation outlets installed as part of the project. Monitoring will occur at key representative locations, identified in consultation with an independent air quality specialist and an Air Quality Community Consultative Committee (AQCCC), to allow direct comparison of measured ambient air quality with dispersion model predictions. The monitoring will commence at least 12 months prior to and continue for at least two years following the commencement of operation. Monitoring results and a comparison of monitoring results against dispersion model predictions and relevant ambient air quality criteria will be made publicly available.	Construction and operation
Noise and vibration			
Impacts from the generation of construction noise and vibration	NV1	<p>A suitably qualified and experienced acoustics advisor Acoustics Advisor, who is independent of the design and construction personnel, will be engaged for the duration of construction of the project. The Acoustics Advisor will be responsible for:</p> <ul style="list-style-type: none"> • Reviewing management plans related to noise and vibration and endorsing that they address all relevant conditions of approval and requirements of all applicable guidelines • Reviewing location and activity specific noise and vibration impact assessments prepared during the project and endorsing the assessments and proposed mitigation measures • Reviewing proposals regarding works outside standard construction hours, confirming that the works are appropriate and endorsing the proposed mitigation measures • Monitoring noise and vibration from construction generally and: <ul style="list-style-type: none"> – Confirming that actual noise and vibration levels and impacts are consistent with predictions – Confirming that reasonable and feasible noise and vibration mitigation measures are being implemented – Suggesting additional reasonable measures to further reduce impacts • Monitoring and providing advice in relation to compliance with conditions of approval and project commitments related to noise and vibration • Providing advice in relation to complaints regarding noise and vibration impacts that cannot 	Construction

Impact	Ref #	Environmental management measure	Timing
		<p>be resolved between the complaint and the project</p> <ul style="list-style-type: none"> • Reviewing and endorsing the proposed operational noise controls, the associated noise model and the proposed implementation program Providing advice to the Proponent, the construction contractor(s) and the Secretary regarding the management of potential noise and vibration impacts associated with the project and compliance with relevant conditions of approval. 	
	NV2	<p>A Construction Noise and Vibration Management Plan (CNVMP) will be prepared for the project. The plan will:</p> <ul style="list-style-type: none"> • Identify relevant performance criteria 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 measures from the <i>Construction Noise and Vibration Guideline</i> (CNVG) (Roads and Maritime 2016) and details about when each will be applied • Describe the process(es) that will be adopted for carrying out location and activity specific noise and vibration impact assessments to assist with the selection of appropriate mitigation measures • Include protocols that will be adopted to manage works required outside standard construction hours in accordance with relevant guidelines • Detail monitoring that will be carried out to confirm project performance in relation to noise and vibration performance criteria. <p>The CNVMP will be implemented for the duration of construction of the project.</p>	Construction
	NV3	<p>Detailed noise assessments will be carried out for all ancillary facilities required for construction of the project. The assessment will consider the proposed site layouts and noise generating activities that will occur at the facilities and assess predicted noise levels against the relevant noise management levels determined in accordance with the requirements of the <i>Interim Construction Noise Guideline</i> (ICNG) (NSW Department of Environment and Climate Change NSW (DECC) 2009). The assessments will be used to determine the appropriate heights and configurations of noise barriers, and other appropriate noise management measures, consistent with the requirements of the ICNG and the CNVG. Noise barriers, as confirmed through the noise assessments, will be installed as early as possible during site establishment and as a minimum prior to the commencement of excavation associated with tunnel access.</p>	Construction
	NV4	<p>Location and activity specific noise and vibration impact assessments will be carried out prior to (as a minimum) activities:</p> <ul style="list-style-type: none"> • With the potential to result in noise levels above 75 dBA at any receiver • Required outside standard construction hours likely to result in noise levels greater than the relevant noise management levels 	Construction

Impact	Ref #	Environmental management measure	Timing
		<ul style="list-style-type: none"> With the potential to exceed relevant performance criteria for vibration. <p>The assessments will clarify predicted impacts at relevant receivers in the vicinity of the activities to assist with the selection of appropriate management measures, consistent with the requirements of ICNG and CNVG that will be implemented during the works.</p>	
Out-of-hours impacts	NV5	<p>An out-of-hours works protocol will be developed for the construction of the project. The protocol will include:</p> <ul style="list-style-type: none"> Details of works required outside standard construction hours, including justification of why the activities are required outside standard construction hours Measures that will be implemented to manage potential impacts associated with works outside standard construction hours Location and activity specific noise and vibration impact assessment process(es) that will be followed to identify potentially affected receivers, clarify potential impacts and select appropriate management measures Details of the approval process (internal and external) for works proposed outside standard construction hours. <p>The protocol will be included in the CNVMP, prepared in consultation with NSW Department of Planning and Environment and the NSW EPA, endorsed by the Acoustics Advisor for the project and implemented during construction of the project.</p>	Construction
Noise monitoring	NV6	<p>Monitoring will be carried out at the commencement of activities for which a location and activity specific new noise and vibration impact assessment has been prepared intensive activities and works in new locations to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate.</p>	Construction
Acoustic Noise from acoustic sheds	NV7	<p>Acoustic sheds will be designed within with consideration of the activities that will occur within them and the relevant noise management levels in adjacent areas. Monitoring will be carried out to confirm that the actual acoustic performance of each shed the sheds is consistent with predicted acoustic performance.</p>	Construction
Blast Management Strategy impacts	NV8	<p>A Blast Management Strategy will be prepared and implemented for the project if blasting is proposed. The strategy will:</p> <ul style="list-style-type: none"> Identify relevant performance criteria in relation to potential noise and vibration impacts due to blasting with reference to (as a minimum) <i>Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration</i> (Australian and New Zealand Environment Conservation Council (ANZECC), 1990) and Australian Standard AS 2187.2-2006 Explosives - 	Construction

Impact	Ref #	Environmental management measure	Timing
		<p>Storage, transport and use, Part 2: Use of explosives</p> <ul style="list-style-type: none"> Describe trials that will be carried out to confirm vibration levels from blasting and facilitate development of predictive tools to allow potential noise and vibration impacts to be identified Include details of management measures that will be implemented to ensure compliance with relevant performance criteria Include details of community consultation requirements prior to commencing blasting. <p>The Blast Management Strategy will be implemented for all blasting carried out as part of the project.</p>	
Operational Long term construction noise impacts	NV9	Receivers that qualify for assessment for at receiver treatment in relation to operational noise that are also predicted to experience significant exceedances of noise management levels due to construction will be given priority preference for assessment for treatment based on the severity and timing of impact. Where the building owner accepts the at receiver treatment proposal, the treatments will be installed as soon as possible. When at receiver treatments are found to be appropriate, the application of the treatment will be expedited.	Construction
	NV10	Where reasonable and feasible, operational noise mitigation such as noise barriers, berms and at-property treatments identified during detailed design should be installed early in the project so as to provide a benefit to receivers during the construction phase of the project.	Construction
Road traffic noise	NV11	Open Graded Asphalt (OGA) or equivalent The use of low noise pavement to further reduce road traffic noise at the source will be investigated during detailed design taking into account whole life engineering considerations and the overall social, economic and environmental effects. If low noise pavement is found to be appropriate, it will be considered as a management measure when assessing operation noise impacts based on the detailed design.	Construction
	NV12	The area in the vicinity of the western portal of the Iron Cove Link, Rozelle, will be assessed further during development of the detailed design to identify appropriate noise mitigation measures to address predicted increases in road traffic noise to the project. The measures that will be considered will include low road noise pavement, noise barriers, at-property treatments and the project design.	Construction
Operational noise performance	NV13	Potential operational noise performance of the project based on the detailed design will be assessed in accordance with NSW Road Noise Policy (DECCW 2011) and appropriate management measures will be confirmed and implemented.	Construction
	NV14	Within 12 months of the commencement of the operation of the project, actual operational noise performance will be compared to predicted operational noise performance. The need for any additional management measures to address any identified operational performance issues and meet relevant operational noise criteria will be assessed and implemented where reasonable and feasible.	Operation
Human health			

Impact	Ref #	Environmental management measure	Timing
Management measures to minimise impacts on human health during construction and operation of the project are provided in the following sections of this table:			
<ul style="list-style-type: none"> • Traffic and transport • Air quality • Noise and vibration • Land use and property • Social and economic. 			
Land use and property			
Acquisition of property required for the project	PL1	Land acquisition for the project will be undertaken in accordance with the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> (NSW) and the <i>Roads and Maritime Services Land Acquisition Information Guide</i> (Roads and Maritime 2014) and the land acquisition reforms announced by the NSW Government in 2016.	Construction
Impacts on property access	PL2	Access to all properties will be maintained during construction, where feasible and reasonable, unless otherwise agreed by the relevant property owner or occupier. Any access physically affected by the project will be reinstated to at least an equivalent standard, unless agreed with by the property owner. The requirement for temporary changes to property access will be minimised during development of the detailed construction methodology. Affected landowners will be consulted when temporary, short-term changes to access to their property will occur. This will include advanced notification of relevant project schedules, construction works and changes to access arrangements.	Construction
Uncertain future land use	PL3	A Residual Land Management Plan will be prepared in consultation with relevant local councils and other key stakeholders. The plan will: <ul style="list-style-type: none"> • Identify and illustrate all remaining project land following construction of the project, including the physical location, land use characteristics, size and adjacent land uses • Identify feasible uses for remaining project land including justification for the selected use • Identify timeframes for implementation of the actions in relation to the identified feasible uses. 	Construction
Overshadowing of residential properties	PL4	Existing residential properties (and approved residential developments approved prior to project approval) that are affected by overshadowing from the final detailed design of the project (including any noise mitigation measures) are to receive a minimum of three hours of direct sunlight in habitable rooms and in at least 50 per cent of the principal private open space area between 9.00 am and 3.00 pm on 21 June. Such properties must be identified for further consideration by the Proponent in a Solar Access and Overshadowing Report which addresses compliance with these requirements: <ul style="list-style-type: none"> • Where existing residential development currently receives less than the required amount of solar 	Construction

Impact	Ref #	Environmental management measure	Timing																				
		access, existing access to sunlight during operation should not be unreasonably reduced <ul style="list-style-type: none"> Where affected properties include dwellings held under strata or community title, these requirements must be interpreted in relation to individual units within those properties. 																					
	PL5	Detailed design of the ventilation facility building at the Iron Cove Link motorway operations complex (MOC4) will include consideration of treatments to minimise overshadowing on properties south of Victoria Road. This may include reducing the height of the building and/or increasing building setbacks or recessing the building.	Construction																				
Ground settlement	PL6	Ground settlement will be managed to comply with the following criteria where possible: <table border="1" data-bbox="642 528 1762 1018"> <thead> <tr> <th data-bbox="642 528 1041 608">Beneath structure/facility</th> <th data-bbox="1041 528 1245 608">Maximum settlement</th> <th data-bbox="1245 528 1496 608">Maximum angular distortion</th> <th data-bbox="1496 528 1762 608">Limiting tensile strain (per cent)*</th> </tr> </thead> <tbody> <tr> <td data-bbox="642 608 1041 762">Buildings – Low or non-sensitive properties (ie less than or equal to two levels and carparks)</td> <td data-bbox="1041 608 1245 762">30 mm</td> <td data-bbox="1245 608 1496 762">1 in 350</td> <td data-bbox="1496 608 1762 762">0.1</td> </tr> <tr> <td data-bbox="642 762 1041 917">Buildings – High or sensitive properties (ie greater than or equal to 3 levels and carparks)</td> <td data-bbox="1041 762 1245 917">20 mm</td> <td data-bbox="1245 762 1496 917">1 in 500</td> <td data-bbox="1496 762 1762 917">0.1</td> </tr> <tr> <td data-bbox="642 917 1041 970">Roads and parking areas</td> <td data-bbox="1041 917 1245 970">40 mm</td> <td data-bbox="1245 917 1496 970">1 in 250</td> <td data-bbox="1496 917 1762 970">N/A</td> </tr> <tr> <td data-bbox="642 970 1041 1018">Parks</td> <td data-bbox="1041 970 1245 1018">50 mm</td> <td data-bbox="1245 970 1496 1018">1 in 250</td> <td data-bbox="1496 970 1762 1018">N/A</td> </tr> </tbody> </table> <p>* As defined in Burland et al. ‘Building response to tunnelling – Case Studies from construction of the Jubilee Line Extension’, London, Thomas Telford (2001)</p>	Beneath structure/facility	Maximum settlement	Maximum angular distortion	Limiting tensile strain (per cent)*	Buildings – Low or non-sensitive properties (ie less than or equal to two levels and carparks)	30 mm	1 in 350	0.1	Buildings – High or sensitive properties (ie greater than or equal to 3 levels and carparks)	20 mm	1 in 500	0.1	Roads and parking areas	40 mm	1 in 250	N/A	Parks	50 mm	1 in 250	N/A	Construction and operation
Beneath structure/facility	Maximum settlement	Maximum angular distortion	Limiting tensile strain (per cent)*																				
Buildings – Low or non-sensitive properties (ie less than or equal to two levels and carparks)	30 mm	1 in 350	0.1																				
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Roads and parking areas	40 mm	1 in 250	N/A																				
Parks	50 mm	1 in 250	N/A																				
	PL7	Further assessment of potential settlement impacts, including numerical modelling, will be undertaken during detailed design. In areas where ground movement in excess of settlement criteria are is predicted, an instrumentation and monitoring program to measure settlement, distortion or strain will be implemented. feasible Feasible and reasonable measures will be investigated and implemented to ensure where possible that the predicted settlement is within the criteria. Measures that will be considered may include (but are not limited to): <ul style="list-style-type: none"> Review of the proposed tunnel design including: <ul style="list-style-type: none"> the depth and alignment of tunnels the proximity of multiple tunnels to each other 	Construction																				

Impact	Ref #	Environmental management measure	Timing
		<ul style="list-style-type: none"> – the proposed tunnel support system – the tunnel lining to manage groundwater inflows • Rationalising the layout of the proposed ventilation tunnels including the number, location and length of tunnels • Review of the proposed construction methodology • Consideration of ground improvement options. 	
	PL8	<p>A Settlement Monitoring Plan Program will be prepared that will provide details on:</p> <ul style="list-style-type: none"> • Settlement criteria and predictions • Location of monitoring points • Duration of monitoring • Data collection and review (type and method) • Comparison of actual settlement with predictions • Triggers and corrective actions that will be implemented if, based on monitoring results, actual settlement is likely to exceed predictions or the relevant criteria, with the aim of complying with the criteria. <p>The Settlement Monitoring Program will be endorsed the Independent Property Impact Assessment Panel (see PL11) prior to the commencement of any construction activities with the potential to result in settlement, as determined by the panel, unless otherwise agreed to by the Secretary.</p>	Construction
	PL9	<p>Settlement monitoring will be carried out for the period in accordance with the Settlement Monitoring Plan for the period program starting prior to commencement of tunnel construction through to until all settlement has stabilised following completion of tunnel construction. The results of settlement monitoring will be compared to predicted settlement. The implementation and adequacy of the Settlement Monitoring Program will be monitored by the Independent Property Impact Assessment Panel Where actual settlement is greater than predicted settlement, the assessment and the proposed measures to reduce settlement will be reviewed. The revised measures will be implemented to ensure that settlement does not exceed the criteria.</p>	Construction and operation
	PL10	<p>Building condition surveys will be offered to property owners within the zone of influence of tunnel settlement (50 metres from the outer edge of the tunnels and within 50 metres of surface works) or as otherwise directed by the Independent Property Impact Assessment Panel (see PL11). Building condition surveys of properties will be carried out prior to the commencement of any project works in the vicinity that have the potential to result in damage to the properties, as identified by the contractor and confirmed by the Independent Property Impact Assessment</p>	Construction

Impact	Ref #	Environmental management measure	Timing
		Panel. Building condition surveys will be carried out by a structural engineer within 50 metres from the edges of the tunnels and ramps). In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified.	
	PL13 (new)	In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified. Any disputes between a property or infrastructure owners regarding damage and rectification will be referred to the Independent Property Impact Assessment Panel (see PL11) for resolution.	Construction
	PL11	An Independent Property Impact Assessment Panel comprising geotechnical and engineering experts, will be established prior to the commencement of works with the potential to result in ground movement and settlement or damage due to vibration . The panel will be responsible for: <ul style="list-style-type: none"> Independently reviewing the verifying building condition survey reports process and checking that reports are adequate to assist with any property damage disputes Resolving any property damage disputes Endorsing the Settlement Management Program and monitoring its implementation and ongoing adequacyEstablishing on-going settlement monitoring requirements. The panel will include at least one specialist with experience with ground movement and settlement due to excavations.	Construction
	PL12	Interface agreements will be entered into with the owners of infrastructure and utility services likely to be impacted by construction of the project. The agreements will likely identify: <ul style="list-style-type: none"> Minimum separation distances and appropriate settlement criteria for utility infrastructure Settlement monitoring requirements during construction Contingency actions in the event that settlement limits are exceeded. 	Construction
Impact to utilities and from utility works	PL14 (New)	The Utilities Management Strategy (Appendix F of the EIS) will be implemented.	Construction
Urban design and visual amenity			
Urban design of project infrastructure	UD1	Prepare an Urban Design and Landscape Plans Plan (UDLPs) for operational project infrastructure including final landscape permanent built works and architectural design-landscaping in consultation with relevant councils, stakeholders and the community. The construction of permanent built works will not commence until the element is included in a suitably prepared and approved UDLP, unless otherwise agreed to by the Secretary.	Construction
	UD5 (new)	Establish an Urban Design Review Panel to provide advice and input into the development of the UDLP and associated sub-plans. Where an UDLP is required to address heritage matters,	Construction

Impact	Ref #	Environmental management measure	Timing
		the panel will include an independent heritage architect.	
Potential for crime at or near construction ancillary facilities	UD2	Specific design measures at construction ancillary facilities will be identified and implemented to prevent crime, based on principles of Crime Prevention Through Environmental Design (CPTED), will be identified and implemented at each facility prior to the commencement of facility operation.	Construction
Potential for crime at or near operational infrastructure	UD3	Specific design measures at surface operational infrastructure will be identified and implemented to prevent crime, based on principles of CPTED, will be identified and implemented at each facility prior to the commencement of facility operation.	Construction
Disorientation while navigating project operational infrastructure	UD4	Wayfinding signage for the road infrastructure will be developed to the satisfaction of Roads and Maritime. Consultation will occur with the relevant local council regarding road signs for council roads. Signage for road infrastructure will be installed prior to the commencement of operation. As part of the project UDLPs, wayfinding for the project will be developed and installed in accordance with relevant Roads and Maritime endorsed guidelines.	Construction
General impacts to landscape and visual amenity	LV1	Ancillary facilities, including the locations of visible structures and plant and perimeter fencing and treatments, will be developed to minimise visual impacts for adjacent receivers where feasible and reasonable. Measures to minimise visual impacts for adjacent receivers will be implemented progressively during the site establishment phase.	Construction
	LV2	Site lighting will be designed to minimise glare issues and light spillage in adjoining properties and will be generally consistent with the requirements of Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting.	Construction
	LV3	Regular maintenance of site hoarding and perimeter site areas should be undertaken, including the prompt removal of graffiti and litter.	Construction
	LV4	Construction worksites and construction ancillary facilities will be established in such a manner as to minimise the need to remove screening vegetation wherever practicable.	Construction
	LV5	Hoardings and temporary noise walls will be erected as early as possible within the site establishment phase to provide visual screening.	Construction
	LV6	Acoustic sheds will be designed to be visually recessive and minimise potential overshadowing impacts where possible.	Construction
	LV7	Where necessary, construction lighting will comply with the requirements of the Civil Aviation Safety Authority (CASA) and Sydney Airport at all times.	Construction
	LV8	Visible elements of operational facilities will be designed to satisfy functional requirements and adopt the design principles detailed in the M4-M5 Link Urban Design Report. The proposed designs will be documented in the relevant UDLP for the project.	Construction

Impact	Ref #	Environmental management measure	Timing
	LV9	The slopes of vegetated batters that form part of the final urban design and landscaping solution will be limited to no more than 1:4 where possible in order to maximise the impact of vegetation on these batters and minimise maintenance.	Construction
	LV10	Where construction ancillary facilities are located in close proximity to sensitive residential receivers such as residents and users of recreational space, high quality fencing suitable for parks and public spaces should be considered.	Construction
Impacts to visual amenity as a result of the Darley Road motorway operations complex	LV11	Investigate options for planting of vegetation to screen residents on the southern side of Darley Road from the Darley Road motorway operations complex. Include feasible and reasonable measures in the relevant UDLP.	Construction
	LV12	Architectural design and detailing of the water treatment facility, substation and front fencing should achieve articulation, visual interest, and integrate with the streetscape.	Construction
Impacts to visual amenity at the Rozelle interchange	LV13	Integrate the new open space at Rozelle with the Lilyfield Road streetscape through considered street tree planting and associated landscape works in accordance with Austroads guidelines.	Construction
	LV14	Implement urban design and landscape measures that allow permeable views between the City West Link carriageway and the new open space to provide a sense of openness and connection with the open space for motorists and the community.	Construction
	LV15	Investigate measures to minimise view impacts of the project to sensitive residential receptors in the vicinity of the Rozelle Rail Yards as described in this assessment and include in the relevant UDLP where reasonable and feasible.	Construction
	LV16	Develop a design that aims to incorporate the ventilation outlets at the Rozelle Rail Yards as an integral component of the larger open space composition, with reference and consideration to the Ventilation Facility Design Review (Annexure 2 of Appendix L (Technical working paper: Urban design)).	Construction
	LV17	Consult with UrbanGrowth NSW regarding the interface between the project footprint and the White Bay Power Station precinct. Design the interface to ensure optimise compatibility between the two areas from a landscaping, visual, heritage and active transport connectivity perspective.	Construction
	LV18	Investigate measures options to retain the mature trees of high retention value adjacent to the light rail corridor at the corner of The Crescent and City West Link and to or provide screen planting alongside the retaining wall edge of the light rail corridor, to minimise landscape and visual impacts. Implement options where feasible and reasonable with consideration of site constraints.	Construction
Impacts to visual amenity at Iron Cove Link	LV19	Investigate vegetative and other screening measures along Victoria Road to improve the visual amenity of the streetscape and reduce impacts associated with the ventilation outlet and increased glare from the portals to residential dwellings to the north of Victoria Road. Reasonable and feasible	Construction

Impact	Ref #	Environmental management measure	Timing
		landscaping measures will be included in the relevant UDLP.	
	LV20	Provide a well-articulated, integrated car parking and landscape design for the bioretention facility in Manning Street that is place sensitive, and enhances the interface between the project and both King George Park and adjacent residences.	Construction
Impacts to visual amenity at St Peters interchange	LV21	The UDLP sub-plan for the area adjoining Campbell Road motorway operations complex is to be consistent with the New M5 St Peters Interchange Recreational Area Sub-plan UDLP at St Peters.	Construction
Visual amenity impacts associated with design of ventilation outlets at Rozelle, Iron Cove Link and St Peters	LV22	Investigate measures during detailed design to reduce the height, bulk, scale and enhance the landscape setting of the ventilation outlets, subject to achieving desired ventilation outcomes, and in accordance with the design principles detailed in the M4-M5 Link Urban Design Report.	Construction
Social and economic			
Impacts on businesses	SE1	A Business Management Plan will be prepared and will include: <ul style="list-style-type: none"> • Identification of businesses that have the potential to be adversely affected by construction activities that will occur as part of the project • Management measures that will be implemented to maintain appropriate vehicular and pedestrian access to businesses and business clusters during business hours and to maintain visibility of the businesses and communicate access to arrangements to potential customers during construction, including alternative arrangements for times when access and visibility cannot be maintained. These will be determined in consultation with the owners of the identified businesses. 	Construction
Changes to community access and connectivity	SE2	A Community Communication Strategy will be prepared that details: <ul style="list-style-type: none"> • Procedures and mechanisms that will be implemented in response to the key social impacts identified for the project • Property acquisition support services that will be provided • Procedures and mechanisms to communicate to project stakeholders (including affected communities), the access and connectivity enhancements and new community and social facilities that will be delivered as part of the project through the Social Infrastructure Plan and to update stakeholders on delivery progress • Procedures and mechanisms that will be used to engage with affected business owners to identify potential access, parking, business visibility and other impacts to develop measures to address potential impacts on a case by case basis. 	Construction
Property acquisition	SE3	Property acquisition will continue to be undertaken in accordance with the <i>Roads and Maritime Services Land Acquisition Information Guide</i> (Roads and Maritime 2014), the <i>Land Acquisition (Just</i>	Construction

Impact	Ref #	Environmental management measure	Timing
		<i>Terms Compensation) Act 1991</i> (NSW) and the land acquisition reforms announced by the NSW Government in 2016 (NSW Government 2016). A property acquisition factsheet that outlines the process and provides further information for concerned residents will continue to be made available online and in hard copy at project information centres.	
	SE4	Affected households will continue to have access to a counselling service that assists people through the property acquisition process.	Construction
	SE5	An independent service will continue to be provided to vulnerable households (eg elderly, those suffering an illness) to assist with relocation. Assistance could include finding a suitable house for relocation, arranging removalists, disconnecting services and attending appointments with solicitors or other representatives.	Construction
	SE6	A community relations support toll-free telephone line will be operated to respond to any community concerns or requests for translation services.	Construction
Impacts on social infrastructure and facilities	OSE8	<p>A Social Infrastructure Plan will be prepared that details:</p> <ul style="list-style-type: none"> Measures that will be delivered as part of the project to improve community connectivity in areas affected by the project, including pedestrian and cyclist access Community and social facilities, for example open space, that will be delivered or enhanced as part of the project Community initiatives and programs that will receive support as part of the project, including the manner in which support will be provided. <p>The Social Infrastructure Plan will be prepared by a suitably qualified and experienced person in consultation with the community and relevant councils and implemented as part of the project.</p>	Construction and operation
Soil and water quality			
Impacts on surface water quality	SW01	A Construction Soil and Water Management Plan (CSWMP) will be prepared for the project. The plan will include the measures that will be implemented to manage and monitor potential surface water quality impacts during construction. The CSWMP will be developed in accordance with the principles and requirements in <i>Managing Urban Stormwater – Soils and Construction, Volume 1</i> (Landcom 2004) and Volume 2D (NSW Department of Environment, Climate Change and Water 2008), commonly referred to as the 'Blue Book'.	Construction
	SW02	A program to monitor potential surface water quality impacts due to the project will be developed and included in the CSWMP. The program will include the water quality monitoring parameters and the monitoring locations identified in Annexure E of Appendix Q (Technical working paper: Surface water and flooding) to the EIS where appropriate. The monitoring program will commence prior to any ground disturbance to establish appropriate baseline conditions and continue for the duration of construction	Construction

Impact	Ref #	Environmental management measure	Timing
		and , as well as for a minimum of three years following the completion of construction or until the affected waterways are as certified by a suitably qualified and experienced independent expert as being rehabilitated to an acceptable condition as certified by a suitably qualified and experienced independent expert (or as otherwise required by any project conditions of approval). Further details to be included in the program are outlined in Appendix Q (Technical working paper: Surface water and flooding) of the EIS.	
Sedimentation of waterways	SW03	Erosion and Sediment Control Plans (ESCPs) will be prepared for all work sites in accordance with the Blue Book. ESCPs will be implemented in advance of site disturbance and will be updated as required as the work progresses and the sites change.	Construction
	SW04	A soil conservation specialist will be engaged for the duration of construction to provide advice regarding erosion and sediment control.	Construction
	SW05	The extent of ground disturbance and exposed soil will be minimised to the greatest extent practicable to minimise the potential for erosion.	Construction
	SW06	Disturbed ground and exposed soils will be temporarily stabilised prior to extended periods of site inactivity to minimise the potential for erosion.	Construction
	SW07	Disturbed ground and exposed soils will be permanently stabilised and proposed landscaped areas will be suitably profiled and vegetated as soon as possible following disturbance to minimise the potential erosion.	Construction
Impacts on the form and aquatic habitat of Whites Creek	SW08	The proposed bridge crossing over and widening of Whites Creek, including all associated temporary and permanent infrastructure, will be designed and constructed in a manner consistent with: <ul style="list-style-type: none"> • <i>Controlled Activities on Waterfront Land, Guidelines for watercourse crossings on waterfront land</i> (NSW Department of Primary Industries (DPI) 2012) • <i>Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (Fairfull and Witheridge 2003) • <i>Policy and Guidelines for Fish Friendly Waterway Crossings</i> (NSW Fisheries February 2004) • <i>Policy and Guidelines for Fish Habitat Conservation and Management Update 2013</i> (DPI-Fisheries 2013). Appropriate fish passage will be provided for crossings of fish habitat streams.	Construction
	SW09	Consultation will be undertaken with Sydney Water regarding the timing of the works at Whites Creek and compatibility of the proposed design and Sydney Water's naturalisation works.	Construction
Impacts on water quality from the discharge of	SW10	Temporary construction water treatment plants will be designed and managed so that treated water will be of suitable quality for discharge to the receiving environment. The level of treatment provided will	Construction

Impact	Ref #	Environmental management measure	Timing
treated wastewater during construction		<p>consider the characteristics of the waterbody, any operational constraints or practicalities and associated environmental impacts and be developed in accordance with ANZECC (2000) and with consideration to the relevant NSW Water Quality Objectives (WQOs) and Protection of the Environment Operations Act 1997 (NSW).</p> <p>An ANZECC (2000) species protection level of 90 per cent is considered appropriate for adoption as discharge criteria for toxicants where practical and feasible. The discharge criteria for the treatment facilities will be included in the CSWMP.</p>	
Impacts on water quality from disturbance of acid sulfate soils	SW11	Procedures, prepared in accordance with the requirements of the <i>Acid Sulfate Soil Manual</i> (Acid Sulfate Soil Management Advisory Committee 1998), will be included in the CSWMP and implemented in the event that acid sulfate soils, rocks or monosulfidic black oozes are encountered during construction of the project.	Construction
Impacts Operational impacts on surface water quality	OSW12	Stormwater from the project during operation will be treated prior to discharge. Where space is available, bioretention systems or constructed wetlands will be installed. Where space is not available, other smaller devices, such as proprietary stormwater treatment devices, will be installed. The final design of treatments will be supported by MUSIC modelling and water sensitive urban design principles.	Construction and operation
	OSW13	Maintenance requirements for all stormwater treatment systems and devices installed as part of the project will be identified and included in relevant operational maintenance schedules/systems.	Construction and operation
	OSW14	Spill containment will be provided on the motorway. Spill management and emergency response procedures will be documented in the Operation Environmental Management Plan (OEMP) and/or Emergency Response Plan.	Construction and operation
	OSW15	The constructed wetland at the Rozelle interchange will be appropriately designed considering Water Sensitive Urban Design Principles to cater for the continuous release flow of treated groundwater from the water treatment plant and onsite stormwater flows and lined to prevent potential interaction with groundwater.	Construction and operation
	OSW16	<p>The operational water treatment facilities will be designed and managed such that effluent will be of suitable quality for discharge to the receiving environment. Opportunities to incorporate nutrient treatment within the plant at Darley Road will be investigated during detailed design.</p> <p>Discharge criteria will be developed in accordance with the ANZECC (2000) and relevant NSW WQOs, including the following discharge criteria:</p> <ul style="list-style-type: none"> 0.3 milligrams per litre for iron 	Construction and operation

Impact	Ref #	Environmental management measure	Timing
		<ul style="list-style-type: none"> 4.81.9 milligrams per litre for manganese. <p>The discharge criteria for the treatment facilities will be nominated during detailed design in consultation with relevant stakeholders and included in the OEMP.</p>	
Sedimentation or scouring effects at operational discharge locations	OSW17	New discharge outlets will be designed with appropriate energy dissipation and scour protection measures as required to minimise the potential for sediment disturbance and resuspension in the receiving waters. Outlet design and energy dissipation/scour protection measures will be informed by drainage modelling.	Construction
	OSW18	Existing drainage outlets that will be subject to increased inflow from the project will be assessed. If necessary, energy dissipation or scour protection will be added to prevent sediment disturbance and resuspension in receiving waters.	Construction
Contamination			
Impacts on human and/or ecological Impacts on site workers and/or local community through receptors through disturbance and mobilisation of contaminated material	CM01	<p>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 <i>Contaminated Land Management Act 1997</i> (NSW) (CLM Act).</p> <p>This includes further investigations in areas of potential contamination identified in the project footprint. If contamination posing a risk to human or ecological receptors is identified, a Remediation Action Plan will be prepared.</p>	Construction
	CM02	Asbestos handling and management will be undertaken in accordance with an Asbestos Management Plan (or similar) prepared in accordance with relevant legislation, regulations and codes of practice) as part of the Work Health and Safety Plan as described in Chapter 23 (Resource use and waste minimisation) of the EIS.	Construction
	CM03	A hazardous materials assessment will be carried out prior to and during the demolition of buildings. Demolition works will be undertaken in accordance with the relevant Australian Standards and relevant NSW WorkCover Codes of Practice, including the Work Health and Safety Regulation 2011 (NSW).	Construction
	CM04	The Construction Waste Management Plan for the project, prepared as described in Chapter 23 (Resource use and waste minimisation) of the EIS , will include procedures for handling and storing potentially contaminated substances.	Construction
	CM05	Stockpile management procedures will be implemented to control dust, odour and cross contamination.	Construction
	CM06	The discovery of previously unidentified contaminated material will be managed in accordance with an unexpected contaminated lands discovery procedure, as outlined in the <i>Guideline for the Management</i>	Construction

Impact	Ref #	Environmental management measure	Timing
		<p>of Contamination (Roads and Maritime 2013) and detailed in the CEMP. The procedure will include:</p> <ul style="list-style-type: none"> • Cease work in the vicinity • Initial assessment by an appropriately qualified environmental consultant • Further assessment and management of contamination, if confirmed, in accordance with section 105 of the CLM Act. 	
Impacts on soil and water quality through incorrect handling of hazardous or contaminated material	CM07	A Construction Soil and Water Management Plan will be prepared for the project including procedures to minimise the interaction of stormwater with contaminated land, including acid sulfate soils, and manage potentially contaminated stormwater runoff and acid sulfate soils, as described in Chapter 15 (Soil and water quality) of the EIS.	Construction
	CM08	Measures identified in Chapter 25 (Hazard and risk) of the EIS will be implemented to appropriately store contaminated materials and materials with the potential to cause contamination dangerous goods and reduce the potential for environmental contamination due to spills and leaks.	Construction
Accidental spills during operation	OpCM01	Procedures to address spills, leaks and tunnel washing will be developed as part of an OEMP and implemented during operation of the project.	Operation

Impact	Ref #	Environmental management measure	Timing
Flooding and drainage			
Impacts on flood behaviour from construction and operation	FD01	<p>A Flood Mitigation Strategy (FMS) will be prepared by a suitably qualified and experienced person in consultation with directly affected landowners, DPI-Water, NSW Office of Environment and Heritage (OEH), State Emergency Services (SES), Sydney Water and the relevant local councils. It will include but not be limited to:</p> <ul style="list-style-type: none"> • Identification of flood risks to the project and adjoining areas, including consideration of local drainage catchment assessments and climate change implications on rainfall, drainage and tidal characteristics • Identification of design and mitigation measures to protect proposed operations and not worsen existing flooding characteristics during construction and operation, including soil erosion and scouring • Identification of drainage system upgrades • The 100 year annual recurrence interval (ARI) flood level will be adopted in the assessment of measures which are required to mitigate flood risk to the project, as well as any adverse impacts on surrounding property • Changes in flood behaviour under probable maximum flood (PMF) conditions will also be assessed in order to identify impacts on critical infrastructure and significant changes in flood hazards as a result of the project • Consideration of limiting flooding characteristics to the following levels: <ul style="list-style-type: none"> - A maximum increase in inundation time of one hour in a 100 year ARI rainfall event - No inundation of floor levels which are currently not inundated in a 100 year ARI rainfall event - A maximum increase of 10 mm in inundation at properties where floor levels are currently exceeded in a 100 year ARI rainfall event - A maximum increase of 50 mm in inundation at properties where floor levels will not be exceeded in a 100 year ARI rainfall event - Or else provide alternative flood mitigation solutions consistent with the intent of these limits - Consideration of the EIS documents. 	Construction
	FD02	<p>Hydrologic and hydraulic assessments will be carried out for all temporary project components (including ancillary facilities) and permanent design features that have the potential to affect flood levels in the vicinity of the project.</p> <p>The results of the assessment will inform the preparation of the Flood Mitigation Strategy (FD01) as well as the design development of temporary and permanent works.</p>	Construction

Impact	Ref #	Environmental management measure	Timing
	FD03	Measures developed to manage potential flood impacts, as identified in the Flood Mitigation Strategy, will be incorporated into the design of temporary and permanent project components and construction and operational management systems as relevant.	Construction
	FD04	All entries (portals) into the tunnels will be designed so that they are located above the peak level of the PMF or the 100 year ARI design flood plus 0.50 metres, whichever is greater. The same hydrological standard will be applied to tunnel ancillary facilities such as tunnel ventilation and emergency response facilities, electrical substations and water treatment plants. where the ingress of floodwaters will also have the potential to flood the tunnels.	Construction
	FD05	Bridge crossings over existing waterways and proposed drainage channels will be designed for the underside of bridge structure to be above the peak 100 year ARI design flood level.	Construction
	FD06	The need to maintain flood conveyance will be factored into construction planning associated with the new bridge structure over Whites Creek.	Construction
	FD07	Parts of the site that will be adversely affected by floodwaters, such as tunnel dive shafts, portals and cut and cover sections, will be protected from floodwater ingress during construction. The flood level adopted for design of temporary protection will be informed by consideration of both mainstream and local overland flows, the potential risk to the environment, safety and the potential disruption and damage to project works.	Construction
	FD08	The Pymont Bridge Road tunnel site (C9) will be designed with consideration of and to appropriately manage the existing surface water flow path on Bignell Road-Lane .	Construction
	FD09	The permanent surface water conveyance solution within the Rozelle Rail Yards will be implemented as soon as possible.	Construction
	FD10	Flood contingency measures will be prepared and implemented where construction ancillary facilities and vulnerable temporary facilities (including fuel storages, water treatment plants and substations) are located in the 20 year ARI design flood extent.	Construction
Impacts on stormwater drainage systems	FD11	Further hydrological and hydraulic modelling based on the detailed design will be undertaken to determine the ability of the receiving drainage systems to effectively convey drainage discharges from the project once operational. The modelling must be undertaken in consultation with the relevant council(s). It will include, but not be limited to: <ul style="list-style-type: none"> • Confirming the location, size and capacity of all receiving drainage systems affected by the operation of the project • Assessing the potential impacts of drainage discharges from the project drainage systems on the 	Construction

Impact	Ref #	Environmental management measure	Timing
		<p>receiving drainage systems</p> <ul style="list-style-type: none"> Identifying all feasible and reasonable mitigation measures to be implemented where drainage from the project is predicted to adversely impact on the receiving drainage systems. 	
	FD12	Where drainage systems are to be upgraded or replaced during the project, existing systems will be left in place and remain operational during the process wherever possible.	Construction
	FD13	Runoff generated from project construction and operational facilities and discharges from water treatment facilities will be managed to mitigate risk of overloading the receiving drainage system.	Construction
	FD14	Entry points to the stormwater used by or immediately downgradient from the project sites will be inspected regularly for blockages and cleaned as required to maintain performance.	Construction
Impacts on flood behaviour from future climate change	FD15	Hydrological and hydraulic assessments of the permanent design will consider the climate change related flood risk to the project and flood impacts from the project, and will confirm requirements for any management measures. The assessment will be undertaken in accordance with the <i>Practical Considerations of Climate Change – Floodplain Risk Management Guideline</i> (DECC 2007).	Construction
Impacts Potential flood impacts on property	FD16	Where peak levels in the 100 year ARI design flood are predicted to increase at any residential, commercial and/or industrial buildings due to construction or operation of the project, a floor level survey will be carried out. If the survey indicates flood impacts in excess of the limits set in FD01, further refinements will be made to the temporary or permanent designs as required to minimise impacts.	Construction
	FD17	<p>A Flood Review Report will be prepared after the first defined flood event affecting the project works for any of the following flood magnitudes – the five year ARI event, 20 year ARI event and 100 year ARI event - to assess the actual flood impact against those predicted in the design reports or as otherwise altered by the FMS. The Flood Review Report(s) must be prepared by an appropriately qualified person(s) and include:</p> <ul style="list-style-type: none"> Identification of the properties and infrastructure affected by flooding during the reportable event A comparison of the actual extent, level, velocity and duration of the flooding event against the impacts predicted in the design reports or as otherwise altered by the FMS Where the actual extent and level of flooding exceeds the predicted level with the consequent effect of adversely impacting of property(ies), structures and infrastructure, identification of the measures to be implemented to reduce future impacts of flooding related to the M4-M5 Link project including the timing and responsibilities for implementation. <p>Flood mitigation measures will be developed in consultation with the affected property, structure and/or</p>	Construction and operation

Impact	Ref #	Environmental management measure	Timing
		infrastructure owners, OEH and the relevant council(s).	
Biodiversity			
Impact on biodiversity values	B1	<p>A Construction Flora and Fauna Management Plan (CFFMP) will be developed and implemented during construction. The CFFMP will include the following:</p> <ul style="list-style-type: none"> • Identification of guidelines relevant to construction, the matters they apply to and what is required to ensure compliance • Pre-disturbance inspection requirements to identify features of biodiversity conservation significance and select appropriate management measures and environmental controls • Management measures and environmental controls to be implemented before and during construction including: <ul style="list-style-type: none"> – An unexpected threatened species finds procedure – Section 3.3.2 Standard precautions and mitigation measures of the <i>Policy and Guidelines for Fish Habitat Conservation and Management Update 2013</i> (DPI-Fisheries 2013) – Tree assessment and management protocols consistent with AS 4970-2009 Protection of trees on development sites – Weed management protocols. <p>The plan will include management measures outlined in Appendix S (Technical paper: Biodiversity) and from any additional assessments carried out during detailed design and project delivery as relevant.</p>	Construction
Disturbance of threatened microbats	B2	<p>Prior to the commencement of any works associated with the modification of the Victoria Road bridge, an inspection will be carried out by a suitably qualified and experienced ecologist to confirm the presence of roosting microbats. If roosting microbats are identified, measures to manage potential impacts will be developed in consultation with an appropriate microbat expert and included in the CFFMP prior to the commencement of any work with the potential to disturb the roosting locations (as confirmed by the microbat expert). The plan will include management measures outlined in Appendix S (Technical paper: Biodiversity assessment report) and from any additional assessments carried out during detailed design and project delivery as relevant</p>	Construction
Aquatic impacts	B3	<p>The proposed road bridge at Whites Creek will be designed with consideration of <i>Policy and Guidelines for Fish Habitat Conservation Update 2013</i> (DPI-Fisheries 2013) and <i>Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (NSW-Fisheries 2003).</p>	Construction
	B4	<p>Site-specific Erosion and Sediment Control Plans (ESCPs) will be prepared for each work location associated with or in the vicinity of waterways and culverts that will be modified as part of the project. The ESCPs will contain measures to stabilise all surfaces disturbed as a result of the project as soon</p>	Construction

Impact	Ref #	Environmental management measure	Timing
		as possible following the disturbance to prevent erosion and to minimise sedimentation in adjacent aquatic environments.	
Loss of trees	B5	The CFFMP will include measures to manage potential impacts on trees. Measures will include: <ul style="list-style-type: none"> • The establishment of tree protection zones • Ground protection measures for trees to be retained. 	Construction
	B6	As many trees as possible will be retained during construction. In the event that tree removal cannot be avoided, a tree replacement strategy will be prepared. Replacement trees will be included in the relevant UDLP. Opportunities for the provision of replacement trees outside the project boundary will be investigated in consultation with local councils. UDLP to be developed and implemented for the project.	Construction
	B7	The CFFMP will include tree management protocols and provision for the development of tree management plans (in accordance with the requirements of AS 4970-2009) where required for specific trees. Protection of trees on development sites will be carried out in consultation with an arborist with a minimum Australian Qualifications Framework (AQF) Level 5 qualification in arboriculture for each tree proposed for retention where works associated with the project have the potential to impact on the tree root zone.	Construction
	B8	Tree removal, pruning and maintenance work will be carried out by an arborist with a minimum AQF Level 3 qualification in accordance with AS 4373-2007 Pruning of Amenity Trees and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998) and advice provided by an arborist with a minimum AQF Level 5 qualification in arboriculture (or equivalent).	Construction
Loss of trees	OB9	A The UDLP will be prepared and implemented to guide the include compensatory planting for trees removed by the project. The plan will include: <ul style="list-style-type: none"> • A tree replacement strategy • Species recommendations for the landscape design to consider, including foraging trees for the Grey-headed Flying-fox • Relevant project specific rehabilitation and revegetation measures associated with the M4 East and New M5 projects, where there is an overlap in use of project footprint. 	Operation
Loss of aquatic habitat	OB10	Consultation will be undertaken with Sydney Water regarding integration of naturalisation works at Whites Creek, including re-establishment of vegetation where possible following construction activities. Vegetation re-establishment will be undertaken in accordance with Guide 3: Re-establishment of native vegetation of the <i>Biodiversity Guidelines: Protecting and Management Biodiversity on RTA Projects</i>	Operation

Impact	Ref #	Environmental management measure	Timing
		(NSW Roads and Traffic Authority 2011).	
Groundwater			
High groundwater inflows in excess of the one litre per second per kilometre design criterion, which will cause significant groundwater inflows and groundwater drawdown	GW1	Groundwater inflows within the tunnels will be minimised by designing the final tunnel alignment to minimise intersections with known palaeochannels and alluvium present in the project footprint.	Construction
	GW2	Appropriate waterproofing measures will be identified and included in the detailed design to permanently, where reasonable and feasible , reduce the inflow into the tunnels to below one litre per second per kilometre for any kilometre length of the tunnel.	Construction
	GW3	Appropriate measures will be investigated and implemented at dive structures and shafts and for cut-and-cover sections of the tunnel to minimise groundwater inflow.	Construction
	GW9 (new)	Further investigations will be carried out to identify areas where groundwater inflows to the tunnels are likely to be elevated, to guide the development of the detailed design and construction methodology. The investigations will be carried out prior to the commencement of excavations with the potential to result in groundwater inflow at each identified location.	Construction
Corrosion of building materials by sulfate reducing bacteria	GW4	Further assessment of the risk posed by the presence of sulfate reducing bacteria and groundwater aggressivity will be undertaken prior to construction. A corrosion assessment will be undertaken by the construction contractor to assess the impact on building materials that may be used in the tunnel infrastructure such as concrete, steel, aluminium, stainless steel, galvanised steel and polyester resin anchors. The outcomes of the corrosion assessment will be considered when selecting building materials likely to encounter groundwater.	Construction
Groundwater drawdown impacting a water supply well water level by more than two metres	GW5	In accordance with the Aquifer Interference Policy (DPI-Water 2012), measures will be taken to 'make good' the impact on an impacted water supply bore by restoring the water supply to pre-development levels. The measures taken will be dependent upon the location of the impacted bore but could include, for example, deepening the bore, providing a new bore or providing an alternative water supply.	Construction
Alteration of groundwater flows and levels due to the installation of subsurface project components	GW6	Potential impacts associated with subsurface components of the project intercepting and altering groundwater flows and levels will be considered during detailed design. Measures to reduce potential impacts will be identified and included in the detailed construction methodology and the detailed design as relevant.	Construction
Actual groundwater inflows and drawdown in adjacent areas exceed expectations	GW7	A detailed groundwater model will be developed by the construction contractor during detailed design . The model will be used to predict groundwater inflow rates and volumes within the tunnels and groundwater levels (including drawdown) in adjacent areas during construction and operation of the project.	Construction

Impact	Ref #	Environmental management measure	Timing
	GW8	Groundwater inflow within and groundwater levels in the vicinity of the tunnels will be monitored during construction and compared to model predictions and groundwater performance criteria applied to the project. The groundwater model will be updated based on the results of the monitoring as required and proposed management measures to minimise potential groundwater impacts adjusted accordingly to ensure that groundwater inflow performance criteria are met.	Operation
Impacts on groundwater quality or groundwater levels	OGW9	<p>A groundwater monitoring program will be prepared and implemented to monitor groundwater inflows in the tunnels and groundwater levels as well as groundwater quality in the three main aquifers and inflows during construction.</p> <p>The program will identify groundwater monitoring locations, performance criteria in relation to groundwater inflow and levels and potential remedial actions that will be considered to address any non-compliances with performance criteria. As a minimum, the program will include manual groundwater level and quality monitoring monthly and inflow volumes and quality weekly.</p> <p>The monitoring program will be developed in consultation with the NSW EPA, DPI-Fisheries, DPI-Water, City of Sydney Council and Inner West Council.</p>	Operation Construction
	OGW10	<p>The groundwater monitoring program prepared and implemented during construction will be augmented and continued during the operational phase. Groundwater will be monitored during the operations phase for three years or as otherwise required by the project conditions of approval and will include trigger levels for response or remedial action based on monitoring results and relevant performance criteria.</p> <p>At least three monitoring wells and vibrating wire piezometers (VWPs) should be constructed as close as possible to the tunnel centrelines to allow for the comparison of pore pressures and standing water levels. The wells could be constructed about 5-10 metres above the top of the tunnel crown to allow for groundwater drawdown monitoring in the Hawkesbury Sandstone.</p> <p>The program will include procedures for monitoring and reporting of extracted groundwater volumes to DPI-Water annually for the duration of construction and operation, unless otherwise agreed to or directed by the Secretary. The operational groundwater monitoring program will be developed in consultation with the NSW EPA, DPI-Fisheries, DPI-Water and the Inner West and City of Sydney relevant councils and documented in the OEMP or EMS.</p>	Operation
Corrosive groundwater could adversely impact the tunnel and associated infrastructure	OGW11	Where the corrosion assessment that will be carried out prior to construction indicates potential issues, corrosion and other associated impacts of highly aggressive groundwater on the tunnel infrastructure will be monitored during operations. The monitoring program will be documented in the OEMP or EMS. Corroded or otherwise impacted infrastructure will be repaired or replaced as required to maintain operational integrity of the road infrastructure.	Operation

Impact	Ref #	Environmental management measure	Timing
Groundwater drawdown due to the project may exceed two metres in registered bores or at other receptors	OGW12	In accordance with the <i>NSW Aquifer Interference Policy</i> (DPI-Water 2012), measures will be taken to 'make good' the impact on an impacted water supply bore by restoring the water supply to pre-development levels. The measures taken will be dependent upon the location of the impacted bore but could include, for example, deepening the bore, providing a new bore or providing an alternative water supply.	Operation
Non-Aboriginal heritage			
General heritage impacts	NAH01	Construction Heritage Management Plan (CHMP) will be prepared and implemented as part of the Construction Environmental Management Plan. The CHMP will include: <ul style="list-style-type: none"> • Measures that will be implemented to manage potential impacts to items of heritage significance • Inclusion of heritage awareness and management training for relevant personnel involved in site works • Details regarding the conservation and curation of any historical artefacts recovered during works. 	Construction
	NAH02	An Interpretation Strategy will be developed and implemented to identify and interpret the key heritage values and stories of the heritage areas affected by the project and inform the development of the Urban Design and Landscape Plan for the project, in accordance with <i>Interpreting Heritage Places and Items Guideline</i> (NSW Heritage Office 2005). The Interpretation Strategy will: <ul style="list-style-type: none"> • Build on themes, stories and initiatives proposed as part of other stages of WestConnex to ensure a consistent approach to heritage interpretation for the project • Include themes and stories including the Rozelle railways historic functions, trains and trams transport, industrialisation and The Rozelle-Darling Harbour Goods Line • Identify how the rail related infrastructure salvaged from the Rozelle Rail Yards will be reused. 	Construction
	NAH03	Photographic archival recording will be undertaken of: <ul style="list-style-type: none"> • Infrastructure associated with the White Bay Power Station site that could be affected by the project. • Whites Creek Stormwater Channel (in the area to be impacted) • Stormwater Canal off Lilyfield Road • 'Cadden Le Messurier' at 84 Lilyfield Road • Former Hotel at 78 Lilyfield Road • Victoria Road overbridge • Each house at 260–266 Victoria Road 	Construction

Impact	Ref #	Environmental management measure	Timing
		<ul style="list-style-type: none"> Each house at 248–250 Victoria Road Former Bank of NSW (164 Parramatta Road). <p>It will be undertaken in accordance with the NSW Heritage Office guidelines <i>Photographic Recording of Heritage Items Using Film or Digital Capture</i> (2006).</p> <p>The photographic archival recording will occur prior to any works that have the potential to impact upon the items and the report development process will include the identification of appropriate stakeholders to receive copies of the documentation.</p>	
	NAH04	<p>As part of the CHMP, a Historical Archaeological Research Design (HARD) will be prepared before the start of proposed works within each of the following Historical Archaeological Management Units (HAMUs): HAMU 3, HAMU 6, HAMU 7, HAMU 9, HAMU 10, and HAMU 11. The HARD will be prepared by a qualified archaeologist in consultation with the NSW Heritage Council and will include:</p> <ul style="list-style-type: none"> Descriptions of clear significance thresholds for possible archaeological items that may be uncovered during works A methodology and scope for a program of archaeological excavation, investigation, and recording of any historical archaeological remains that will be impacted by the project Requirement for post-excavation reporting, including artefact analysis and additional historical research, where necessary, and long term management of records Details of what will happen with any artefacts uncovered and associated reports. 	Construction
	NAH05	<p>Before excavation of archaeological management sites, a suitably qualified Excavation Director who complies with Criteria for Assessment of Excavation Directors (Heritage Council of NSW 2011) will be engaged to advise on matters associated with historic archaeology. Where archaeological excavation is required, the Excavation Director will oversee excavation and advise on archaeological matters.</p>	Construction
Heritage impacts due to vibration	NAH06	<p>Potential vibration impacts to features of heritage significance will be managed in accordance with the CNVMP prepared for the project.</p>	Construction
Heritage impacts due to settlement	NAH07	<p>Potential heritage impacts due to settlement and ground movement caused by the project will be managed in accordance with the relevant measures identified in the land use and property section of this table and monitored in accordance with the Settlement Monitoring Plan Program.</p>	Construction
Impacts to unexpected items of potential heritage conservation significance or human remains	NAH08	<p>Any items of potential heritage conservation significance or human remains discovered during construction will be managed in accordance with an Unexpected Heritage Finds and Humans Remains Procedure developed for the project in accordance with relevant guidance provided by the Heritage Council of NSW, the NSW Heritage Division of OEH and the <i>Standard Management Procedure Unexpected Archaeological Finds</i> (Roads and Maritime 2015a). The procedure will detail requirements</p>	Construction

Impact	Ref #	Environmental management measure	Timing
		regarding notification of relevant agencies and the NSW Police and will be implemented for the duration of construction.	
Loss of heritage where items are required to be demolished	NAH09	A Heritage Salvage Strategy will be prepared to identify the salvage potential of the fabric and features from heritage items and potential heritage items that will be demolished to facilitate the project. This could include timber joinery, fireplaces, stained glass, stairs, decorative tiles, bricks, steel truss structures, windows etc. The strategy will also identify options and a process for dissemination of salvaged items to owners, community groups and interested parties.	Construction
	NAH10	Sandstone kerbing in the vicinity of 32 and 34 Victoria Road, Rozelle that will be removed to facilitate the project will be salvaged and provided to Inner West Council.	Construction
Potential impact to White Bay Power Station	NAH11	The potential for impacts to the railway cutting on the eastern side of Victoria Road, associated with the White Bay Power Station, will be considered during the development of the detailed design for the realigned Victoria Road and associated bridge. The final design will seek to avoid impact to the railway cutting and maintain the visual relationship between the cutting and the White Bay Power Station site. Landscaping sympathetic to the relationship, developed in consultation with a heritage specialist, will be included in the UDLP for the project.	Construction
	NAH12	A condition assessment of the southern penstock (and its associated water channels) will be carried out by a heritage specialist and a structural engineer prior to any works in the vicinity with the potential impact upon the item. If required any conservation works required to limit potential impacts on deteriorated fabric (loose bricks, corroded steel) will be identified and implemented prior to construction.	Construction
	NAH13	The southern penstock and its associated water channels (location and extent unknown) will be protected during works associated with the reconstruction of the Victoria Road Bridge -bridge.	Construction
	NAH16 (new)	A condition assessment of the northern penstock will also be carried out by a heritage specialist and a structural engineer prior to any vibratory works in the vicinity that have the potential to impact on the item. The condition assessment will inform additional management measures to protect the northern penstock, if required. Any conservation works required to limit potential impacts on deteriorated fabric (loose bricks, corroded steel) will be identified and implemented prior to commencement of the relevant vibratory works in the vicinity.	Construction
Potential impact to Whites Creek Stormwater Channel No 95	NAH14	The new bridge over the Whites Creek Stormwater Channel must not impact the extant significant heritage fabric of the channel and should be a solely independent structure.	Construction
Potential impacts to heritage items at	NAH15	Landscaping, following the construction of the substation, should consider screening the substation and water treatment plant, from the Leichhardt (Charles Street) Underbridge. The design and location	Construction

Impact	Ref #	Environmental management measure	Timing
Leichhardt (Darley Road)		of the landscaping will be informed by a heritage specialist and should seek to create a visual separation between the new structure and the heritage item.	
Aboriginal heritage			
Impacts on unexpected finds of Aboriginal objects	AH1	Any items of potential Aboriginal archaeological or cultural heritage conservation significance or human remains discovered during construction will be managed in accordance with the Unexpected Heritage Finds and Humans Remains Procedure developed for the project.	Construction
Vibration impacts on Aboriginal items	AH2	Subject to gaining access from the relevant landholder, a suitably qualified archaeologist will visit AHIMS site #45-6-2278 prior to the commencement of any vibration intensive construction activities in the vicinity of the site to verify the site to confirm and record its current condition.	Construction
	AH3	If the AHIMS site #45-6-2278 is verified, an assessment will be completed by a suitably qualified and experienced person prior to the commencement of any vibration intensive construction activities in the vicinity. The assessment will consider all vibration intensive activities that will occur in the vicinity, the likely vibration levels and relevant vibration criteria and identify the management measures, including monitoring, that will be implemented to prevent and reduce potential impacts. A final condition assessment will be carried out at the completion of construction detailing recommendations for remediation measures if required.	Construction
Greenhouse Gas			
Emission of greenhouse gases during construction	GHG1	An Energy Efficiency and Greenhouse Gas Emissions Strategy and Management Plan will be prepared for the project as part of the project's Sustainability Management Plan and will be implemented to assist in achieving 'Design' and 'As Built' ratings of Excellent under the Infrastructure Sustainability Council of Australia infrastructure rating tool.	Construction and operation
	GHG2	Undertake an updated greenhouse gas (GHG) assessment based on detailed design for ongoing monitoring and review of emissions during construction.	Construction
	GHG3	Opportunities to use low emission construction materials, such as recycled aggregates in road pavement and surfacing, and cement replacement materials will be investigated and incorporated where feasible and cost-effective.	Construction
	GHG4	Construction plant and equipment will be operated and maintained to maximise efficiency and reduce emissions, with construction planning used to minimise vehicle wait times and idling onsite and machinery turned off when not in use.	Construction
	GHG5	Locally produced goods and services will be procured where feasible and cost effective to reduce transport fuel emissions.	Construction
	GHG6	At least 20 per cent of construction energy (electricity) required for the project will be sourced from renewable energy generated onsite and/or an accredited GreenPower energy supplier, where	Construction

Impact	Ref #	Environmental management measure	Timing
		possible. Six per cent of construction energy (electricity) requirements will be offset, with any offset undertaken in accordance with the Australian Government National Carbon Offset Standard.	
Emission of greenhouse gases during operation	OGHG7	The tunnel will be designed with appropriate vertical alignments and grades to allow vehicles to maintain constant speeds and minimise fuel use to reduce potential greenhouse gas emissions.	Construction and operation
	OGHG8	Energy efficiency will be considered during the design of mechanical and electrical systems such as the tunnel ventilation system, tunnel lighting, water treatment systems and electronic toll and surveillance systems. Energy efficient systems will be installed where reasonable and practicable.	Operation
	OGHG9	At least six per cent of operational energy (electricity) required for the project will be sourced from an accredited GreenPower energy supplier and/or through renewable energy generated onsite. Opportunities for operational energy offset, in accordance with the Australian Government National Carbon Offset Standard, will be considered during detailed design.	Operation
Resource use and waste minimisation			
Resource consumption	RW1	Construction material will be sourced in accordance with the relevant aims of the WestConnex Sustainability Strategy (Sydney Motorway Corporation 2015) and a Sustainability Strategy Management Plan (that will be developed during detailed design), including to optimise resource efficiency and waste management, and the selection of select locally sourced materials and prefabricated assets where possible, to reduce greenhouse gas emissions. Unnecessary resource consumption will be avoided through the detailed design of the project and by making realistic predictions about the required quantities of resources, such as construction materials.	Construction
Waste generation and disposal	RW2	Wastes will be managed and disposed of in accordance with relevant NSW legislation and government policies.	Construction
	RW3	A Construction Waste Management Plan will be prepared as part of the CEMP and regularly updated during detailed design and construction, detailing appropriate procedures for waste management. The plan will include the waste management measures described in this EIS.	Construction
	RW4	Wastes will be managed using the waste hierarchy principles of: <ul style="list-style-type: none"> • Avoidance of unnecessary resource consumption to reduce the quantity of waste being generated • Recovery of resources for reuse on-site or off-site for the same or similar use, without reprocessing • Recovery of resources through recycling and reprocessing so that waste can be processed into a similar non-waste product and reused • Disposal of residual waste. 	Construction
	RW5	Resource recovery will be applied to the management of construction waste and will include: <ul style="list-style-type: none"> • Recovery of resources for reuse – reusable materials generated by the project will be segregated 	Construction

Impact	Ref #	Environmental management measure	Timing
		<p>for reuse on site, or off site where possible, including the reuse of the major waste streams (VENM)</p> <ul style="list-style-type: none"> • Recovery of resources for recycling – recyclable resources (such as metals, plastics and other recyclable materials) generated during construction and demolition • Resources will be segregated for recycling and sent to an appropriate recycling facility for processing • Recovery of resources for reprocessing – cleared vegetation will be mulched or chipped on-site and used for landscaping, in the absence of a higher beneficial use being identified. 	
	RW6	Options identified for the off-site reuse of waste will comply with relevant NSW EPA resource recovery exemptions and requirements.	Construction
	RW7	The Construction Waste Management Plan will document anticipated volumes of spoil that will be generated by the project, spoil storage locations within project sites and likely spoil disposal sites. The Construction Waste Management Plan and spoil reuse opportunities will be regularly reviewed and updated during detailed design and project construction.	Construction
	RW8	The project will reuse or recycle around 95 per cent of uncontaminated spoil generated for beneficial purposes, either within the project or at other locations in accordance with the project spoil management hierarchy.	Construction
	RW9	Suitable areas will be identified to allow for contingency management of unexpected waste materials, including contaminated materials. Suitable areas will be required to be hardstand or lined areas that are appropriately stabilised and bunded, with sufficient area for stockpile storage.	Construction
Exposure to unexpected contaminated land	RW10	The discovery of previously 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 2013) and detailed in the CEMP.	Construction
Dust generation, erosion and sedimentation of stockpiles	RW11	Spoil stockpiles will be provided with appropriate environmental controls and managed to reduce potential impacts associated with dust generation, erosion and sedimentation.	Construction
Generation of general waste	RW12	General wastes from site offices such as putrescibles, paper, cardboard, plastics, glass and printer cartridges will be separated and collected for recycling off-site wherever practicable.	Construction
Exposure to asbestos	RW13	An asbestos survey will be undertaken of buildings to be demolished as part of the project in accordance with an Asbestos Management Plan as part of the Work Health and Safety Plan. The survey will be conducted by a suitably qualified person.	Construction
	RW14	Asbestos handling and management will be undertaken in accordance with an Asbestos Management Plan (or similar) prepared in accordance with relevant legislation, regulations and	Construction

Impact	Ref #	Environmental management measure	Timing
		codes of practice as described in Chapter 23 (Resource use and waste minimisation) of the EIS. Adjacent communities will be provided with advance notification about potential hazards. Asbestos handling and management will be undertaken in accordance with an Asbestos Management Plan as part of the Work Health and Safety Plan and relevant NSW legislation, government policies and Australian Standards. The plan will include prior notification to adjacent communities about potential hazards.	
Waste generation and disposal	OpRW1	The project will be operated in accordance with the relevant aims of the WestConnex Sustainability Strategy (Sydney Motorway Corporation 2015) and a Sustainability Strategy will be developed during detailed design to outline ways to optimise resource efficiency and waste management.	Operation
	OpRW2	Waste will be managed and disposed of in accordance with relevant NSW legislation and government policies and the mitigation measures described in this EIS.	Operation
Wastewater use and discharge	OpRW3	Opportunities to reuse treated groundwater during project operation will be considered in preference to discharge to the stormwater system or receiving waterbodies. This could include irrigation of landscaped areas within the project footprint such as new open spaces at the Rozelle interchange.	Operation
	OpRW4	In order to reduce demand on local water supplies, options will be investigated to provide water for the deluge system from wastewater produced through the tunnel drainage system, where it meets appropriate quality parameters.	Operation
Climate change and risk adaption			
Impacts of climate change	CC1	In the refinement of construction Work Health and Safety Management Plans, consider the increased potential for heat stress among construction personnel and implement measures for greater awareness and education of personnel around health and wellbeing during periods of extreme heat.	Construction
	CC2	This initial climate change risk assessment will inform a detailed climate change risk assessment which will be undertaken during detailed design, in accordance with AS 5334-2013 <i>Climate change adaptation for settlements and infrastructure – A risk based approach</i> . The assessment will identify adaptation measures to address medium, high and extreme risks. The decision to implement adaptation measures for medium risks will also be considered during detailed design.	Construction
	CC3	Adaptation measures will be identified and implemented to address high and extreme climate change risks. Adaptation measures for medium risks will also be considered further during detailed design and implemented where reasonable and feasible.	Construction
	CC4	The impact of climate change on potential flood risks will be considered during development of the detailed design in accordance with relevant guidelines as described in Chapter 17 (Flooding and drainage) and Appendix Q (Technical working paper: Surface water and flooding) of the EIS.	Construction
	CC5	Increased flood risks due to climate change will be considered in the detailed design of drainage	Construction

Impact	Ref #	Environmental management measure	Timing
		systems. Drainage network features will be developed and installed to mitigate potential increased flood risks as described in Chapter 17 (Flooding and drainage) and Appendix Q (Technical working paper: Surface water and flooding) of the EIS.	
	CC6	Potential changes to sea levels due to climate change will be considered during the design of operational water treatment plants that will discharge to waterways. Discharge outlets and relevant water treatment plant features will be designed and constructed accordingly.	Construction
	CC7	Consider the projected increase in the intensity and frequency of extreme rainfall during detailed design, which may lead to exacerbated risk of road incidents. Consider implementation of operational procedures for surface connections to increase safety during extreme rainfall events, such as use of variable speed signs and reduced speed limits.	Construction and operation
Hazard and risk			
Spills and leaks from the storage and transport of dangerous goods and hazardous substances during construction	HR1	Storage of dangerous goods and hazardous materials will occur in accordance with suppliers' instructions and relevant Australian Standards and legislation including the: <ul style="list-style-type: none"> • <i>Work Health and Safety Act 2011</i> (NSW) • Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW 2005) • Environment Protection Manual for Authorised Officers: Bunding and Spill Management, technical bulletin (NSW EPA 1997). Storage methods may include bulk storage tanks, chemical storage cabinets/ containers or impervious bunds.	Construction
	HR2	Secure, bunded areas will be provided around storage areas for oils, fuels and other hazardous liquids. Impervious bunds will be of sufficient capacity to contain at least 110 per cent of the volume of the largest stored container.	Construction
	HR3	Management measures to reduce the potential for spills, reduce potential spill volumes and prevent any contamination will be developed and implemented for activities such as vehicle refuelling, servicing, maintenance, and washdown, where there is a potential for spills and contamination.	Construction
	HR4	Safety Data Sheets for dangerous goods and hazardous substances will be stored on site prior to their arrival.	Construction
	HR5	Transport of dangerous goods and hazardous substances will be conducted in accordance with relevant legislation and codes, including the Dangerous Goods (Road and Rail Transport) Regulation 2014 (NSW) and the Australian Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission 2008).	Construction
	HR6	Construction lighting will be designed and installed in accordance with the design	Construction

Impact	Ref #	Environmental management measure	Timing
		requirements of the Civil Aviation and Safety Authority (CASA) and the Sydney Airport Master Plan 2033 The project will be constructed in accordance with the design requirements of CASA and the Sydney Airport Master Plan 2033, with respect to lighting used during construction.	
Potential impacts from fire and safety incidents during operation	OpHR1	The fire and safety systems and measures adopted for the project will be equivalent to or exceed the fire safety measures recommended by National Fire Protection Association 502 (American), Permanent International Association of Road Congresses (European), AS4825 (Australian) and Roads and Maritime standards.	Construction
	OpHR2	Ongoing consultation will be undertaken with emergency services regarding fire and safety systems and associated measures adopted for the project.	Operation
	OpHR3	The transport of dangerous goods and hazardous substances will be prohibited through the all mainline tunnels and entry and exit ramps associated with the project.	Operation
	OpHR4	An Incident Response Plan will be developed as part of the Emergency Response Plan for the project and implemented in the event of an accident or incident.	Operation
	OpHR5	The response to incidents within the motorway will be managed in accordance with the memorandum of understanding between Roads and Maritime and the NSW Police Service, NSW Rural Fire Service, NSW Fire Brigade and other emergency services.	Operation
Spills and leaks from the storage and transport of dangerous goods and hazardous substances	OpHR6	Storage of dangerous goods and hazardous materials will occur in accordance with suppliers' instructions and relevant Australian Standards and legislation including the: <ul style="list-style-type: none"> • <i>Work Health and Safety Act 2011</i> (NSW) • Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW 2005) • Environment Protection Manual for Authorised Officers: Bunding and Spill Management, technical bulletin (NSW EPA 1997). Storage methods may include bulk storage tanks, chemical storage cabinets/ containers or impervious bunds.	Operation
	OpHR7	Secure, bunded areas will be provided around storage areas for oils, fuels and other hazardous liquids. Impervious bunds will be of sufficient capacity to contain at least 110 per cent of the volume of the largest stored container.	Operation
	OpHR8	Management measures to reduce the potential for spills, reduce potential spill volumes and prevent any contamination will be developed and implemented for activities such as vehicle refuelling, servicing, maintenance or washdown, where there is a potential for spills and contamination.	Operation
	OpHR9	Material Safety Data Sheets for dangerous goods and hazardous substances will be stored on site	Operation

Impact	Ref #	Environmental management measure	Timing
		prior to their arrival.	
Exposure to electric and magnetic fields	OpHR10	The detailed design of the project substations will ensure that the exposure limits for the general public suggested by the Draft Radiation Standard (Australian Radiation Protection and Nuclear Safety Agency 2006) will not be exceeded at the boundary of the substation sites.	Construction
Impacts from air emissions	OpHR11	Should the exhaust plumes at any of the M4-M5 Link ventilation outlets be assessed as a 'controlled activity' under the Airports Act and the Airspace Regulations, then the project will be operated in accordance with any conditions of approval from the Secretary of Department of Infrastructure and Regional Development.	Construction and operation
	OpHR12	Aviation hazard lighting (if required), building lighting and surface road lighting will be designed and operated in accordance with the requirements of CASA and the Sydney Airport Master Plan 2033.	Construction and operation
Cumulative impacts			
Ongoing construction impacts on the local community throughout the construction phase of the M4-M5 Link	C1	<p>The effective management of cumulative impacts on the affected community requires oversight and direction from one overarching body such as a government department/agency or local council</p> <ul style="list-style-type: none"> Multi-party engagement and cooperation is needed to ensure all contributors to impacts are working together to minimise the effects or enhance the benefits of multiple projects occurring concurrently or consecutively Communication strategies across the various projects should be managed to be consistent in their messaging to the community to avoid confusion. <p>Cumulative impacts strategy will be prepared in accordance with the Cumulative impact assessment methodology in Chapter 26 and Appendix C (Cumulative impact assessment methodology) of the EIS. It will include strategies and measures to minimise cumulative impacts on the community and other stakeholders including:</p> <ul style="list-style-type: none"> Identification of key stakeholders and projects Identification of precincts for which separate Cumulative impact plans may be developed and implemented Identification of a co-ordinating body Procedures and mechanisms for co-ordinating consultation and sharing of information, such as works programs and schedules, with other projects Opportunities and measures to work with other projects to minimise the effects of impacts and enhance the benefits of multiple projects occurring concurrently or consecutively Opportunities to co-ordinate community communications across the various projects to provide consistent messaging. 	Construction and operation

Impact	Ref #	Environmental management measure	Timing
	C2	A Community Consultative Committee will be established for the project in accordance with <i>Community Consultative Committee Guidelines</i> (NSW Department of Planning and Environment 2016). The committee will provide a forum for discussion between Roads and Maritime, the construction contractor(s), local community and councils regarding the project, including cumulative impacts.	Construction
Sustainability			
Unsustainable use of resources during the construction and operation of the project	S1	The construction contractor will develop and implement a Sustainability Management Plan during detailed design. The Sustainability Management Plan will establish governance structures, processes and systems that ensure integration of all sustainability considerations (vision, commitments, principles, objectives and targets), initiatives, monitoring and reporting during the detailed design and construction phases of the project.	Construction and operation
	S2 (new)	The project will be designed and constructed to achieve an Excellent 'Design' and 'As built' rating under the Infrastructure Sustainability Council of Australia's Infrastructure Sustainability rating tool.	Construction

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E2 Conclusion and next steps

The NSW Department of Planning and Environment (DP&E) will, on behalf of the NSW Minister for Planning, review the Environmental Impact Statement and this Submissions and preferred infrastructure report for the M4-M5 Link project. Once DP&E has completed its assessment, a draft Environmental Assessment Report will be prepared for the Secretary of DP&E, which may include recommended conditions of approval.

The assessment report will be provided to the NSW Minister for Planning, who will then approve the project (with any conditions considered appropriate) or refuse to give approval to the project.

A copy of the final Submissions and preferred infrastructure report will be made publicly available. The NSW Minister for Planning's determination, including any conditions of approval and the Secretary's Environmental Assessment Report will be published on the DP&E Major Projects website following determination.

E3 References

- Austroroads Road Safety Audit Guide (2nd Edition 2002)
- Australian Government 2016. Smart Cities Plan²
- Australian Standard 5334-2013 *Climate change adaptation for settlements and infrastructure - A risk based approach* (AS 5334-2013)
- Commonwealth of Australia, 2013. *Energy Efficiency Opportunities Program – The First Five Years; 2006-2011 Overview*
- Commonwealth of Australia, 2017. *National Inventory Report 2015 Volume 1*
- NSW Heritage Office guidelines Photographic Recording of Heritage Items Using Film or Digital Capture (2006)
- Research on impacts of connected and Autonomous vehicles (CAV's) on traffic flow Stage 1: Evidence Review, March 2016 (DOT UK 2016a)
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