Part C

Synthesis

20

PART C SYNTHESIS, RISK ANALYSIS AND CONCLUSION

20.0 Synthesis

This chapter provides a synthesis of the findings of the Environmental Impact Statement.

20.1 Overview

Sydney Metro West would involve the construction and operation of a new 24-kilometre metro line with stations confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD). It would also include a stabling and maintenance facility at Clyde and associated aboveground and underground tracks to connect to the tunnels and other operational ancillary infrastructure. A services facility would also be located at Rosehill (within the Clyde stabling and maintenance facility). The main elements of Sydney Metro West are shown on Figure 20-1.

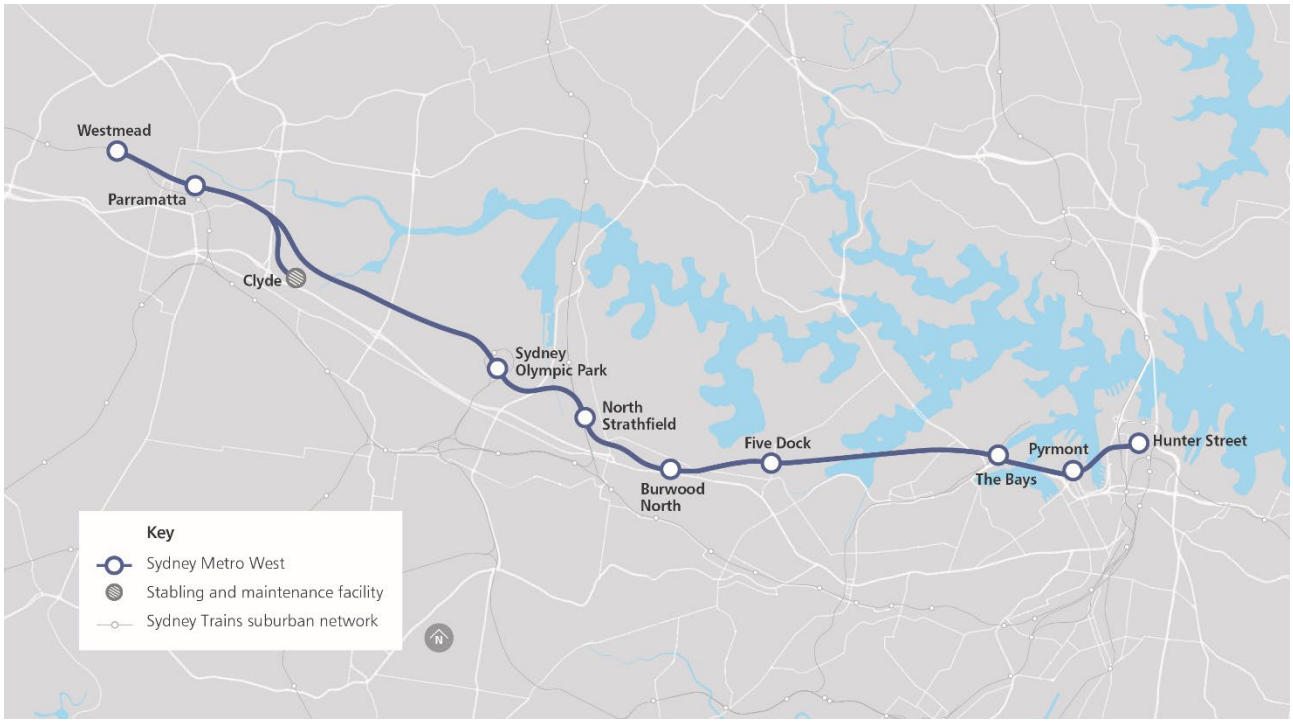

Figure 20-1 Sydney Metro West

Sydney Metro West is being assessed as a staged infrastructure application under section 5.20 of the *Environment Planning and Assessment Act 1979*. The Concept and major civil construction work for Sydney Metro West between Westmead and The Bays (Stage 1 of the planning approval process) was approved by the Minister for Planning and Public Places on 11 March 2021.

An Environmental Impact Statement for major civil construction between The Bays and Sydney CBD (Stage 2 of the planning approval process) was exhibited from 3 November 2021 to 15 December 2021, and the planning application is currently under assessment.

Stage 3 of the planning approval process, the subject of this Environmental Impact Statement, includes tunnel fit-out, construction of stations, ancillary facilities and station precincts, and operation and maintenance of the Sydney Metro West line (this proposal).

20.2 Key features of this proposal

This proposal would involve:

- fit-out of tunnels including rail systems for metro train operations
- construction, fit-out and operation of:
  - metro station buildings and the surrounding metro precincts
  - a services facility and traction substations
  - a control centre, test track and stabling and maintenance facility at Clyde
- space for non-station uses at metro stations (e.g. retail, commercial and/or community facilities)
- provision for over and/or adjacent station development within metro precincts
- rail interchange support works, including work to the existing T1 Western Line at Westmead and T9 Northern Line at North Strathfield
- transport network modifications such as new interchange facilities and changes to public transport networks to serve metro stations
- subdivision of sites
- operation and maintenance of the Sydney Metro West line.

All operation and construction components may be subject to further design development and further changes may be made during the ongoing design to take into account the outcomes of community and stakeholder engagement and environmental investigations.

20.3 Key operational aspects

20.3.1 Network interface, servicing and capacity

The project would operate as a separate rail line, allowing customers fast and easy transfers with the T1 Western Line at Westmead, T9 Northern Line at North Strathfield, and the Sydney Trains suburban rail network and Sydney Metro in the Sydney CBD. It would also allow for transfers with the future Parramatta Light Rail (Stage 1) at Westmead and Parramatta, the planned Parramatta Light Rail (Stage 2) at Sydney Olympic Park, and the existing Sydney Light Rail network in the Sydney CBD.

As with the broader Sydney Metro network, this proposal would deliver a ‘turn up and go’ service stopping at all stations along Sydney Metro West.

Demand for the service would be managed through increased service frequency. The ultimate operational frequency would be for 30 trains per hour in each direction – a train every two minutes each way.

Operations would be tailored to cater for planned special events; for example major events at Sydney Olympic Park or New Year’s Eve. Details for special event operations would be determined during the design development process.

20.3.2 Metro alignment and track

Details of the tunnel alignment of this proposal between Westmead and Hunter Street (Sydney CBD) are described in Chapter 5 (Project description – operation) of this Environmental Impact Statement.

This proposal would also include turnbacks (to allow trains to change to the other set of tracks) at Westmead and in the Sydney CBD. Crossover points (a track crossing point that would enable a train to cross between two parallel tracks) for use in degraded operations due to maintenance, breakdowns or other emergencies, would be provided at various points along the alignment.

Stub tunnels would be located at the western and eastern extents of the tunnels to safeguard for potential future extensions. This would allow for minimal disruption of the operating line during the construction of future extensions.

20.3.3 Hours of operation

The hours of operation would be aligned to the Sydney Trains suburban rail network and the Sydney Metro network. It is anticipated that Sydney Metro West would generally operate from early morning to late at night. To accommodate for planned special events, operating hours could be extended as required.

Final operating hours would be determined as part of the development of service schedules for the metro line, taking into account maintenance access requirements, customer requirements and broader network considerations.

The Clyde stabling and maintenance facility would operate 24 hours a day, seven days a week.

20.3.4 Train types and ticketing

All trains would be new, single-deck, fully automated and driverless metro trains. They would deliver a fast, safe and reliable journey for customers with high performance standards and good customer amenities.

20.3.5 Maintenance

Maintenance planning would generally allow for routine and major periodic maintenance of infrastructure with a view to maximising service availability and minimising impacts on customers. Scheduled maintenance would generally occur between the last and first train services, or during planned weekend maintenance periods, when train services would not be in operation on parts of the line.

Rail maintenance vehicles would be able to use the network and provide access for maintenance crews. Track monitoring equipment may also be used on metro trains to support maintenance activities.

20.3.6 Other operational features

Other key operational features would include:

- access and interchange features to allow connections to other modes of transport (such as the existing suburban rail network and other parts of the metro network) and the surrounding precinct
- pedestrian and cyclist links and connections to other modes of transport and the surrounding precinct
- structures and spaces for non-station uses at metro stations (e.g. retail, commercial and/or community facilities)
- traction substations to provide traction power supply
- tunnel ventilation system to allow for a range of ventilation requirements including fresh air in tunnels and stations, and ventilation for fire and life safety and operational scenarios
- an operational water treatment plant located at the Clyde stabling and maintenance facility to treat wastewater pumped from the tunnels, stations and other underground facilities.

20.3.7 Provision for future over and/or adjacent station development

As the design for Sydney Metro West has further progressed, opportunities for two types of potential development have been identified – over station development and adjacent station development.

Provision for over station development would be made at Parramatta, Sydney Olympic Park, Pyrmont and Hunter Street (Sydney CBD). Provision for adjacent station development would be made at Westmead, Parramatta, Sydney Olympic Park, Burwood North and The Bays.

Design of the metro stations and precincts would take into account planned over and/or adjacent station development, so that future developments can be built efficiently and effectively.

Over and/or adjacent station developments do not form part of this proposal and would be subject to separate assessment and approval.

20.4 Key construction aspects

The location and land required for the proposed construction sites and for the permanent features required for operation would generally be consistent with the locations identified and established as part of the previous Sydney Metro West planning applications. However, some additional land would be required for construction at the following sites:

- Westmead metro station construction site – additional areas for roadwork to the north and south of the existing rail corridor, work within the existing rail corridor and on platforms at the existing Westmead Station
- Sydney Olympic Park metro station construction site – a minor additional area for public domain work in the south-west corner of the site
- North Strathfield metro station construction site – additional areas for work within the existing rail corridor and on platforms at the existing North Strathfield Station and land (also within the rail corridor) to support construction activities within the existing rail corridor
- The Bays Station construction site – additional areas to support utility and drainage work, road work, traction substation construction, and other station precinct and public domain work.

Construction of this proposal is expected (subject to planning approval) to commence in late 2024. The construction period would be around four years, followed by around a further year of testing and commissioning. An indicative construction program for this proposal and how it interrelates with the work carried out under the previous Sydney Metro West planning applications is shown in Figure 20-2.

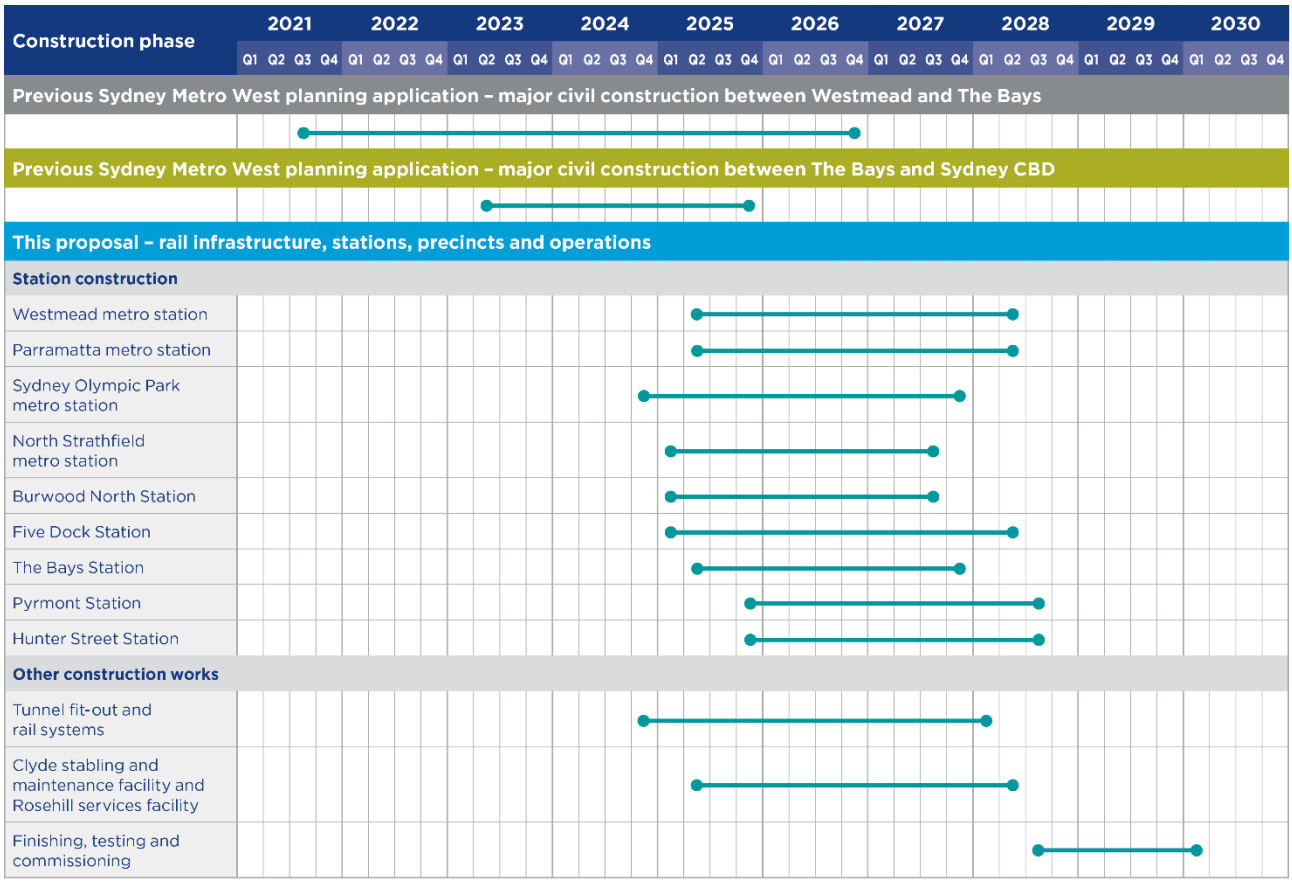

Figure 20-2 Indicative construction program

Table 20-1 shows the proposed construction sites and provides a summary of their uses as they relate to this proposal.

Table 20-1 Construction sites and their uses

Construction site	Equipment and material laydown	Enabling works	Station construction	Heavy vehicle movements	Stabling and maintenance facility construction	Services facility construction	Precinct works	Fit out	Testing and commissioning	Site offices and worker amenities	Vehicle parking
Westmead metro station	●	●	●	●			●	●	●	●	●
Parramatta metro station	●	●	●	●			●	●	●	●	●
Sydney Olympic Park metro station	●	●	●	●			●	●	●	●	●
North Strathfield metro station	●	●	●	●			●	●	●	●	●
Burwood North Station	●	●	●	●			●	●	●	●	●
Five Dock Station	●	●	●	●			●	●	●	●	●
The Bays Station	●	●	●	●			●	●	●	●	●
Pyrmont Station	●	●	●	●			●	●	●	●	●
Hunter Street Station (Sydney CBD)	●	●	●	●			●	●	●	●	●
Tunnels								●	●		
Clyde stabling and maintenance facility and Rosehill services facility	●	●		●	●	●	●	●	●	●	●

20.4.1 Construction methods

Table 20-2 provides an overview of the key construction methods for this proposal.

Table 20-2 Construction methods for this proposal

Construction activity	Construction methods
Enabling works	Enabling works would generally include: • archaeological, geotechnical and contamination investigations • delivery of construction plant equipment and materials • utility supply and adjustments • establishment of site facilities, including amenities, site offices, security huts, dangerous goods storage, workshops, site utilities and water treatment equipment • establishment of material laydown areas • establishment and/or adjustment of environmental and safety controls, as well as hoardings around the construction sites.
Station construction	Underground station structural work would generally include the construction of: • detailed excavation for lift pits, drains, sumps, electrical earthing and foundations • base slab and outer walls, including drainage and a waterproof membrane layer • station platforms, mezzanine levels and rooms, and emergency access • support columns and foundations for vertical transport (such as escalators and lifts) and the station buildings and, where relevant, for future over station developments (subject to separate approval) • pedestrian access, including delivering or provisioning for underground pedestrian links to future adjacent development • roof slabs (covering the shafts and station boxes), where required. Aboveground station work would generally include the construction of: • station entrances, concourses, canopies and emergency access • station service buildings and facilities such as loading docks and maintenance access • structures for non-station uses (e.g. retail, commercial and/or community facilities) • future over and/or adjacent station development provisions at relevant stations.
Station fit-out work	The mechanical and electrical fit-out of the stations would include: • installation of the rail systems (for example passenger information systems, help points, platform screen doors) located at the stations and the building services required for the function of the stations • initial fit-out of mechanical and electrical services would occur concurrently with the structural work, including the installation of large equipment, such as ventilation fans, lifts and escalators • final fit-out of mechanical and electrical services would occur after the completion of structural work and concurrently with the architectural fit-out • the architectural fit-out of the stations, including the final finishes for the stations, such as glazing, wall and ceiling cladding, and floor finishes.

Construction activity	Construction methods
Station precinct and interchange work	Station precinct and interchange work would generally include, where applicable: • intersection and traffic signal modifications • safety infrastructure to protect vulnerable road users and manage vehicle speeds, such as pedestrian crossings, speed humps and changes to traffic speed zones • kerb and guttering and surfacing • transport interchange facilities (for example bus shelters, bicycle paths and bicycle parking) • public domain and placemaking infrastructure, including footpaths, street lighting and landscaping • accessibility infrastructure (for example, accessible ramps and lifts) • line marking, signage and other finishes such as hostile vehicle barriers (for example, security bollards).
Ancillary facilities and associated work	Construction activities at the Clyde stabling and maintenance facility would include: • civil works for the construction of the rail entry/exit structures to the facility from the mainline tunnels • B-double heavy vehicle access • overhead wiring and associated structures, including installation of structure footings, structures and running of wiring • construction of aboveground buildings and maintenance sheds • construction of an operational water treatment plant. Construction activities at the Rosehill services facility would include: • construction of aboveground buildings for mechanical, electrical and ventilation equipment and a shaft to connect to the tunnels below • following site establishment work, lifts, emergency access stairs and a tower crane would be installed to enable workers to access each level of the services facility and to unload materials into the shaft • installation of floor slab sections and intermediate walls on each floor • construction of a traction substation, including the excavation and construction of foundations, placement of underground conduit routes, construction of the substation building and yard, and installation and commissioning of the electrical and mechanical equipment.
Tunnel fit-out and rail systems work	Tunnel fit-out and rail systems work would include: • fresh air tunnel ventilation fit-out • track slab and rail fastening • rail track installation • cable and equipment installation • installation of other equipment, such as power structures, lighting, drainage and fire and life safety systems.

Construction activity	Construction methods
Finishing work, testing and commissioning	Site stabilisation and rehabilitation would be carried out progressively during the work, and would include the following activities: • demobilisation of construction sites and facilities • removal of materials, waste and redundant structures from the work sites • decommissioning of temporary work site signs • removal of temporary fencing and hoardings • establishment of permanent fencing • restoration of disturbed areas as required, including remediation and/or revegetation where required • landscaping, irrigation, drainage and other station amenity work where applicable. Testing and commissioning would be carried out to check that all systems and infrastructure have been installed and are operating according to Sydney Metro's operational requirements. Once all services are installed and tested individually, testing and commissioning of the whole system would occur in three stages: • collection of safety and quality assurance documentation and commissioning of readiness checks • installation and operation tests and checks • final inspection, site acceptance tests, commissioning and validation of individual systems.

20.4.2 Construction hours

Wherever possible the aboveground and external construction activities would be carried out during the following daytime construction hours:

- 7am to 6pm Monday to Friday
- 8am to 6pm Saturday
- no work on Sundays or public holidays.

It is proposed to extend the standard construction hours for the proposal to include from 1pm to 6pm on Saturdays to reduce the overall program of the proposal. Earlier completion would bring considerable benefits to the community and would reduce the duration of construction related disruption. The extended construction hours on Saturdays (from 1pm to 6pm) for this proposal would also align with the Concept conditions of approval.

Underground and internal construction activities would generally take place 24 hours per day, seven days per week. This would include access to the tunnels via the stations and service facility sites, as well as material deliveries at these locations.

20.5 Placemaking and design

20.5.1 Placemaking

Chapter 7 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) provides the approach to placemaking, the design process, and the place and design principles for stations and ancillary facilities and includes integration with strategic planning for stations and ancillary facilities between Westmead to The Bays. Chapter 5 of *Sydney Metro West Environmental Impact Statement – Major civil construction between The Bays and Sydney CBD* (Sydney Metro, 2021a) includes integration with strategic planning for Pyrmont and Hunter Street (Sydney CBD) stations. In accordance with Concept condition of approval C-B1, the design of this proposal would have regard to the place and design principles outlined in the previous Sydney Metro West planning applications so that a high-quality urban design response is achieved.

Details regarding placemaking outcomes for each station and ancillary facility are provided in Part B (Environmental assessment) of this Environmental Impact Statement. An overview of how the proposal meets the relevant transport and connectivity outcomes of the *Healthy Built Environment Checklist* (NSW Government, 2020a) is provided in Appendix I (Healthy Built Environment Checklist).

20.5.2 Design

Design Guidelines

Station and precinct Design Guidelines have been developed for Sydney Metro West to guide the design of:

- the interface between stations and their surrounding locality, including:
  - station entries
  - transport interchange facilities (bicycle facilities, bus stops, kiss and ride, point-to-point facilities and connections to existing metro, rail, buses and existing and future light rail)
  - landscaping and other elements of the public domain
  - heritage interpretation and Connecting with Country
- station, stabling and service buildings, including underground stations
- rail corridor works including tunnel dive structures, bridges and underpasses.

The Design Guidelines identify corridor-wide station and precinct design principles that can be applied across all sites, as well as place-specific design principles that respond to contextual factors.

The station and precinct Design Guidelines are provided in Appendix E (Design Guidelines).

Design principles

The Design Guidelines described above also identify corridor-wide urban design principles (Table 20-3) to guide future stages of design development. The corridor-wide urban design principles have been developed so that all stations are part of a network and together contribute to a corridor of activity centres that offer social, employment and housing opportunities while also contributing to local character.

Table 20-3 Sydney Metro West corridor-wide urban design principles

Title	Urban design principle
Land use and function	• identify uses that support and contribute to the delivery of unique, attractive and vibrant urban centres which provide a sense of connection and identity for local communities and visitors • activate the public domain of station precincts to integrate stations and supporting infrastructure with existing and desired future urban settings.
Places and spaces	• ensure the scale of development reflects existing and desired future character • reflect and build on opportunities to strengthen design and place outcomes for Aboriginal and non-Aboriginal heritage • create a safe and legible hierarchy of public spaces such as parks, plazas and pedestrian links for active and passive recreation.
Access and connectivity	• prioritise walking and other modes of active transport in the design of stations, interchanges and associated developments • integrate walkable urban environments with the Green Grid to contribute to safe, permeable and well-connected station precincts • manage the design of streets in accordance with Movement and Place principles • enable easy connections with other transport services.
Environment and sustainability	• precinct planning supported by ‘Designing with Country’ strategy • contribute to the evolution of a new urban development paradigm that incorporates environmentally sustainable elements, processes and designs • maximise green infrastructure.

Place and design principles have been developed for each Sydney Metro West station, station precinct and ancillary facility. The purpose of these principles is to guide future design through identifying outcomes that would be achieved at the station or ancillary facility and in the immediate public domain and interchange area. The principles build on the five Sydney Metro-wide design objectives and have considered relevant local government strategies and *Better Placed* design objectives.

Preliminary place and design principles for stations and ancillary facilities between Westmead and The Bays were provided in Chapter 7 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a). Preliminary place and design principles for Pyrmont Station and Hunter Street Station (Sydney CBD) were provided in Chapter 5 of the *Sydney Metro West Environmental Impact Statement – Major civil construction between The Bays to Sydney CBD* (Sydney Metro, 2021a). These principles have since been further refined in consultation with key stakeholders (including relevant local and state government agencies). The place and design principles for each station and facility and how the design achieves these principles are included in Part B (Environmental assessment) of this Environmental Impact Statement.

Sydney Metro would work with key stakeholders to implement and achieve these principles.

20.6 Aspects to be resolved through design development

The design presented in this Environmental Impact Statement has been developed to a level where potential impacts can be appropriately identified and assessed. The assessment of this proposal:

- resolves a number of design and assessment items identified in the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a)
- confirms that the proposed performance outcomes can be achieved
- identifies feasible construction methods
- identifies key risks and constraints as well as environmental assessment issues.

Some design elements of this proposal would continue to be refined as part of the design development process. Design development would continue to be informed by the design objectives and principles, Design Guidelines, Design Quality Framework and feedback from community and stakeholders. The use of a Design Advisory Panel / Design Review Panel will allow for high quality standards throughout the whole design process. Further detail on the design process for Sydney Metro West is provided in Chapter 5 (Proposal description – operation) of this Environmental Impact Statement.

Aspects of the design that may be subject to further refinement include:

- at Westmead metro station investigate options for the potential layout and use of Alexandra Avenue in consultation with other parts of Transport for NSW and provision of additional metro station entry points
- at North Strathfield metro station investigate the need and options for the potential upgrade to the existing aerial footbridge
- integration of The Bays Station with the Bays West Place Strategy, Bays West Urban Design Framework and sub-precinct master plans in consultation with the NSW Department of Planning and Environment
- review of the location of the water quality treatment plant at the Clyde stabling and maintenance facility in relation to delivery of the ‘Wilderline’
- review of the future use of residual land at the Clyde stabling and maintenance facility , including potential use of this land to provide flood storage to meet the requirements of condition of approval D10 of SSI 10038. This is subject to ongoing consultation with the City of Parramatta Council and the NSW Department of Planning and Environment
- review of power supply requirements for operations including the design and sizing of the traction substations and provision of additional power to each station precinct
- a review of the specific station infrastructure configurations and layouts to respond to detailed design
- a review of transport interchange and access arrangements at each station precinct in consultation with Transport for NSW, councils and key stakeholders.

The construction approach, methodology and program presented in this Environmental Impact Statement (including construction site layouts and access, and rail access points) is indicative and would be refined as design and construction planning progresses. A final construction methodology and program would be developed by the construction contractor(s) when appointed.

20.7 Proposed measures to avoid or minimise impacts

This Environmental Impact Statement describes measures to avoid or minimise the impacts of the construction and operation of this proposal.

20.7.1 Overall approach to environmental management

The proposed approach to environmental management is to prepare an overarching, integrated environmental management strategy for the whole of Sydney Metro West.

The overarching approach to environmental management is shown in Figure 20-3.

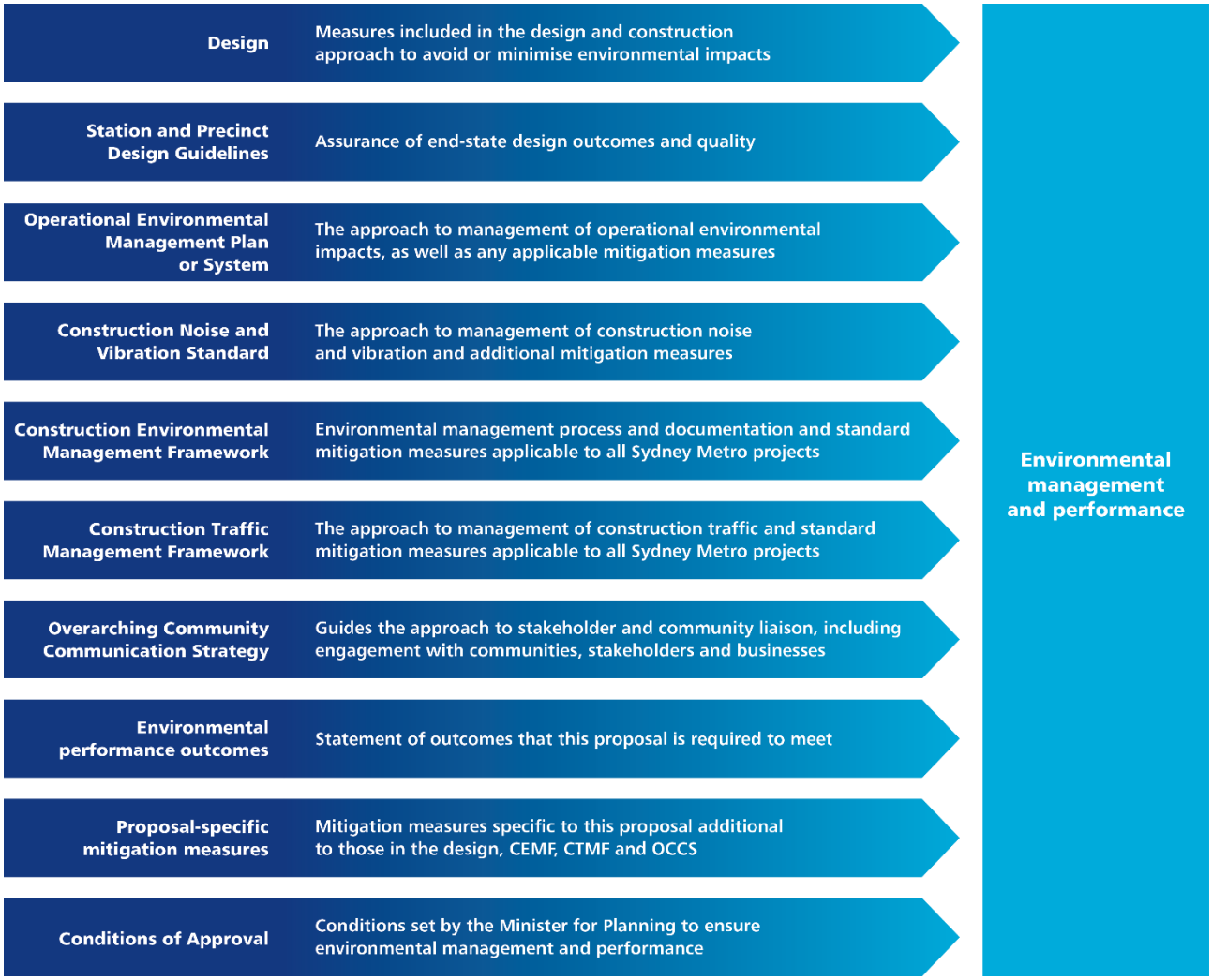

Figure 20-3 Approach to environmental mitigation and management

20.7.2 Approach to environmental management during operation

Environmental performance during operation would be managed by the implementation of an Operational Environmental Management Plan or System. The plan/system would detail how the mitigation measures and performance outcomes would be implemented and achieved during operation and specify the environmental management practices and procedures to be followed during operation.

The plan/system would be prepared in consultation with relevant agencies and in accordance with the *Guideline for the Preparation of Environmental Management Plans* (Department of Infrastructure, Planning and Natural Resources, 2004).

The plan/system would likely include, but not be limited to, the following:

- a description of activities to be undertaken during operation
- statutory and other obligations, including approvals, consultations and agreements required from authorities and other stakeholders
- overall environmental policies, guidelines and principles to be applied to operation
- a description of the roles and responsibilities, including relevant training and induction to ensure that employees are aware of their environmental and compliance obligations
- an environmental risk analysis to identify the key environmental performance issues associated with the operation phase
- details of how environmental performance would be managed and monitored.

20.7.3 Approach to environmental management during construction

Construction Environmental Management Framework

The Sydney Metro Construction Environmental Management Framework (CEMF) (Appendix F) details the approach to environmental management and monitoring during construction. The framework is a linking document between planning approval documentation and construction environmental management documentation, which would be developed by the construction contractors. The CEMF details the environmental, stakeholder and community management systems and processes for the construction of this proposal. Specifically, it details the requirements in relation to the Construction Environmental Management Plan, sub-plans and other supporting documentation for each specific environmental aspect. The CEMF also provides the standard mitigation measures to be implemented at all sites, including monitoring requirements.

Construction Traffic Management Framework

The Construction Traffic Management Framework (CTMF) (Appendix G) provides the overall strategy and approach for construction traffic management for Sydney Metro West, and an outline of the traffic management requirements and processes that would be common to each of the proposed construction sites. It establishes the traffic management processes, acceptable criteria and monitoring requirements to be considered and followed in managing roads and footpaths adjacent to construction sites.

Construction Noise and Vibration Standard

The Sydney Metro Construction Noise and Vibration Standard (CNVS) (Appendix H) defines how construction noise and vibration would be managed for Sydney Metro West as a whole. The CNVS provides guidance for managing construction noise and vibration impacts to provide a consistent approach to management and mitigation across all Sydney Metro projects. The CNVS identifies the requirements and methodology to develop construction noise and vibration impact statements. These would be prepared prior to specific construction activities, based on a more detailed understanding of construction methods, including the size and type of construction equipment. The CNVS also provides the standard noise and vibration mitigation measures to be implemented at all sites.

Overarching Community Communications Strategy

The Overarching Community Communications Strategy (OCCS) (Appendix C) has been prepared to guide Sydney Metro's approach to stakeholder and community liaison, including engagement with communities, stakeholders, and businesses. This plan is intended to be used as a framework for community engagement across all Sydney Metro projects and contracts. The OCCS considers all work activities and packages for Sydney Metro and its projects for the duration of work, and 12 months following the completion of construction. The OCCS is further considered in Chapter 3 (Stakeholder and community engagement) of this Environmental Impact Statement.

20.7.4 Environmental management measures

Mitigation measures have been developed to mitigate and manage the potential impacts of this proposal and achieve the performance outcomes outlined in Section 20.7.6.

An Operational Environmental Management Plan or System would detail mitigation measures and performance outcomes that would be implemented and achieved during operation. It would also specify the environmental management practices and procedures to be followed during operation.

A range of measures for the management of potential impacts from construction are included in the CEMF, OCCS, CNVS and CTMF. Additional mitigation measures have been identified throughout this Environmental Impact Statement to manage proposal-specific impacts and these measures are compiled in Table 20-4.

Proposal-specific measures have not been identified for business impacts; biodiversity; sustainability, climate change and greenhouse gas; air quality; waste and resource use; and hazard and risk. Potential impacts associated with these environmental aspects would be adequately managed through the measures in the OCCS (for business impacts) and the CEMF (for all other aspects).

The proposal-specific measures have been identified to manage construction and operational impacts proposal-wide and some measures have been identified to manage impacts in a site-specific location. The location/s applicable to each mitigation measure are identified in Table 20-4.

The mitigation measures may be revised in response to submissions raised during public exhibition and/or any design changes made following exhibition. A revised list of mitigation measures would be provided in the Submissions Report and, if required, the Amendment Report/Preferred Infrastructure Report.

Table 20-4 Summary of management and mitigation measures

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
Transport – operation			
EIS-TT1	Property access	Access would be maintained to neighbouring properties.	All
EIS-TT2	Active transport	Potential opportunities to connect active transport measures with the wider active transport network would be further investigated in consultation with key stakeholders.	All
EIS-TT3	Impacts to parking	Measures to address potential parking impacts arising from a loss of on-street parking in the vicinity of station precincts, as well due to potential park and ride in residential streets would be developed, where required, in consultation with relevant local councils.	WMS, PMS, SOPMS, NSMS, BNS, FDS, TBS, PS
EIS-TT4	Traffic congestion	Measures to manage congestion issues in the area and improve bus service reliability along the T-way would be investigated including the potential for Alexandra Avenue, between Hawkesbury Road and Hassall Street, to be restricted to buses, taxis and emergency vehicles only.	WMS
EIS-TT5	Bus access to precinct	Appropriate intersection updates to enable bus access to the station precinct would be investigated in consultation with Sydney Olympic Park Authority and Transport for NSW.	SOPMS
EIS-TT6	Pomeroy Street / Queen Street / Beronga Street intersection upgrade	The upgrade of the Pomeroy Street / Queen Street / Beronga Street intersection would be determined in consultation with City of Canada Bay Council and Transport for NSW.	NSMS
EIS-TT7	Operational traffic congestion	Provision of kiss and ride facilities on Robert Street to reduce the number of vehicle movements into and out of the precinct would be investigated in consultation with Inner West Council.	TBS
EIS-TT8	Pedestrian access	The need for pedestrian crossing facilities at the Robert Street / new precinct street and new precinct street / Port Access Road intersections would be investigated in consultation with Inner West Council and NSW Department of Planning and Environment.	TBS
EIS-TT9	Future road network performance	The potential signalisation of the Robert Street / Mullens Street intersection to improve future year level of service would be investigated in consultation with Inner West Council and NSW Department of Planning and Environment.	TBS

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
EIS-TT10	Property access	Further investigation, including a safety assessment, would be carried out so that safe access is maintained to 48-50 Robert Street.	TBS
EIS-TT11	Pyrmont Bridge Road / Union Street intersection performance	Measures to improve overall performance for both pedestrians and vehicles at the Pyrmont Bridge Road/ Union Street intersection would be investigated in consultation with City of Sydney Council and Transport for NSW.	PS
EIS-TT12	Pedestrian crossing provision at Bligh Street / Hunter Street intersection	Widening of selected pedestrian crossings at the Bligh Street / Hunter Street intersection to accommodate future pedestrian demands would be investigated in consultation with City of Sydney Council and Transport for NSW.	HSS
EIS-TT13	Footpath capacity	The potential for minor footpath upgrades on O'Connell Street, Hunter Street and at Richard Johnson Square (corner of Bligh Street and Hunter Street) would be investigated in consultation with key stakeholders, in response to increased pedestrian demand associated with the metro station.	HSS
Transport – construction			
EIS-TT14	Impacts to rail services	Where works are required within the rail corridor, Sydney Trains and Australian Rail Track Corporation would be consulted to minimise potential disruptions to rail services. Works would be carried out during scheduled Sydney Trains rail possessions where possible, and customers would receive advanced notification of proposed works and information on alternative travel options.	WMS, NSMS
EIS-TT15	Bus priority	Opportunities to improve bus priority along the temporary detour at Westmead metro station construction site would be investigated during detailed design.	WMS
EIS-TT16	Active transport	Pedestrian and cyclist access would be maintained during the temporary closure of Alexandra Avenue at Westmead. Wayfinding and customer information would be provided to guide pedestrians and cyclists to alternative routes.	WMS
EIS-TT17	Construction and operation of vehicular traffic	The design of the temporary traffic arrangements at Westmead metro station construction site would consider construction traffic, alternate bus routes and bus stops, local vehicular traffic and pedestrian safety. The design of the temporary traffic arrangements would be undertaken in consultation with Transport for NSW, Schools Infrastructure, Heath Infrastructure, relevant local councils and bus operators.	WMS
EIS-TT18	Active transport	A temporary north-south pedestrian route would be provided between Macquarie Street and George Street at the Parramatta metro station construction site, although some short-term closures may be required.	PMS
EIS-TT19	Active transport	Access would be maintained to the pedestrian footbridge at the existing North Strathfield Station. Any adjustments to the footbridge would be carried out in consultation with Transport for NSW.	NSMS

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
EIS-TT20	Construction vehicle impacts	Construction site traffic generated at the Five Dock Station construction site would be managed to minimise movements during church service times at St Albans Anglican Church.	FDS
Noise and vibration – operation			
EIS-NV1	Potential airborne noise from station and ancillary facilities	Stations and ancillary facilities would be designed to meet the applicable noise criteria derived from the *Noise Policy for Industry* (EPA, 2017). Train breakout noise from the draft relief shaft would be designed to meet a noise criterion of L_{AFmax} 65 dB(A) at 15 metres. The noise generated by stations and ancillary facilities would be reviewed during further design development to confirm that the noise levels predicted are achievable based on the final design of this proposal.	All
EIS-NV2	Potential airborne-borne rail noise	Aboveground track section connecting to the Clyde stabling and maintenance facility would be designed to meet the relevant airborne noise criteria from the *Rail Infrastructure Noise Guidelines* (EPA, 2013).	CSMF
EIS-NV3	Potential ground-borne rail noise	Track form would be confirmed as part of design development in order to meet the relevant ground-borne noise and vibration criteria from the *Rail Infrastructure Noise Guidelines* (EPA, 2013).	Tunnels
Noise and vibration – construction			
EIS-NV4	Noise impacts to horses at Rosehill Racecourse Stables	Consultation with the owners and operators of the horse stables near the Clyde stabling and maintenance facility construction site would be carried out so that potential impacts to horses are appropriately managed.	CSMF
Non-Aboriginal heritage – operation			
EIS-NAH1	Heritage interpretation	Where heritage items, including significant archaeology are impacted by this proposal, they would be considered for inclusion in the Heritage Interpretation Strategy (refer to Appendix K) or place specific interpretation plans prepared as part of this proposal.	All

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
EIS-NAH2	Permanent indirect (visual) impact	Detailed design for aboveground station elements, ancillary facilities and public domain and landscaping work located in or near to heritage significant items, would respond to the following heritage guidelines during design development in order to minimise indirect (visual) impacts to heritage items identified under this proposal: • *The Burra Charter – The Australia ICOMOS Charter for Places of Cultural Significance* (2013), Australia ICOMOS • *Better Placed – Design Guide for Heritage* (2019), prepared by the NSW Government Architect • *Design in Context* (2005), prepared by the NSW Heritage Office and the Royal Australian Institute of Architects NSW Chapter • *New Uses for Heritage Places* (2008), prepared by the Heritage Council of NSW and the Royal Australian Institute of Architects NSW • *Draft Connecting with Country Framework* (2020), Government Architect NSW. Detailed design would also respond to guidelines and policies outlined in existing Conservation Management Plans or other relevant heritage assessment documents for relevant heritage items (State Abattoir, White Bay Power Station), with particular focus on preserving significant views towards the item.	PMS, SOPMS, TBS, PS (eastern and western sites), HSS (eastern and western sites)
EIS-NAH3	Permanent indirect (visual) impact	In order to mitigate permanent indirect (visual) impacts to heritage items located adjacent to or within the Parramatta metro station site: • the new Civic Link would incorporate a landscape design that enhances the heritage significant elements and features of the adjacent 'Roxy Theatre' (SHR # 00711) • the design of any aboveground station elements would consider setbacks from adjacent heritage items ('Kia Ora (potential archaeological site) (Parramatta LEP item # I716), and 'Horse Parapet Façade (and potential archaeological site)' (Parramatta LEP item # I656)) in order to respect the heritage setting of these items and their visual connection to other heritage items in the vicinity • the design of aboveground station elements would respond to the existing alignment and orientation of adjacent heritage items, particularly 'Horse Parapet Façade (and potential archaeological site)' (Parramatta LEP Item # I656) which is aligned with the surrounding street development.	PMS
EIS-NAH4	Direct (physical) and permanent indirect (visual) impacts	An Adaptive Reuse Strategy and Conservation Management Plan would be prepared for heritage items which would be integrated into the proposed metro station precincts. Relevant heritage items include: • 'Shops (potential archaeological site)' Parramatta LEP item #I703 • 'Kia Ora' (Parramatta LEP item #I716) • 'Skinners Family Hotel' (SHR #00584).	PMS, HSS (western site)
EIS-NAH5	Permanent indirect (visual) impact	The new public domain to the west of Richard Johnson Square (SLEP 2012 Item # I1673) would incorporate a landscape design that enhances the heritage significant elements and features of the adjacent item.	HSS (eastern site)

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
Non-Aboriginal heritage – construction			
EIS-NAH6	Archaeology	Non-Aboriginal archaeology at the Parramatta metro station construction site would be managed in accordance with the approved *Sydney Metro West Parramatta Station Construction Site Archaeological Research Design and Excavation Methodology* (GML Heritage, 2021) developed as required by condition of approval D25 of SSI-10038.	PMS
EIS-NAH7	Archival recording and archaeological management	Prior to the removal of the Convict Drain (Parramatta LEP Item # I647) associated with the excavation for basement structures, it would be archivally recorded as part of archaeological management in accordance with relevant recording provisions outlined in the approved *Sydney Metro West Parramatta Station Construction Site Archaeological Research Design and Excavation Methodology* (GML Heritage, 2021). The convict drain must have its location precisely surveyed and integrity investigated, in accordance with condition of approval D15 of SSI-10038.	PMS
EIS-NAH8	Archaeology	An addendum to the existing Archaeological Research Design/s or a new Archaeological Research Design/s would be prepared to identify the excavation methodology for predicted locally significant non-Aboriginal archaeological remains for the additional footprint area at The Bays construction site. Archaeological mitigation measures recommended in the Archaeological Research Design would be carried out in accordance with Heritage NSW guidelines, and where appropriate, supervised by a suitably qualified Excavation Director with experience in managing locally significant archaeology.	TBS
EIS-NAH9	Archaeology	Preliminary archaeological reports would be prepared within six months of completion of works stage site specific archaeological investigations. An Archaeological Excavation Report/s would be prepared by the Excavation Director/s. An executive summary would be prepared for the purposes of publication and communication with community where significant archaeological remains are identified. The final reports would be provided to the NSW Heritage Division within twenty-four months of the completion of archaeological excavations specified in the archaeological research design(s).	TBS
EIS-NAH10	Direct and indirect heritage impacts	In order to mitigate direct (physical) and permanent indirect (visual) impacts to heritage items located within The Bays Station site: • the proposed culvert to the north of the White Bay Power Station would not intersect the 'White Bay Power Station (Inlet) Canal' (Port Authority of NSW s170 SHI # 4560062) • the design would respond to guidelines and policies outlined in the existing Conservation Management Plan for the White Bay Power Station or as updated. Opportunities to minimise the scale or alter the siting of the proposed traction substation so that the prominence of White Bay Power Station is not obstructed on significant viewlines from the south and south-east would be explored during detailed design • piling and other foundation work to install the traction substation would be sited and designed so that they do not directly impact the 'White Bay Power Station (Inlet) Canal' (Port Authority of NSW s170 4560062).	TBS

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
Aboriginal heritage – construction			
EIS-AH1	Test excavation	Consistent with *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a), archaeological test excavation (and salvage if required) must be carried out where intact natural profiles with the potential to contain significant archaeological deposits are encountered or if archaeological deposits are identified within AHIMS ID#45-6-3826 (The Bays PAD 01). Excavations must be undertaken in accordance with the methodology outlined in the Aboriginal cultural heritage assessment report (Artefact Heritage Pty Ltd, 2020).	TBS
Landscape and visual amenity – operation			
EIS-LV1	Landscape impacts	The landscape design for the project would incorporate appropriate species to achieve year round flowering and support urban biodiversity.	All
EIS-LV2	Landscape impacts	The landscape design for the project would consider the effects of climate change on the long-term viability of urban tree health and longevity.	All
EIS-LV3	Landscape impacts	The landscape design for the project would consider opportunities to incorporate local native plant species identified in consultation with the traditional owners of the site where possible.	All
EIS-LV4	Lighting impacts	Lighting at stations and ancillary facilities would be operated in accordance with AS4282-2019 Control of the obtrusive effects of outdoor lighting.	All
EIS-LV5	Visual impacts	Revegetate the embankments of the rail corridor where possible to screen views from residences on Alexandra Avenue.	WMS
EIS-LV6	Activation of streetscapes	Opportunities to provide temporary activation would be explored in areas of future adjacent station development (that would be delivered by others).	WMS, PMS, SOPMS, BNS, TBS
EIS-LV7	Visual impacts	Engineered batters and water management measures would be designed to have a natural shape and low profile as far as is reasonable and feasible and would be designed to support vegetation that would allow for their visual integration and screening over time.	WMS, CSMF
EIS-LV8	Landscape impacts	Opportunities to provide gardens within the areas adjoining the heritage listed areas of the station, or in the vicinity, would be investigated as part of design development to reflect the local values of the community and reinforce the sense of place for the North Strathfield local centre.	NSMS
EIS-LV9	Visual impacts	Design of the traction substation building would have an industrial character with a high quality architectural finish and not detract from the visual prominence of the existing power station façade and silhouette of the twin stacks.	TBS

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
EIS-LV10	Landscape impacts	Investigate opportunities with City of Sydney Council to provide public domain improvements to Richard Johnson Square.	HSS
EIS-LV11	Visual impacts	Revegetate the embankments and provide screening vegetation between the proposed surface rail (in the former T6 Carlingford rail corridor) and the Rosehill Gardens racecourse to minimise views where feasible.	CSMF
EIS-LV12	Visual impacts	Opportunities to provide further vegetation screening of the stabling and maintenance facility, and realigned Unwin and Kay Street bridge from sensitive receivers, such as the M4 Western Motorway, James Ruse Drive, and residential properties to the west of James Ruse Drive, would be investigated during design development.	CSMF
EIS-LV13	Visual impacts	Corridor services, including the combined services route, would be designed to reduce visual clutter and minimise visual impact ensuring these structures have a low profile and do not obstruct views across the corridor.	CSMF
EIS-LV14	Visual impacts	The water treatment building would be designed to minimise its mass and scale and have a high-quality architectural form and finish.	CSMF
Landscape and visual amenity – construction			
EIS-LV15	Activation of streetscapes	Opportunities to provide temporary activation during construction in the vicinity of the Parramatta metro station construction site and the Five Dock Station western construction site would be explored in consultation with the City of Parramatta Council and City of Canada Bay Council respectively.	PMS, FDS
EIS-LV16	Landscape impacts	Any new temporary structures facing Fred Kelly Place and Richard Johnson Square would be designed with a suitable urban design and/or landscape treatment to minimise visual amenity and landscape character impact where feasible and reasonable.	FDS, HSS
Soils, contamination and groundwater – construction			
EIS-GW1	Potential reduced baseflow to Toongabbie Creek and Domain Creek	A review of additional geotechnical and hydrogeological data from ongoing investigations would be carried out to inform the hydraulic connectivity between groundwater and surface water and whether predicted groundwater drawdown from this proposal is likely to occur in the vicinity of these creeks.	WMS

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
EIS-GW2	Potential reduced baseflow to Toongabbie Creek and Domain Creek. Requirements for baseline monitoring of hydrological attributes	Additional site investigations would be carried out at creeks or surface water bodies where the additional data review in EIS-GW1 shows there is a likely surface water/groundwater interaction. This would involve baseline monitoring of creek flows (streamflow gauging) prior to construction, and baseflow streamflow analysis to confirm the existing groundwater baseflow contribution to streamflow for each creek. Where a significant reduction in baseflow is predicted due to this proposal, design responses would be implemented at station and shaft excavations to reduce potential baseflow loss.	WMS
EIS-GW3	Impacts to groundwater dependent ecosystems	Additional investigations and assessment completed as part of the previous Sydney Metro West planning application (mitigation measure B3) would be reviewed and updated for this proposal, to confirm the potential for impacts to groundwater dependent ecosystems due to groundwater drawdown, and to identify any required mitigation through design.	WMS, PMS, CSMF, NSMS, BNS, FDS
Flooding – operation			
EIS-HF1	Flood protection	As part of design development, including for drainage infrastructure, consideration would be given to the flood risk at all sites. Design development would include consideration of relevant best practice guidelines and include: • identification of measures to not worsen flood impacts on the community and on other property and infrastructure, up to and including the one per cent Annual Exceedance Probability (AEP) flood event • metro tunnels and other critical infrastructure would be protected from the Probable Maximum Flood (PMF), or the one per cent AEP flood level with an allowance for freeboard of 0.5 metres (whichever is greater) • provide flood protection for the nominated station or facility entry threshold level. Flood protection would be integrated into the architectural/urban design strategy for this proposal. Not worsen is defined as: • a maximum increase in flood levels of 50mm in a one per cent AEP flood event • a maximum increase in time of inundation of one hour in a one per cent AEP flood event • no increase in potential soil erosion and scouring from any increase in flow velocity in a one per cent AEP flood event.	All

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
EIS-HF2	Emergency management arrangements	Emergency management arrangements would be developed to manage flood risks to people and vehicles accessing stations and ancillary facilities. Egress arrangements would consider flood hazard in nearby streets particularly where active flood measures are employed. They would be designed so that the inclusion of flood barriers at relevant access points does not interfere with the egress strategy. Emergency management arrangements would also be integrated across this proposal and consider such matters as the relative degree of isolation of stations or ancillary facilities due to inundation by floodwaters.	All
EIS-HF3	Residual impacts during operations	Ongoing consultation would occur with State Emergency Services and relevant councils in relation to potential impacts to existing community emergency management arrangements for flooding.	WMS, PMS, SOPMS, PS, HSS
Flooding – construction			
EIS-HF4	Flooding behaviour impacts	Detailed construction planning for The Bays Station construction site would aim to minimise potential impacts on flood behaviour, along the north-western side of the site adjacent to low-lying property, to minimise reduction in floodplain storage and blockage to local overland flow paths.	TBS
Social impacts - operation			
EIS-S1	Social impacts	Sydney Metro would develop a strategy to promote Sydney Metro West and educate customers on accessing and using the new public transport infrastructure. The objectives of the strategy would include to enhance understanding of Sydney Metro West and its benefits, maximise customer use, alleviate travel related stress, and support the realisation of wider economic benefits through its use.	All
Social impacts – construction			
EIS-S2	Potential impacts on school infrastructure	Ongoing engagement would be undertaken with NSW Department of Education to continue to investigate feasible and reasonable mitigation measures related to construction traffic, pedestrian safety, construction noise and vibration, and air quality.	WMS, PMS, NSMS, BNS, FDS
EIS-S3	Activation of streetscapes	In addition to temporary activation measures outlined in the Construction Environmental Management Framework, temporary activation considered in the vicinity of the Five Dock Station western construction site and Parramatta metro station construction site would include opportunities to provide spaces and places for the community to gather and meet each other.	PMS, FDS

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
Hydrology and water quality – operation			
EIS-SSWQ1	Stormwater design	Water quality measures such as gross pollutant traps, bio-retention swales and Water Sensitive Urban Design features would be investigated during design development and implemented where feasible and reasonable.	All
EIS-SSWQ2	Wastewater discharge	The water treatment plant would be designed so that wastewater is treated during operation to a level that is compliant with the ANZG (2018) default guidelines for 95 per cent species protection and 99 per cent species protection for toxicants that bioaccumulate unless other discharge criteria are agreed with relevant authorities.	CSMF
EIS-SSWQ3	Water quality monitoring	A surface water monitoring program would be implemented to observe any changes in surface water quality associated with operation of this proposal and inform appropriate management responses. The program would be developed in consultation with the EPA and relevant councils. Monitoring would occur at all waterbodies with the potential to be impacted. Water quality monitoring of all discharges from the operational water quality treatment plant would be undertaken to confirm the ANZG guideline water quality trigger values are met.	CSMF
Property – operation			
EIS-P1	Future use of residual land	The future use of residual land around the Clyde stabling maintenance facility and Rosehill services facility would be determined in consultation with the City of Parramatta Council and the NSW Department of Planning and Environment, taking into account the existing zoning of the land, the nature of the surrounding uses, the recreational needs of the local population, and the necessary work and remediation to make the land suitable for potential public use.	CSMF, RSF

Notes:

1. WMS: Westmead metro station; PMS: Parramatta metro station; SOPMS: Sydney Olympic Park metro station; NSMS: North Strathfield metro station; BNS: Burwood North Station; FDS: Five Dock Station; TBS: The Bays Station; PS: Pyrmont Station; HSS: Hunter Street Station (Sydney CBD); CSMF: Clyde stabling and maintenance facility; RSF: Rosehill services facility.

20.7.5 Interactions between mitigation measures

Mitigation measures identified through the assessment of some environmental aspects are relevant and likely to affect the assessment and management of other environmental aspects. Table 20-5 identifies the interactions between mitigation measures.

Table 20-5 Interactions between mitigation measures

Issue	Interactions
Transport	• noise and vibration, specifically measures which address potential road traffic noise impacts during construction • air quality, specifically measures which address the management of construction vehicle traffic emissions.
Noise and vibration	• transport, specifically measures which address potential road traffic noise impacts during construction • non-Aboriginal heritage, specifically measures which address the management of potential vibration impacts to heritage items during construction.
Non-Aboriginal heritage	• noise and vibration, specifically measures which address the management of potential vibration impacts on heritage structures during construction • groundwater, specifically measures which address the management of ground settlement and potential damage to buildings and structures • landscape and visual, specifically measures which address the management of potential visual impacts on heritage items during construction and operation.
Aboriginal heritage	• no anticipated interactions.
Landscape and visual amenity	• non-Aboriginal heritage, specifically measures which require the detailed design to respond the heritage guidelines, minimise visual impacts to and enhance the setting of surrounding heritage items.
Soils, contamination and groundwater	• hydrology and water quality, specifically measures which address surface water quality impacts including from acid sulfate soils and saline soils • waste management and resource use, specifically measures which address spoil management and reuse targets, including management of contaminated spoil • sustainability, greenhouse gas and climate change, specifically measures which address the reuse of captured groundwater • hazard and risk, specifically measures which address storage and transport of dangerous goods and hazardous substances.
Flooding	• sustainability, greenhouse gas and climate change, specifically relating to climate change risk treatments being confirmed and incorporated into the design (i.e. due to increased heavy rainfall events and potential flooding risks).
Social impacts	• transport, specifically measures regarding community notification and to manage potential access impacts • noise and vibration, specifically measures to minimise noise and vibration impacts on sensitive receivers during construction and operation • non-Aboriginal heritage, specifically measures to minimise or avoid direct and indirect impacts on non-Aboriginal heritage items and areas • Aboriginal heritage, specifically measures to minimise or avoid impacts on Aboriginal cultural heritage • landscape and visual, specifically measures to manage potential amenity impacts • local business impacts, specifically measures to minimise impacts to businesses including small business owner engagement • air quality, specifically measures to manage potential amenity impacts from dust during construction.

Issue	Interactions
Local business impacts	• transport, specifically measures regarding community notification and to manage potential access impacts to businesses and parking • noise and vibration, specifically measures to minimise noise and vibration impacts on businesses during construction and operation • landscape and visual, specifically measures to manage potential amenity impacts on businesses during construction and operation • air quality, specifically measures to manage potential amenity impacts from dust during construction for local businesses.
Biodiversity	• landscape and visual, specifically measures relating to the landscape design incorporating species to support urban biodiversity, tree retention and replacement, and to minimise light spill impacts on surrounding receivers including fauna • soils, contamination and groundwater, specifically measures which address potential impacts to groundwater ecosystems • noise and vibration, specifically measures to minimise noise and vibration impacts that have the potential to result in indirect impacts on fauna during construction and operation • hydrology and water quality, specifically measures to minimise ecological impacts from the discharge of treated construction water and from the operational water treatment plants, and for erosion and sedimentation controls to avoid impacts on aquatic habitat • air quality, specifically measures which address dust impacts from spoil handling and stockpiles, reducing potential impacts on surrounding vegetation.
Property	• transport, specifically measures that address maintaining access to existing properties.
Air quality	• soils and contamination, specifically measures which address the management of contaminated soils and groundwater during construction, including vapours and gas • hazard and risk, specifically measures which address appropriate handling and management of hazardous materials or asbestos.
Sustainability, climate change and greenhouse gas	• landscape and visual, specifically measures that address mitigating and minimising vegetation removal impacts, including tree retention and replacement • flooding, specifically measures that address potential flooding impacts and an outline of flood impact criteria that would be adhered to for this proposal • waste management and resource use, specifically measures that address potential resource and waste generation impacts, including spoil management and reuse targets.
Waste management and resource use	• transport, specifically measures which address potential traffic and transport impacts from spoil transport • noise and vibration, specifically measures which address potential noise and vibration impacts from spoil transport • hydrology and water quality, specifically measures which address wastewater management and water treatment, and potential erosion and sedimentation impacts • soils, groundwater and contamination, specifically measures which address the management of high contamination risk areas, including opportunities to remove contamination prior to earthworks • sustainability, climate change risk and greenhouse gas, specifically measures which address resource consumption and targets for reuse of resources • air quality, specifically measures which address dust impacts from spoil handling and stockpiles.

Issue	Interactions
Hazard and risk	• flooding, specifically measures which address flooding risks during construction and operation • groundwater and geology, specifically measures which address potential settlement impacts, including on structures • soils, groundwater and contamination, specifically measures which address potential contamination impacts from existing sources and from this proposal • sustainability, greenhouse gas and climate change, specifically measures which address climate change risks such as extreme heat • waste management and resource use, specifically measures relating to disposal of hazardous materials.
Hydrology and water quality	• soils, contamination and groundwater, specifically measures relating to the management of contaminated soils and groundwater, and to minimising groundwater inflows for the management of drawdown impacts to surface water systems including groundwater dependent ecosystems • sustainability, climate change and greenhouse gas, specifically objectives and targets relating to water management and reuse • waste management and resource use, specifically objectives and targets relating to wastewater management.

20.7.6 Performance outcomes

The Secretary's environmental assessment requirements for this proposal identified a number of desired performance outcomes. These outline the broader objectives to be achieved during design and construction of this proposal.

Table 20-6 identifies the Sydney Metro West performance outcomes, which have been generated as part of the *Sydney Metro West Environmental Impact Statement – Major civil construction work between Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) and outlines how this proposal addresses these outcomes. Design development and any design changes would also be considered against these environmental performance outcomes. Appendix A (Secretary's environmental assessment requirements) outlines where the Planning Secretary's environmental assessment requirements, including the desired performance outcomes, are addressed in this Environmental Impact Statement.

Table 20-6 Performance outcomes

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
Biodiversity		
The proposal design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Offsets and/or supplementary measures are assured which are equivalent to any residual impacts of proposal construction and operation.	Construction: • impacts on biodiversity are avoided (where possible) and minimised, including the clearing of native vegetation • significant impacts to flow regimes in receiving waterways are avoided • design of waterway modifications and crossings incorporates best practice principles • the Concept does not contribute to key threatening processes associated with weeds and pathogens • biodiversity impacts are offset in accordance with the *Biodiversity Conservation Act 2016*.	The construction footprint of this proposal is predominantly in built up areas and within the area that would be cleared as part of the work carried out under the previous Sydney Metro West planning applications. As a result, there is little vegetation or other habitat value present that would be affected by this proposal. The limited amount of native vegetation to be disturbed is of poor to moderate quality and threatened species habitats are very limited. Impacts to threatened species and communities were assessed as negligible. As most construction sites are not located within or adjacent to major overland or mainstream flow paths, and following the implementation of mitigation measures, there is a low potential to impact flow regimes. The likelihood of this proposal contributing key threatening processes associated with weeds and pathogens is low. The CEMF includes a requirement to implement weed management measures and mitigation measures to prevent introduction and spread of amphibian chytrid fungus, *Phytophthora cinnamomi* and exotic rust fungi. Further details on biodiversity impacts and mitigation are provided in Part B (Environmental assessment) of this Environment Impact Statement.
Business		
The proposal minimises impacts to business function and property including maintenance of appropriate access to businesses.	Operation: • potential impacts to businesses are minimised • connectivity is improved to, from and between businesses in Greater Parramatta, the Sydney CBD and other centres.	Sydney Metro West would improve connectivity between the Parramatta and Sydney CBDs and to key centres within the corridor. This would support business investment and growth.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
	Construction: • potential impacts to businesses are minimised • affected businesses are communicated with in a clear and timely manner to reduce disruption and address concerns • access to businesses for employees and customers is maintained • assistance is provided to businesses that are adversely impacted.	The design development of this proposal has aimed to avoid or minimise potential business impacts by avoiding additional privately owned land needed for construction sites to reduce direct impacts on businesses (where possible). The design and construction planning has also aimed to maintain customer and vehicular delivery access for existing businesses. Small business owner engagement would be undertaken to assist small business owners adversely impacted by construction. Further details on business impacts are provided in Part B (Environmental assessment) of this Environmental Impact Statement.
Design, place and movement		
The proposal is well-designed and enhances the environment where it is located, including optimising accessibility and connectivity for communities, improving quality of places for people walking, cycling and using public transport, and enhancing public spaces. The proposal contributes to greener places, facilitating the enhancement and provision of green infrastructure. The proposal minimises adverse impacts on the visual amenity of the built and natural environment (including public open space).	• the design reflects the Sydney Metro Design Objectives and the place and design principles • the Sydney Metro Design Quality Framework is implemented • Metro stations contribute positively to the surrounding urban environment and provide a sense of place • no net loss of tree numbers and tree canopy.	This proposal would allow for the implementation of the Sydney Metro Design Objectives and place and design principles, as well as the Design Quality Framework. The design of stations reflects the place and design principles to provide a positive contribution to the urban environment. This proposal includes a commitment to replace trees at a ratio of 2:1 within 10 years of the date of approval for the Concept or no later than the commencement of operations (whichever is earlier) and achieve an increase in tree canopy coverage (in accordance with Concept conditions of approval C-B8 and C-B9).

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
Flooding and hydrology		
The proposal minimises adverse impacts on existing flooding characteristics. Construction and operation of the proposal avoids or minimises the risk of, and adverse impacts from, infrastructure flooding or flooding hazards. Long-term impacts on surface water and groundwater hydrology are minimised. The environmental values of nearby, connected and affected water sources, including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved). Sustainable use of water resources.	Operation: • increases in flood levels are minimised, particularly within private properties, during events up to and including the one per cent annual exceedance probability (AEP) • no additional private properties are affected by flood events up to and including the one per cent AEP • the potential for soil erosion and scouring is minimised for events up to and including a one per cent AEP event • dedicated evacuation routes are not impacted in flood events up to and including the probable maximum flood (PMF) • the performance of the downstream drainage network is maintained. Construction: • dedicated evacuation routes are not impacted in flood events up to and including the PMF.	Design development would include consideration of relevant best practice guidelines and include: • identification of measures to not worsen flood impacts on the community and on other property and infrastructure, up to and including the one per cent AEP flood event • provide flood protection for the nominated station or facility entry threshold level. Flood protection would be integrated into the architectural/urban design strategy for this proposal. The following criteria would be met for this proposal: • a maximum increase in flood levels of 50mm in a one per cent AEP event • a maximum increase in time of inundation of one hour in a one per cent AEP event • no increase in potential soil erosion and scouring from any increase in flow velocity in a one per cent AEP flood event. Construction of this proposal would be carried out in a manner that minimises the potential for adverse flooding impacts, through staging of works and the implementation of mitigation measures. This proposal would avoid impacts to dedicated evacuation routes in flood events up to and including the PMF (during construction) at most sites. As part of the CEMF, construction planning regarding flooding matters would be carried out in consultation with the NSW State Emergency Service and the relevant local council. Further details on flooding and hydrology impacts and mitigation are provided in Part B (Environmental assessment) of this Environmental Impact Statement).

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
Heritage		
The design, construction and operation of the proposal, to the greatest extent possible, the long-term protection, conservation and management of the heritage significance of items of environmental heritage. The design, construction and operation of the proposal avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage.	Operation: • design is sympathetic to retained and adjacent heritage items • appropriately qualified and suitably experienced heritage architect and relevant stakeholders are consulted during design • the design of stations includes non-Aboriginal heritage interpretation. Construction: • direct impacts on World Heritage and National Heritage List items are avoided • impacts on State Heritage Register items are avoided or minimised so that the overall heritage value of the item is maintained • impacts to non-Aboriginal heritage items and archaeology are avoided or minimised where feasible and reasonable • accidental impacts to heritage items are avoided.	The design of this proposal would be sympathetic to the historic significance of surrounding listed heritage items, and where practicable, avoids and minimises impacts to heritage. These principles are outlined in the Design Guidelines (refer to Appendix E). This proposal would be reviewed by the Design Review Panel to assist in meeting design objectives and achieving quality design outcomes. A Draft Heritage Interpretation Strategy has been prepared for this proposal (refer to Appendix K), which would be updated to reflect findings of further detailed heritage investigations. The Draft Heritage Interpretation Strategy (Appendix K) also includes how Aboriginal heritage values would be interpreted and reflected within the design, including at Sydney Metro West stations. Sydney Metro is piloting the Connect with Country framework and developing a corridor-wide approach to connect with Country and an ongoing approach to Aboriginal engagement. As part of the pilot Sydney Metro is working with Aboriginal knowledge holders in the development of heritage interpretation and throughout design development. This proposal would predominantly involve the continued use of construction sites used by the previous Sydney Metro West planning applications. This would avoid direct impacts to State and local heritage items where possible. This proposal would continue to retain and protect heritage items within the construction sites, including Kia Ora at Parramatta and the former Skinners Family Hotel in the Sydney CBD.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
		This proposal would also limit potential archaeological impacts to those locations where additional construction footprints would be required for this proposal. Accidental impacts to heritage items would be avoided through the implementation of the CEMF (Appendix F). Further details on non-Aboriginal heritage impacts and mitigation are provided in Part B (Environmental assessment) of this Environmental Impact Statement.
Noise and vibration		
Construction noise and vibration (including airborne noise and ground-borne noise) are effectively managed to minimise adverse impacts on acoustic amenity, and adverse impacts on the structural integrity of buildings and items. Noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the proposal are effectively managed to protect the amenity and wellbeing of the community.	Operation: • operational noise and vibration levels comply with the rail noise trigger levels in the *Rail Infrastructure Noise Guidelines* (Environment Protection Authority, 2013) and external noise criteria in the *Noise Policy for Industry* (Environment Protection Authority, 2017), where applicable. Construction: • construction noise and vibration impacts on local communities are minimised by controlling noise and vibration at the source, on the source to receiver path and at the receiver • structural damage to buildings and heritage items from construction vibration is avoided.	The design of the underground and aboveground sections of the rail line would achieve the trigger levels from the *Rail Infrastructure Noise Guidelines* (Environment Protection Authority, 2013) through the use of appropriate track form. Fixed facilities at stations and ancillary infrastructure generally meets the applicable criteria derived from the *Noise Policy for Industry* (Environment Protection Authority, 2017). This would continue to be considered as part of future design development. This proposal would minimise construction noise impacts to the local community by: • controlling noise and vibration at the source • controlling noise and vibration on the source to receiver transmission path • implementing feasible and reasonable measures to minimise the noise and vibration impacts of construction activities on local sensitive receivers.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
		This proposal would minimise impacts to structures by: • controlling vibration at the source • controlling vibration on the source to receiver transmission path • implementing feasible and reasonable measures to minimise vibration impacts of construction activities on structures. Further details on noise and vibration impacts and mitigation are provided in Part B (Environmental assessment) of this Environmental Assessment).
Social		
The proposal provides socially sustainable outcomes. The proposal maximises the social and economic welfare of the community. The proposal delivers good development outcomes by minimising negative social impacts and enhancing positive social impacts on affected communities.	Operation: • negative impacts on customers and the community (including transport services, amenity, noise and vibration, water management and air quality) are minimised • impacts on the availability and quality of public open space and social infrastructure are avoided • access to local facilities, services and destinations is improved, supporting opportunities for community interaction and improving social cohesion • placemaking at stations provides a focal point for the community improving social cohesion • legacy projects are delivered to benefit local communities. Construction: • negative impacts on customers and the community (including transport services, amenity, noise and vibration, water management and air quality) are minimised	The design of this proposal has aimed to avoid and minimise impacts on the availability and quality of public open space and social infrastructure. There would be some potential indirect impacts on social infrastructure (such as places of worship in Parramatta, schools and nursing homes in Burwood North, cultural facilities and bicycle infrastructure in Pyrmont, and pedestrian accessibility in the Sydney CBD). Some public open space and public domain areas in Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays and Sydney CBD would experience potential indirect impacts during construction. There would be no direct impacts to open space and social infrastructure. Mitigation measures have been proposed to address these potential impacts. These facilities and areas would also experience positive benefits during operation, such as improved accessibility and public domain improvements. Placemaking initiatives at stations would deliver new community focal points and potentially improve social cohesion.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
	• affected communities are communicated with in a clear and timely manner to enhance community benefits, reduce disruption and address community concerns.	Further details on social impacts are provided in Part B (Environmental assessment) of this Environmental Impact Statement. Community engagement activities carried out to date and the framework for future community engagement is detailed in Chapter 3 (Stakeholder and community engagement) of this Environmental Impact Statement.
Transport and traffic		
The project minimises adverse transport and traffic impacts and optimises transport and traffic functioning. The project minimises and manages impacts to network connectivity, safety and efficiency of the transport system during construction.	Operation: • the modal access hierarchy is implemented at stations • sufficient customer capacity in stations and station plazas is provided to limit crowding or queuing in accordance with Fruin's level of service C (for 2056 demand) • stations and interchanges are fully accessible and compliant with the *Disability Discrimination Act 1992* (Cth) and the *Disability Standards for Accessible Public Transport 2002*. Construction: • construction traffic and transport impacts on special events are minimised • safe routes for pedestrians and cyclists are provided around construction sites • safe access to properties is maintained • road occupancy is minimised, particularly in the Parramatta and Sydney CBDs • changes to the travel paths of road users, including bus routes, are minimised • affected emergency services and public transport operators are provided early communication on changes in traffic conditions • loss of on-street parking and loading zones is minimised	The design of all stations has implemented the modal access hierarchy. Stations have been designed to achieve Fruin's level of service C for the expected customer demand. Key footpaths around stations generally achieve Fruin's level of service C. Where this is not achieved, Sydney Metro would continue to consult with relevant stakeholders to investigate the need for and implementation of appropriate measures. All stations and interchanges have been designed to be fully accessible and compliant with the *Disability Discrimination Act 1992* (Cth) and the *Disability Standards for Accessible Public Transport* (Australian Government, 2002). The design development of this proposal has included a focus on minimising the need for works within the existing rail corridors (at Westmead, Parramatta and North Strathfield) and avoiding direct impacts to major roads where possible.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
	• heavy vehicle routes are developed in consultation with relevant parts of Transport for NSW • the use of local roads by heavy vehicles is minimised • safe access and egress is provided to and from construction sites.	The need for pedestrian and cyclist diversion has been avoided where possible (for example, a temporary pedestrian route would be provided through the Parramatta metro station construction site during construction). Similarly, the need for diversions of existing bus routes has been minimised as far as possible (for example, at Westmead metro station by keeping Alexandra Avenue open for the majority of the construction period). Impact on existing parking would be minimised by limiting the extent of construction sites, having dedicated access/egress points and by encouraging workers to use public transport. Where more substantial loss of existing parking is expected, such as at North Strathfield and Five Dock, the CTMF includes a commitment to work with the local council to investigate opportunities to provide alternative parking facilities. Construction vehicle routes for this proposal were developed in consultation with Transport for NSW to minimise the use of local roads and use the most efficient route to the arterial road network. Left in/left out or straight through access-egress is proposed at most construction sites. Where this is not practicable, safe right turn movement would be manageable due to existing or proposed traffic volumes, sight distances or other appropriate measures. The CTMF provides a range of measures that would be implemented including measures to: • maintain pedestrian, cyclist and motorist safety around construction sites • maintain safe access to properties • provide ongoing consultation with emergency services and other transport operators.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
		Further details on transport impacts and mitigation are provided in Part B (Environmental assessment) of this Environmental Impact Statement.
Water - Quality		
The proposal is designed, constructed and operated to protect the NSW Water Quality Objectives (WQOs) where they are currently being achieved, and contribute towards achievement of the WQOs over time where they are currently not being achieved, including downstream of the proposal to the extent of the proposal impact, including estuarine and marine waters (if applicable).	Operation: • the water quality criteria for water discharge, determined in consultation with NSW Environment Protection Authority, is met. Construction: • the discharge water quality requirements outlined in applicable environment protection licence(s) are met • existing water quality of receiving surface watercourses is maintained.	Discharges from the operational water treatment plant for this proposal would be monitored for compliance with the water quality criteria that would be developed in consultation with the NSW Environment Protection Authority. As identified in Appendix F (Construction Environmental Management Framework), standard erosion and sediment control measures would be implemented for all surface works areas to minimise pollutant loading to the downstream waterways during construction of this proposal. Wastewater would be treated to comply with the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines, the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) and the draft ANZG (2020) guidelines or the discharge water quality requirements outlined in applicable environment protection licence(s). Runoff from construction sites would be designed to meet the standards outlined in *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) and *Volume 2D* (NSW Department of Environment and Climate Change, 2008a), commonly referred to as the 'Blue Book. With these management measures, pollutant loading to the receiving waterways would be low, with the possibility of improved water quality where existing water quality does not meet the above guidelines. Further details on water quality impacts and mitigation are provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
Other		
	Aboriginal heritage	
	Operation: • the design of stations includes Aboriginal heritage interpretation in consultation with registered Aboriginal parties. Construction: • impacts on areas of moderate or higher archaeological potential and significance are avoided or minimised, where feasible and reasonable • accidental impacts to heritage items are avoided.	Impacts to Aboriginal heritage have been minimised by avoiding direct impacts to previously recorded Aboriginal sites where possible and by locating construction sites within the footprint of the area disturbed as part of work carried out under the previous Sydney Metro West planning applications. A Draft Heritage Interpretation Strategy has been prepared for this proposal (refer to Appendix K), which would be updated to reflect findings of further detailed heritage investigations. Accidental impacts to heritage items would be avoided through the implementation of the CEMF (Appendix F). Further details on Aboriginal heritage impacts and mitigation are provided in Part B (Environment assessment) of this Environmental Impact Statement.
	Air quality	
	• air quality impacts are minimised during construction and operation.	This proposal includes a commitment to implementing best practice dust and odour management measures predominantly within the construction footprint. Air quality impacts would be minimised during operation by venting air from stations and tunnels through the ventilation outlets incorporated into the stations and at the services facility. The design of these outlets would ensure that the discharged air would be quickly dispersed into the ambient environment. This proposal would also result in a shift from private vehicle usage to public transport, thereby resulting in a minor reduction in emissions.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
		Further details on air quality impacts and mitigation are provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.
	Climate change and greenhouse gas	
	Operation: • comprehensively address climate change risks during the design life of Sydney Metro West for all risks rated 'medium' or higher • the critical State significant infrastructure must be designed to withstand known impacts associated with climate change to year 2100 • 100 per cent of the greenhouse gas emissions associated with consumption of electricity during operation are offset. Construction: • 25 per cent of the greenhouse gas emissions associated with consumption of electricity during construction are offset.	Climate change risk treatments would be confirmed and incorporated into the detailed design for this proposal. This proposal includes a commitment to identify and mitigate all very high and high risks in relation to climate change throughout planning, design, construction and operation. This proposal would implement passive design features, such as maximising natural ventilation and natural daylight and energy efficiency of train systems during planning, design and construction. This proposal would be designed to withstand known impacts associated with climate change to year 2100. This proposal has made a commitment to offset 25 per cent of the greenhouse gas emissions associated with consumption of electricity during construction and to offset 100 per cent of the greenhouse gas emissions associated with consumption of electricity during operation. Further details on greenhouse gases and climate change and mitigation are provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.
	Sustainability	
	• the construction and operation of Sydney Metro West is consistent with the Sydney Metro Environment and Sustainability Statement of Commitment • sustainability initiatives are incorporated into the planning, design and construction of the Concept	This proposal would be consistent with the directions identified in the Sydney Metro Environment and Sustainability Statement of Commitment and has adopted sustainability principles, initiatives and targets that will be incorporated in a Sydney Metro West Sustainability Plan.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
	• Infrastructure Sustainability Council of Australia (ISCA) IS rating of (Version 1.2) (or equivalent level of performance using a demonstrated equivalent rating tool) and a 5-Star Green Star rating (or equivalent level of performance using a demonstrated equivalent rating tool) are achieved during design and construction for appropriate components • design of stations and stabling buildings achieve at least a 15 per cent improvement over performance requirements set out in Section J of the National Construction Code.	This proposal includes a commitment to achieving an equivalent or improved level of sustainability performance compared to previous metro projects. This would include achieving and Infrastructure Sustainability Council of Australia (ISCA) IS rating of 75 Version 1.2 (or equivalent) as Design and As-Built and a 5-Star Green Star rating (or equivalent) depending on specific component. This proposal would achieve a minimum 15 per cent improvement on the current (2019) minimum performance requirement stipulated in the National Construction Code/Building Code of Australia in relation to the design of stations and stabling buildings. Further details on sustainability are provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.
	Hazard and risk	
	• dangerous goods are transported, stored and used so as to not cause a hazardous event.	Potential hazards associated with the on-site storage, use and transport of chemicals, fuels and materials used during this proposal would be managed in accordance with the CEMF, *Work Health and Safety Act 2011*, the Work Health and Safety Regulation 2017, the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and Applying the State environmental planning policy (SEPP) 33 (NSW Department of Planning, 2011). Further details on hazards and mitigation are provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
	Property and land use	
	Operation: • future land use opportunities within metro station precincts are developed in cooperation with (as relevant) the NSW Department of Planning and Environment, the Greater Sydney Commission, and local councils • transport infrastructure is effectively integrated with land use planning. Construction: • acquisition of privately owned land is minimised by limiting the extent of construction sites and using existing government-owned land where possible • residual land at the completion of construction is minimised • the need for partial acquisitions is minimised.	Sydney Metro has been working with relevant stakeholders so that the stations and precincts are integrated with future land use opportunities. This includes but is not limited to: • NSW Department of Planning and Environment to integrate with the Westmead Place Strategy • Sydney Olympic Park Authority (now NSW Department of Planning and Environment) to integrate with the Sydney Olympic Park master plan • NSW Department of Planning and Environment to integrate with The Bays master planning • NSW Department of Planning and Environment to integrate with the Pyrmont Peninsula Place Strategy • NSW Department of Planning and Environment to integrate with the Camellia-Rosehill Place Strategy • relevant local councils to integrate with local plans. Station locations have been selected to link, jobs, education, health and other services. Stations also create opportunities for integrated station and precinct developments that provide for community needs, including consideration of relevant planning controls and local character. At relevant sites, the design of stations also makes provision for over and/or adjacent station developments. Construction sites for this proposal have also been located within existing property boundaries and, for the most part, are located within the areas established as part of the previous Sydney Metro West planning applications.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
		Construction sites for this proposal have been located to avoid the need for additional private property acquisition and maximise use of government-owned land where possible (such as at The Bays where permanent acquisition of a portion of land owned by Place Management NSW would be required). Construction sites have also been optimised, taking into account expected operational requirements for the stations, as well as considering the key construction requirements. In all cases, the construction footprint for this proposal has been reduced as much as practicable to minimise the need for land acquisition and temporary property impacts. Residual land has been minimised to one location around the Clyde stabling and maintenance facility and Rosehill services facility. In accordance with Concept condition of approval C-B2 (b), Sydney Metro is considering the future use of this residual land in consultation with the City of Parramatta Council and the NSW Department of Planning and Environment. Further details on property impacts and mitigation are provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement. Further details on land use impacts and mitigation are provided in Part B (Environmental assessment) of this Environmental Impact Statement.
	Soils	
	Construction: • impacts on aquatic environments from the disturbance of acid sulfate soils are avoided • pollution of surface water is minimised through the implementation of appropriate erosion and sediment controls.	As identified in Appendix F (Construction Environmental Management Framework), this proposal would manage acid sulfate soils in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998). The manual includes procedures for the investigation, handling, treatment and management of such soils.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
		Erosion and sediment measures would be implemented at all construction sites in accordance with the principles and requirements in *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) and *Volume 2D* (NSW Department of Environment and Climate Change, 2008a), commonly referred to as the 'Blue Book'. Further details on soil impacts and mitigation are provided in Part B (Environmental assessment) of this Environmental Impact Statement.
	Contamination	
	Operation: • residual contamination does not pose a risk to Sydney Metro customers or staff. Construction: • contamination risks to human health and ecological receivers are minimised through effective management of existing contaminated land • contaminated land is remediated to be suitable for the intended future land use.	Contaminated land, where present, would be investigated and remediated during construction. The potential for ongoing management of offsite contaminated groundwater in operation would be managed through appropriate design and treatment at the operational water treatment plant. Work carried out under the previous Sydney Metro West planning applications would seek to avoid or minimise potential interaction with known contaminated sites and appropriately manage and remediate contaminated material where present. The approach to management and mitigation of contamination for this proposal would follow the same process established for the previous Sydney Metro West planning applications, including the relevant conditions of approval (conditions D71 to D78). These processes would ensure that residual contamination does not pose a risk to Sydney Metro customers or staff and that the land is suitable for the intended future land use. Further details on contamination impacts and mitigation are provided in Part B (Environmental assessment) of this Environmental Impact Statement.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
	Groundwater	
	• groundwater supply for licenced groundwater users is not significantly affected by groundwater drawdown • the groundwater accessible to groundwater dependent ecosystems is not significantly reduced • structural damage to buildings from ground movement associated with excavation, tunnelling or groundwater drawdown is avoided.	The work carried out under the previous Sydney Metro West planning applications would minimise potential groundwater impacts by tanking stations at Parramatta, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD), as well as crossover caverns near Westmead metro station and Burwood North Station, and the mainline tunnels to avoid ongoing groundwater inflow. Groundwater modelling to confirm the potential groundwater drawdown impacts and flow patterns would be undertaken for work carried out under the previous Sydney Metro West planning applications. This would be reviewed and updated to confirm potential groundwater impacts for this proposal. The specific risk to most buildings and structures due to ground movement would be managed as part of the work carried out under the previous Sydney Metro West planning applications. The potential for further ground movement (and therefore potential impacts to buildings and structures) as a result of construction of this proposal would be limited. Where building damage risk is rated as moderate or higher (as per the CIRIA 1996 risk-based criteria (Godfrey, 1996)), a structural assessment of the affected buildings/structures would be carried out and specific measures implemented to address the risk of damage. Further details on groundwater impacts and mitigation are provided in Part B (Environmental assessment) of this Environmental Impact Statement.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
	Waste management and resource use	
	Operation: • the use of potable water for non-potable purposes is avoided if non-potable water is available • the reuse of water is maximised, either on site or off-site. Construction: • 100 per cent of useable spoil is reused in accordance with the spoil reuse hierarchy • a minimum 95 per cent recycling target is achieved for construction and demolition waste • products made from recycled content are prioritised • the use of potable water for non-potable purposes is avoided if non-potable water is available • the reuse of water is maximised, either on site or off-site.	The design of Sydney Metro West tunnels and station excavation took into consideration the waste hierarchy by aiming to reduce the volume of spoil generated, as far as practical. While there is limited excavation required, this proposal would beneficially reuse 100 per cent of reusable spoil, in accordance with the spoil management hierarchy. Spoil would be assessed for its reuse potential according to the hierarchy of options established in the *Sydney Metro West Environmental Impact Statement – Westmead to the Bays and Sydney CBD* (Sydney Metro, 2020a). Spoil that cannot be reused would be classified in accordance with NSW Waste Classification Guidelines. This proposal would adopt a construction waste recycling target of at least 95 per cent and would reuse at least 80 per cent of train wash water at the stabling and maintenance facility. Rainwater would be harvested and reused at permanent and temporary facilities where possible to avoid the need to use potable water. This proposal would also minimise the embodied impacts of concrete through the adoption of a supplementary cementitious materials use target and set targets for the use of alternate binder systems on non-structural elements. Further details on waste and resource impacts and mitigation are provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.

Desired performance outcome from Secretary's environmental assessment requirements	Sydney Metro West Concept performance outcomes	How this proposal addresses performance outcomes
	Cumulative impacts	
	Construction: • cumulative impacts are minimised through co-ordination of construction activities and communication processes with nearby projects.	This proposal includes a commitment to coordinating and consulting with relevant stakeholders to manage the interface of projects under construction at the same time. This would include: • provision of regular updates to the detailed construction program, construction sites and haul routes • identification of key potential conflict points with other construction projects • developing mitigation strategies in order to manage potential conflicts. Further details on cumulative impacts and mitigation are provided in Chapter 19 (Cumulative impacts) of this Environmental Impact Statement.

20.8 Summary of impacts that have not been avoided

20.8.1 Outline of strategies to avoid potential impacts

Many potential impacts have been avoided through the project development process, which included input from key stakeholders and the community. In particular, locating the project almost entirely underground would avoid or reduce most major environmental impacts.

Residual environmental impacts have been minimised through the specific design and the construction methods chosen, as well as application of comprehensive mitigation and management measures that have been shown to be effective on previous construction projects. Design development and refinements would continue to further minimise any residual impacts.

Despite this, it is not unexpected that a proposal of this scale and nature being constructed in a highly urbanised environment would still have potential residual impacts that are unavoidable, particularly during construction.

20.8.2 Impacts that have not been avoided and will require mitigation

This section provides a summary of these unavoidable impacts for this proposal.

Part B (Environmental assessment) of this Environmental Impact Statement provides an assessment of the potential impacts of this proposal. The key potential impacts requiring mitigation and management are summarised in Table 20-7.

Potential impacts would be mitigated by implementing comprehensive environmental management procedures and plans. These are described in Section 20.7.

Table 20-7 Key potential impacts requiring mitigation and management

Issue	Potential impact
Operational transport	This proposal would provide substantial improvements to the transport network by more than doubling rail capacity between Parramatta and the Sydney CBD and reducing crowding on parts of the existing network. Local transport benefits would also be realised with improvements to the pedestrian and cycling networks around stations. Notwithstanding, there are some potential operational transport impacts including: • potential decline in intersection performance, particularly at Westmead, The Bays and Pyrmont. Sydney Metro is continuing to work with relevant stakeholders to investigate opportunities to improve performance at these locations • removal of a number of on-street parking spaces to provide transport interchange facilities at metro stations. On average, this would represent the removal of a small number of on-street parking spaces across the metro stations.
Construction transport	• temporary increase in construction traffic on the local and regional road network, resulting in potentially temporary increased congestion and delays, particularly at Westmead (during the 12-18 month closure of Alexandra Avenue), Parramatta, Five Dock, Pyrmont and The Bays. Construction site traffic would be managed to minimise movements during peak periods and avoid school zones during pick up and drop off times • potential temporary local traffic disruptions and short-term access restrictions and detours for road users. Directional signage and line marking would be used to direct and guide drivers and pedestrians past construction sites and on the surrounding network. This would be supplemented by variable message signs to advise drivers of potential delays, traffic diversions, speed restrictions, or alternate routes • potential temporary access restrictions for pedestrians and cyclists within and surrounding the construction sites such as Horwood Place in Parramatta. Most of these would be a continuation of arrangements established as part of work carried out under the previous Sydney Metro West planning applications. Access to existing properties and buildings would be maintained in consultation with property owners • potential temporary impacts to the public transport network, particularly in Westmead during the 12-18 month closure of Alexandra Avenue, associated with the temporary relocation of bus stops and changes to bus routes resulting in minor impacts to commuters

Issue	Potential impact
	• potential temporary pedestrian and cyclist safety impacts near construction site access and egress points where construction vehicles would interact with the public. Vehicle access to and from construction sites would be managed to maintain pedestrian, cyclist and motorist safety. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasions, police presence • several on and off-street parking spaces would be temporarily unavailable to the general public for the duration of construction. Most of these spaces would be a continuation of impacts established as part of work carried out under the previous Sydney Metro West planning applications.
Operational noise and vibration	In most cases, operational noise and vibration levels would comply with the applicable criteria from the relevant guideline; however, there are some minor potential impacts including: • potential exceedances at the Rosehill Garden racecourse stables from the stabling and maintenance facility. Sydney Metro is continuing to consult with the racecourse to determine appropriate criteria and mitigation measures • potential exceedances to a small number of residential receivers near Burwood North Station. Appropriate mitigation would be determined as part of detailed design to achieve compliance with the applicable criteria.
Construction noise and vibration	• given the nature and duration of works and the close proximity of receivers, airborne noise during construction is expected to temporarily exceed noise management levels at all sites – and at some sites by possibly more than 20 dBA. Noise intensive works within the construction sites would be completed during daytime hours where possible and standard mitigation measures as outlined in the Sydney Metro CEMF would be implemented. Regardless, 'moderate' worst-case temporary impacts are expected at some receivers • noise intensive work during the night-time would generally only be required for work that is necessary to be completed in or adjacent to the existing rail corridor at Westmead and North Strathfield. This work would be required to be completed during short-term rail possessions when trains are not operating. Night-time work would also be required for station/facility fit-out and activities associated with material delivery at rail system access shafts, however, the impacts from this work are generally much lower • potentially temporary highly noise affected receivers (subject to noise levels of 75 dBA or greater) at Westmead metro station, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Clyde construction sites. This would generally be for short-term or intermittent work • potentially temporary high sleep disturbance impacts at Westmead and North Strathfield construction sites; and moderate sleep disturbance impacts at Burwood North, Five Dock, Pyrmont construction sites. Perimeter site hoarding would be designed with consideration of on-site heavy vehicle movements with the aim of minimising sleep disturbance impacts • potential temporary ground-borne noise impacts at nearby receivers associated with excavation or earthworks at Parramatta, Clyde and Five Dock. Less ground-borne noise and vibration intensive alternative construction methodologies may be adopted where deemed feasible and reasonable • potential temporary exceedances of vibration criteria including cosmetic damage screening criteria, and human comfort criteria at several buildings closest to the Parramatta, Clyde and Five Dock construction sites. Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure • potential minor construction traffic noise impacts to receivers near the Westmead, Parramatta, Sydney Olympic Park, Five Dock, Clyde construction sites. Further assessment of construction traffic would be completed during detailed design and measures would be implemented to minimise temporary traffic noise impacts.

Issue	Potential impact
Non-Aboriginal heritage	• potential minor indirect impact to the views and setting of four local heritage items or conservation areas (at Parramatta, Burwood North, Five Dock and Pyrmont). Detailed design for above-ground station elements, ancillary facilities and public domain and landscaping work located in or near to heritage significant items, would have regard to the relevant heritage guidelines in order to minimise indirect impacts to heritage items • potential minor direct impact (removal of remaining southern portion of the heritage gardens) and potential moderate indirect impact to the views and setting to the section 170 and local heritage listed North Strathfield Railway Group at North Strathfield metro station construction site • potential moderate indirect impact to views and setting of the State heritage listed White Bay Power Station and former Skinners Family Hotel during operation at The Bays and Hunter Street, respectively • potential minor direct impact to archaeological remains associated with 1920s-era Telford road sub-surfaces at Westmead metro station construction site (within the additional footprint for this proposal in the road corridor). Where heritage items, including significant archaeology are impacted by this proposal, they would be considered for inclusion in the Heritage Interpretation Strategy (Appendix K) or place specific interpretation plans prepared as part of this proposal • potential moderate direct impact from partial removal of local heritage listed Convict Drain at Parramatta metro station construction site (removal of the drain where it is located within the site). Prior to the partial removal of the Convict Drain it would be archivally recorded as part of archaeological management in accordance with relevant recording provisions outlined in the approved Archaeological Research Design prepared for the Parramatta metro station site • potential minor to moderate settlement and vibration impacts to adjacent local and State-listed heritage items at Parramatta, The Bays and the Clyde stabling and maintenance facility construction site. Where vibration levels or ground movement is predicted to exceed the screening criteria, a more detailed assessment of the structure and monitoring would be carried out • potential minor temporary direct impact to State heritage listed White Bay Power Station due to construction of traction substation resulting in alteration to former yard area, however no impacts to built elements of the heritage item • potential minor to moderate temporary impacts to views and overshadowing of adjacent heritage items at Parramatta, North Strathfield, The Bays, Pyrmont and Hunter Street • potential moderate direct impact to State listed White Bay Power Station (inlet) canal during excavation for drainage works for this proposal at The Bays Station construction site.
Aboriginal heritage	• there is low potential for impact to Aboriginal objects, and any Aboriginal objects that might be located within the study area are likely to be within a disturbed context and would therefore be considered to be of low archaeological significance • potential need for further archaeological investigation and salvage of Aboriginal archaeological deposits associated with The Bays PAD-01 within the areas of additional footprint required for this proposal at The Bays Station construction site. If Aboriginal archaeological remains are recovered during construction, results would be incorporated into the Designing with Country strategy for this proposal in consultation with Aboriginal knowledge holders • potential for impact to unexpected Aboriginal objects. If unexpected Aboriginal objects are identified during construction work, the unexpected finds procedure would be implemented • in recognition of potential impacts to the Aboriginal cultural values of this proposal area, the line-wide Heritage Interpretation Strategy for Sydney Metro West would address Aboriginal cultural values and be prepared in consultation with the local Aboriginal community, knowledge holders and with reference to the Connecting with Country framework.

Issue	Potential impact
Landscape and visual amenity	• the operation of Sydney Metro West would provide placemaking and amenity benefits at station precincts. Stations are being designed to integrate with their surrounding areas, to make vibrant and attractive places that reflect the unique context and future aspirations for each place. The Sydney Metro West Station and Precinct Design Guidelines have been developed to guide the design of this proposal including for landscaping and heritage interpretation • opportunities for revegetation and to provide vegetation screening at the Clyde stabling and maintenance facility would be investigated during design development • potential continued temporary visual impacts as a result of construction activities including acoustic sheds (or other acoustic measures), machinery and equipment, site hoardings, partially complete structures, and other construction works. Construction mitigation measures to manage potential landscape and visual impacts of the proposal include addressing matters such as tree retention, appearance of acoustic sheds (or other acoustic measures) and site hoarding during construction, minimising lighting impacts and removal of graffiti • loss of landscaping vegetation providing amenity. Opportunities for the retention and protection of existing trees would be identified during detailed construction planning. Replacement of trees would be undertaken at a ratio of 2:1. • opportunities to provide temporary activation during construction in the vicinity of the Parramatta metro station construction site and the Five Dock Station western construction site would be explored in consultation with the City of Parramatta Council and City of Canada Bay Council respectively.
Soils, contamination and groundwater	• potential temporary soil erosion impacts from the exposure of soil to water runoff and wind during minor excavation works required for this proposal. This would be adequately managed with the implementation of standard erosion and sediment controls, which would be established through the CEMF • disturbance of existing contamination (soil in areas of additional footprint, groundwater, acid sulfate soils and saline soils) during construction potentially causing impact to human health or receiving environments. Most areas of environmental interest (AEIs) identified for this proposal are ranked low or very low. If contamination is encountered, it would be managed in accordance with relevant guidelines and mitigation measures including Detailed Site Investigations and Remediation Action Plans where required • potential new contamination from this proposal from spills of oils, fuels or chemicals from plant and equipment during construction or operation, although this would be readily manageable with standard measures • potential continued impacts to groundwater levels and flows at untanked structures, following the work carried out under previous Sydney Metro West planning applications. Further groundwater modelling to confirm the impacts and flow patterns would be undertaken for the work carried out under the previous Sydney Metro West planning applications. This would be further reviewed and updated as required for this proposal • potentially contaminated groundwater ingress into untanked structures (and negligible inflows to tanked structures) during construction and operation. Any groundwater ingress would be collected and treated in accordance with applicable water quality requirements. • potential risk of damage to existing buildings and structures due to potential ground movement during excavation at Parramatta metro station. Further investigations of potential ground movement impacts would be undertaken during detailed design and condition surveys of buildings and structures in the vicinity of excavations would be carried out prior to the commencement of excavation at each site • potential impacts to groundwater dependent ecosystems at some sites as well as surface water – groundwater interaction would be confirmed during further investigation under the work carried out for the previous Sydney Metro West planning application, and to identify any required mitigation during construction and through design

Issue	Potential impact
	• potential saltwater intrusion due to ongoing dewatering of the untanked shafts at The Bays, Pyrmont and Hunter Street during operation. Further groundwater modelling would be undertaken for the work carried out under the previous Sydney Metro West planning applications to assess whether saltwater intrusion during the operation phase could occur.
Flooding	• potential impacts (generally minor) to flood behaviour and floodplain storage during operation due to the establishment of infrastructure, including resulting impacts to adjacent properties and drainage infrastructure. As part of design development, including for drainage infrastructure, consideration would be given to the flood risk at all sites. Design development would include identification of measures to not worsen flood impacts on the community and on other property and infrastructure, up to and including the one per cent AEP flood event. Design development would also identify measures to provide flood protection for the nominated station or facility entry threshold level • stations would be designed to be protected from the one per cent AEP with climate change flood event (plus freeboard), with the exception of Parramatta metro station and Clyde stabling and maintenance facility which would be designed to be protected from the PMF event • potential for inundation of construction areas during flood events particularly in areas where flooding currently occurs (such as high flood risk areas in Parramatta metro station construction site and The Bays Station construction sites). Detailed construction planning would consider flood risk at construction sites • minor potential flooding impacts associated with the interruption of overland flow paths by installation of temporary construction site infrastructure (i.e. noise barriers, acoustic sheds (or other acoustic measures), retaining walls) and/or modifications to landforms (i.e. placement of fill materials, stockpiles). Key areas of potential flooding risk include the Parramatta metro station and The Bays Station construction sites. Construction planning regarding flooding matters would be carried out in consultation with the NSW State Emergency Service and the relevant local council.
Social impacts	• temporary changes to local amenity and access for local social infrastructure and services, potentially resulting in negative community perception, community interactions and connectedness. Consultation would be carried out with managers of social infrastructure located near construction sites about the timing and duration of construction works and management of potential impacts, with the aim of minimising potential disruption to the use of the social infrastructure from construction activity • the community's enjoyment of nearby community facilities may potentially be temporarily reduced where they are located close to construction sites • time delay related stress and temporary changes to the way of life for people living, working, or accessing services near the construction site including greater construction interface with customers on the existing Sydney Trains platform, or changes to transport, temporary changes to bus stops, parking, footpaths and pedestrian crossings. Some disruption and changes are inevitable due to construction activity; however, traffic management measures would minimise these impacts. The Sydney Metro West OCCS would also include a complaint handling process to facilitate community feedback on potential construction impacts are followed up and measures reviewed and amended if required • potential changes to community character, such as changes to streetscape, access, businesses, increased number of workers and visitors in the area due to construction activities resulting in changes to connections to the surrounding area and belonging. Consultation would be carried out with stakeholders to identify opportunities for public art at stations, plazas and precincts to reflect community values, culture and identity of the local community

Issue	Potential impact
	• potential wellbeing impacts associated with construction activities, including sensitivity to noise and vibration, dust and air quality, and visual impacts. Potential decline in social amenity and ability to experience surroundings and living environments in the way the community have done in the past to due to ongoing operational noise and light spill. Management measures would be implemented during construction and operation to manage negative impacts on local amenity • impacts to cultural festivals and Aboriginal and non-Aboriginal heritage items of significance adjacent to the Parramatta metro station construction site, with impacts to communities' connection to place, shared histories and the future of their community. Measures would be in place to mitigate impacts to culture associated with heritage items, over the longer term, such as by working with festival organisers, construction activity and traffic management practice would be adjusted or temporarily changed to minimise potential conflicts during special or cultural events in the Paramatta CBD. Opportunities to offset temporary changes to community culture would be considered in the Community Benefit Plan • potential decline in how people experience their surroundings due to presence of new stations and ancillary facilities during operation, and the perception of increased potential for antisocial behaviour. Active monitoring of any changes to crime statistics would help to proactively identify crime prevention and social intervention strategies as adaptive management strategies, if required.
Local business impacts	• potential temporary reduction in passing trade for pedestrian traffic due to footpath closures or hoarding potentially restricting visibility of businesses that are reliant on passing trade (e.g. cafes). Clear pathways and signage would be implemented around construction sites to maximise visibility of retained businesses, including sufficient lighting along pedestrian footpaths during night-time where relevant • temporary changes to the road network, including temporary parking loss has the potential to affect deliveries and convenience for business employees and customers. Consultation would occur with the relevant local council to investigate opportunities to provide alternative parking facilities • slight to moderate potential impacts to businesses from temporary environmental impacts such as impacts from noise, vibration, dust, and visual amenity during construction. Small business owner engagement would be carried out to assist small business owners adjacent to major construction sites that are adversely impacted by construction. Management measures would be implemented during construction to manage negative impacts on local amenity • as a result of the work carried out under the previous Sydney Metro West planning applications, some local customers could have redistributed their trade towards similar locally serving businesses within other parts of the study area or the surrounding area which would be a negative impact for those businesses that potentially experience a reduction in trade. This redistribution of trade could continue during construction of this proposal • some businesses may have experienced continued impacts associated with traffic congestion and increased travel times during construction of this proposal. Measures to improve road network performance are outlined in the CTMF and may include managing construction vehicles to minimise movements during peak periods, traffic signal optimisation at an intersection or corridor level, active traffic management including the use of closed-circuit television cameras in conjunction with portable variable message signs to advise drivers of potential delays or the availability of less congested alternative routes • unplanned power and utility interruptions could result in business impacts during interruptions. Given the physical separation between the construction sites and the surrounding businesses, and that most utility works would be completed as part of the work carried out under the previous Sydney Metro West planning applications, any substantial impact from unplanned power and utility interruptions is considered to be unlikely. Planned power and utility interruptions would be scheduled to before or after typical business hours where feasible and reasonable. Prior notice would be provided to all affected business owners of the interruptions

Issue	Potential impact
	• there is potential for businesses to experience a temporary reduction in patronage due to perceptions related to safety and security when travelling through the local business study area. These perceived impacts are likely to be limited to retail and cafes and restaurants that would normally continue trading into the evening. Hoarding and screening impacting the visibility of business would be minimised where feasible and reasonable, without compromising public safety or the effective management of construction airborne noise. Clear pathways and signage would be implemented around construction sites to maximise visibility of businesses, including sufficient lighting along pedestrian footpaths during night-time where relevant.
Biodiversity	• removal of landscape plantings, street trees or naturally propagated weeds or common urban-adapted native species across six sites (Westmead, Sydney Olympic Park, North Strathfield, Burwood North, The Bays and Pyrmont). This vegetation is not considered to have high habitat value for threatened species or result in significant impacts to biodiversity. The landscape design would incorporate appropriate species to achieve year round flowering and support urban biodiversity, and would also consider the effects of climate change on the long-term viability of urban tree health and longevity • potential minor disturbance to fauna due to construction activity including light spill, dust and noise impacts. Given the context of the existing development and disturbance around stations and ancillary facilities, the impact of this disturbance is not anticipated to be significant.
Property	• some residual land has been identified for this proposal around the Clyde stabling and maintenance facility and Rosehill services facility. This residual land is located to the north of Duck Creek in the area not required for the Rosehill services facility. In accordance with Concept condition of approval C-B2 (b), Sydney Metro is considering the future use of this residual land. This is subject to ongoing consultation with the City of Parramatta Council.
Air quality	• potential temporary nuisance impacts from dust, emissions from vehicles and construction plant or odour from contaminated soils or groundwater. Best-practice dust management measures would be implemented during all construction work and additional measures would be implemented if required subject to outcomes of monitoring.
Sustainability, climate change and greenhouse gas	• potential climate change risks during construction associated with extreme heat and extreme rainfall and flooding events, which could place increased pressure on erosion and sediment control measures and/or resulting in flooding of tunnels and construction sites. Increased heatwave events may also have an impact on construction personnel, systems and equipment • potential climate change risks during operation associated with increase in average temperatures, sea level rise and higher tides, and frequency of extreme weather events on rail operations and infrastructure or customer and staff comfort • increase in greenhouse gas emissions through the consumption of electricity during construction and operation. Sydney Metro will offset at least 25 per cent of the greenhouse gas emissions associated with consumption of fuel and electricity (scope 1 and 2) during construction and 100 per cent of the greenhouse gas emissions associated with operational consumption of electricity.
Waste management	• potential residual impacts would include generation of unusable spoil during excavation works due to contamination or acid sulfate soils. Potential waste management issues during construction would be manageable through standard mitigation measures. These measures would be developed in accordance with the CEMF, which requires the Principal Contractor to develop a waste management plan and comply with the Sydney Metro West Sustainability Plan.

Issue	Potential impact
Hydrology and water quality	• potential impacts to the water quality of receiving waterways due to the release of pollutants during construction and operation. Soil and water management measures would manage these potential pollutant sources to minimise potential for these to be conveyed to nearby water bodies. The construction and operational water treatment plants would be designed with the aim of treating wastewater to a level as close as practicable to relevant surface water criteria to either maintain or improve the water quality of the surface waterways and marine environment. • potential temporary erosion of soils resulting in off-site sedimentation of waterways during construction, potentially resulting in exceedances of water quality criteria. Erosion and sediment measures would be implemented at all construction sites in accordance with the CEMF and relevant guidelines • potential exposure of soil salinity/saline soils during construction resulting in off-site discharge of saline water, potentially resulting in exceedances of water quality trigger levels. Prior to ground disturbance in high probability salinity areas, testing would be carried out to determine the presence of saline soils. If salinity is encountered, excavated soils would not be reused or would be managed in accordance with *Book 4 Dryland Salinity: Productive Use of Saline Land and Water* (NSW Department of Environment and Climate Change, 2008b).
Hazard and risk	• potential incidents associated with transport and storage of hazardous substances and dangerous goods during construction and operation. All hazardous substances would be stored and managed in accordance with relevant legislation and guidelines • potential rupture or interference with utilities. Dial before you dig searches and non-destructive digging would be carried out to identify the presence of underground utilities in areas where additional footprint is required, and ongoing consultation would be carried out with utility providers for high pressure gas or petroleum pipelines to identify appropriate construction methodologies, reducing the likelihood of impacts to utilities • the on-site handling and transport of contaminated soil and hazardous waste, including asbestos. Potential risks would be managed in accordance with NSW guidelines including the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and *Applying SEPP 33* (Department of Planning, 2011).

20.9 Justification for this proposal

20.9.1 Addressing the need

The approved Sydney Metro West Concept included consideration of the justification of the project as a whole in the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a). This was developed within the framework of the transport and planning strategies identified in State government policies. In particular, this includes the *Greater Sydney Region Plan: A Metropolis of Three Cities – connecting people* (Greater Sydney Commission, 2018a), *Building Momentum: State Infrastructure Strategy 2018*-2038 (Infrastructure NSW, 2018) and *Future Transport Strategy 2056* (Transport for NSW, 2020a).

Sydney is Australia's financial and economic capital, housing half of the country's globally competitive service sector jobs. The Greater Parramatta to Sydney CBD corridor is one of three economic corridors nominated in the Greater Sydney Region Plan (Greater Sydney Commission, 2018a). The corridor is of national economic significance and contains nearly 620,000 high-productivity jobs, which is around 20 per cent of the jobs in Greater Sydney and generates eight per cent of the nation's Gross Domestic Product per year. Recognising the importance of the corridor, several land use planning and development initiatives have commenced in Westmead, Parramatta, Sydney Olympic Park, The Bays and the Sydney CBD. These initiatives are expected to account for more than 60 per cent of forecast population growth and more than 80 per cent of forecast jobs growth in the corridor by 2036.

Sydney's growing population will continue to increase demand on the existing transport network and by 2056, NSW transport networks will need to accommodate 28 million trips per day. The existing rail network is congested, with customers on most rail lines often experiencing significant crowding on trains and station platforms during the morning and evening peaks. Despite planned upgrades and more services that will provide some short-term relief, the T1 Western Line is expected to reach capacity in 2024 and the T9 Northern Line is expected to reach capacity in 2027. As train and station crowding reduces service reliability, this results in fewer services operating in a given time period and in turn leads to further crowding. Reliability impacts in the Sydney CBD cause network-wide impacts, reducing network capacity and increasing crowding on trains and platforms.

There is a strong link between public transport and land use change. Transport accessibility and amenity are critical to supporting employment, housing supply and urban renewal opportunities and ultimately to supporting Sydney's economic and population growth. Transport accessibility and amenity issues, including crowding and capacity constraints within the Greater Parramatta to Sydney CBD corridor, as well as traffic congestion from high levels of car use, are limiting the achievement of planned growth because these areas are less attractive to households and developers.

Sydney Metro West, which includes this proposal, would address this substantial need by more than doubling rail capacity from Parramatta to the Sydney CBD. At ultimate capacity, Sydney Metro West would be able to move more than 40,000 people an hour in each direction and would complement the suburban and intercity services between Parramatta and the Sydney CBD. This proposal, as part of Sydney Metro West, would result in numerous transport benefits once the Sydney Metro West project becomes operational including:

- substantially improving the public transport network's accessibility to key economic centres across the Greater Parramatta to Sydney CBD corridor
- reducing crowding on trains and on station platforms
- increasing the reach and use of Sydney's public transport network by providing new station locations between Westmead and Hunter Street (Sydney CBD)
- improving travel times for commuters
- providing an alternative to the suburban rail network with additional capacity to reduce the impacts of scheduled maintenance and major unavoidable incidents
- providing the opportunity for mode shift from car to public transport, which could result in road user travel time savings.

By improving the connections between key economic centres, Sydney Metro West would foster significant growth in jobs, including directly supporting the creation of new jobs within the corridor, particularly at key precincts.

Sydney Metro West would provide city-shaping benefits as the significant increase in transport connectivity, capacity and amenity in the Greater Parramatta to Sydney CBD corridor would boost the economic productivity of Sydney and facilitate planned land use outcomes in the CBDs, planned precincts and urban renewal areas.

Sydney Metro West, including this proposal, would also provide a fast, reliable and frequent connection between Greater Parramatta and the Sydney CBD and would:

- relieve the congested T1 Western Line, T9 Northern Line and T2 Inner West and Leppington Line
- provide travel time savings for customers in Western Sydney and along the Greater Parramatta to Sydney CBD corridor
- reduce station crowding at some stations
- provide rail transport to areas where it is currently not available
- connect Greater Parramatta and the Sydney CBD to support the vision for a metropolis of three cities
- support delivery of the '30-minute city' as identified in *Future Transport Strategy 2056* (Transport for NSW, 2020a)
- reinforce the role of Greater Parramatta as the Central River City
- improve connectivity to major attractions and key precincts located along the corridor, including The Bays, Pyrmont and the Sydney CBD

- support urban renewal and increased housing supply
- increase accessibility across Sydney and provide customers with a new world-class metro service.

This proposal is seeking planning approval to enable the strategic benefits of the approved Concept to be realised. As this proposal is a subsequent stage within the approved Concept (following the previous Sydney Metro West planning applications), it would continue to be consistent with the key strategic planning and transport infrastructure strategies and policies and contribute to providing the identified benefits of the approved Concept.

20.9.2 Biophysical, economic and social considerations including the principles of ecologically sustainable development

Comprehensive investigations have been carried out in the preparation of this Environmental Impact Statement to assess the biophysical, economic and social impacts. The key potential impacts that cannot be avoided are summarised in Section 20.8. As described in Section 20.7, this proposal would incorporate environmental management and mitigation measures, performance outcomes and design features so that unavoidable potential impacts are managed and mitigated as far as feasible and reasonable and to an acceptable level.

Biophysical, economic and social considerations have also been assessed in the context of the principles of ecologically sustainable development. The *Environmental Planning and Assessment Act 1979* (EP&A Act) adopts the definition of ecologically sustainable development contained in the *Protection of the Environment Administration Act 1991* (NSW). An assessment of the biophysical, economic and social impacts of Sydney Metro West in the context of the principles of ecologically sustainable development is provided below. On the basis of this assessment, the carrying out of the proposal in the manner proposed is justified for the reasons set out below.

Precautionary principle

The environmental risk analysis documented in Chapter 21 (Environmental risk analysis) of this Environmental Impact Statement addresses the potential impacts of this proposal. That analysis, together with the detailed assessment carried out in preparing this Environmental Impact Statement indicates that there would be no threat of serious or irreversible damage to the environment.

In addition, the lack of full scientific certainty has not been used as a reason for postponing measures to prevent environmental degradation. As detailed in each impact assessment chapter of this Environmental Impact Statement, mitigation measures have been proposed to manage identified risks/threats of environmental damage.

The assessments carried out are consistent with accepted scientific and assessment methodologies and have considered relevant statutory and agency requirements. The assessments have applied a conservative approach with regard to proposed construction and operational arrangements, and the modelling used has been carried out in collaboration with key stakeholders and relevant statutory and agency requirements.

Intergenerational equity

The objectives of Sydney Metro West are essentially around ensuring an efficient and reliable public transport network. This would benefit current and future generations. Once operational, Sydney Metro West would leave a positive legacy for future generations. It would provide long-term benefits by strengthening connections and access across Sydney, providing improved connectivity on the rail network, and improving the capacity, reliability and efficiency of the transport system. It would address emerging issues with respect to capacity and congestion, which otherwise would be more difficult to address at a future stage.

In addition to the broader Sydney transport operational benefits, the ‘door-to-door’ experience provided by Sydney Metro West could also result in long-term health benefits with the creation of safer and more appealing conditions for pedestrians, cyclists and other transit users. These benefits would also flow through to future generations.

Sydney Metro West would result in a greater demand on electricity; however, operational electricity use would be fully offset. Significant changes to carbon and energy policy (and legislation) are currently occurring in Australia, which aim to shift electricity generation from coal-fired to renewable sources. As more electricity is generated from renewable sources, the climate change benefits of using electric rail would be improved. A range of measures to mitigate greenhouse gas emissions have been developed and would be implemented.

This Environmental Impact Statement outlines initiatives and targets set out within the Sydney Metro West Sustainability Plan that tackle climate change and manage resources efficiently. Sydney Metro has committed to achieving an Infrastructure Sustainability rating of 75+ for this proposal, as well as to designing this proposal to withstand known climate change impacts to the year 2100.

Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity has been considered throughout Sydney Metro West's development and design stages. The construction footprint has been developed to avoid or minimise impact to areas of high ecological value. Detailed assessments have been carried out to identify flora and fauna impacts and a range of mitigation measures identified for implementation.

Impacts on biological diversity and ecological integrity have been assessed as minor.

Improved valuation and pricing of environmental resources

Economic appraisal of Sydney Metro West draws on a number of established methodologies that provide for the valuation of externalities, including environmental externalities, and their inclusion in the appraisal process. Environmental parameters that can be valued include air pollution, greenhouse gas emissions, noise pollution, water runoff, nature and landscape and urban separation. Valuations typically adopt broad average values.

The value placed on the environment was inherent in the development of the design. In addition, the costs associated with the planning and design of measures to avoid or minimise adverse environmental impacts and the costs to implement them have been built into the overall project costs. Ongoing design development, together with specific issue-based management plans, would represent further commitment to the recognition of the value of protecting environmental resources.

20.9.3 Cumulative impacts

Operational stage cumulative impacts of this proposal would largely relate to the substantial overall strategic benefits, including the identified city-shaping, transport and productivity benefits. These benefits could be enhanced as part of the future integrated transport network. Substantial cumulative landscape character and visual amenity benefits may also arise due to urban realm improvements, particularly at locations such as The Bays and Pyrmont.

Potential temporary cumulative impacts during construction have been an important consideration, given the potential concurrent construction with a number of large infrastructure projects – in particular, the continuation of activities associated with work carried out under the previous Sydney Metro West planning applications. However, construction impacts associated with this proposal would be generally more confined and of a less intensive nature. These impacts would be managed in accordance with the CEMF, performance outcomes and identified mitigation measures. Coordination and engagement with other projects would also continue throughout construction to further manage construction fatigue and cumulative impacts where possible.

Any potential cumulative adverse impacts during construction would be offset by the substantial longer term benefits of Sydney Metro West.