Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Chapter 27

Cumulative impacts

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27 Cumulative impacts

This chapter provides an overview of the potential cumulative impacts associated with the construction and operation of the project and identifies measures which address these impacts.

The Secretary's environmental assessment requirements as they relate to cumulative impacts and where in the environmental impact statement these have been addressed, are detailed in Table 27-1.

Avoiding or minimising impacts has been a key consideration throughout the design and development process for the Beaches Link and Gore Hill Freeway Connection project. A conservative approach has generally been used in the assessments, with potential impacts presented before implementation of environmental management measures. The environmental management measures proposed to minimise the potential impacts in relation to cumulative impacts are discussed in Section 27.5.

Table 27-1 Secretary's environmental assessment requirements – cumulative impacts

Secretary's requirement	Where addressed in EIS
Environmental Impact Statement	
1. The EIS must include, but not necessarily be limited to, the following: o. an assessment of the cumulative impacts of the project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced, and projects that have recently been completed	Projects that have been assessed and may have potential cumulative impacts are identified in **Section 27.2**. Potential cumulative impacts are described in **Section 27.3** and **Section 27.4**.
Assessment of Key Issues	
2. For each key issue the Proponent must: c. identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence of the impact (comprehensive risk assessment), and the cumulative impacts of: a) concurrent project construction activities; and b) proposed and approved projects (where information is available at the time of writing)	Potential cumulative impacts during construction and operation for the key issues discussed in **Chapters 8** to **26** are described in **Section 27.3** and **Section 27.4**.
Consultation	
4. The Proponent must assess the potential for complaint fatigue to occur during construction of the project and describe how mitigation measures, complaint handling procedures and community consultation mechanisms will mitigate complaint fatigue. The assessment must consider the cumulative impacts from the project and other major projects in the local area.	The potential for complaint fatigue to occur and proposed mitigation measures and complaint handling procedures are described in **Chapter 7** (Stakeholder and community engagement). Potential impacts of construction and complaint fatigue are described in **Section 27.3.7**.

27.1 Assessment methodology

Cumulative impacts can occur when impacts from the project interact or overlap with impacts from other projects and potentially result in a larger overall effect on the environment, businesses or local communities. Cumulative impacts may also occur when projects are constructed consecutively with construction activities occurring over extended periods of time with little to no break in between, resulting in construction fatigue for local receivers. Construction fatigue incorporates the potential for complaint fatigue, which may impact communication of community concerns during construction.

This section provides:

- A description of how projects were initially identified for consideration of cumulative construction or operational impacts with the project
- The screening criteria applied to determine whether the identified projects should be assessed for cumulative impacts
- An overview of the type of assessment carried out for the relevant cumulative impacts.

The cumulative impact assessment in this environmental impact statement is based on the broad requirements set out by the Secretary's environmental assessment requirements.
The methodology is shown in Figure 27-1.

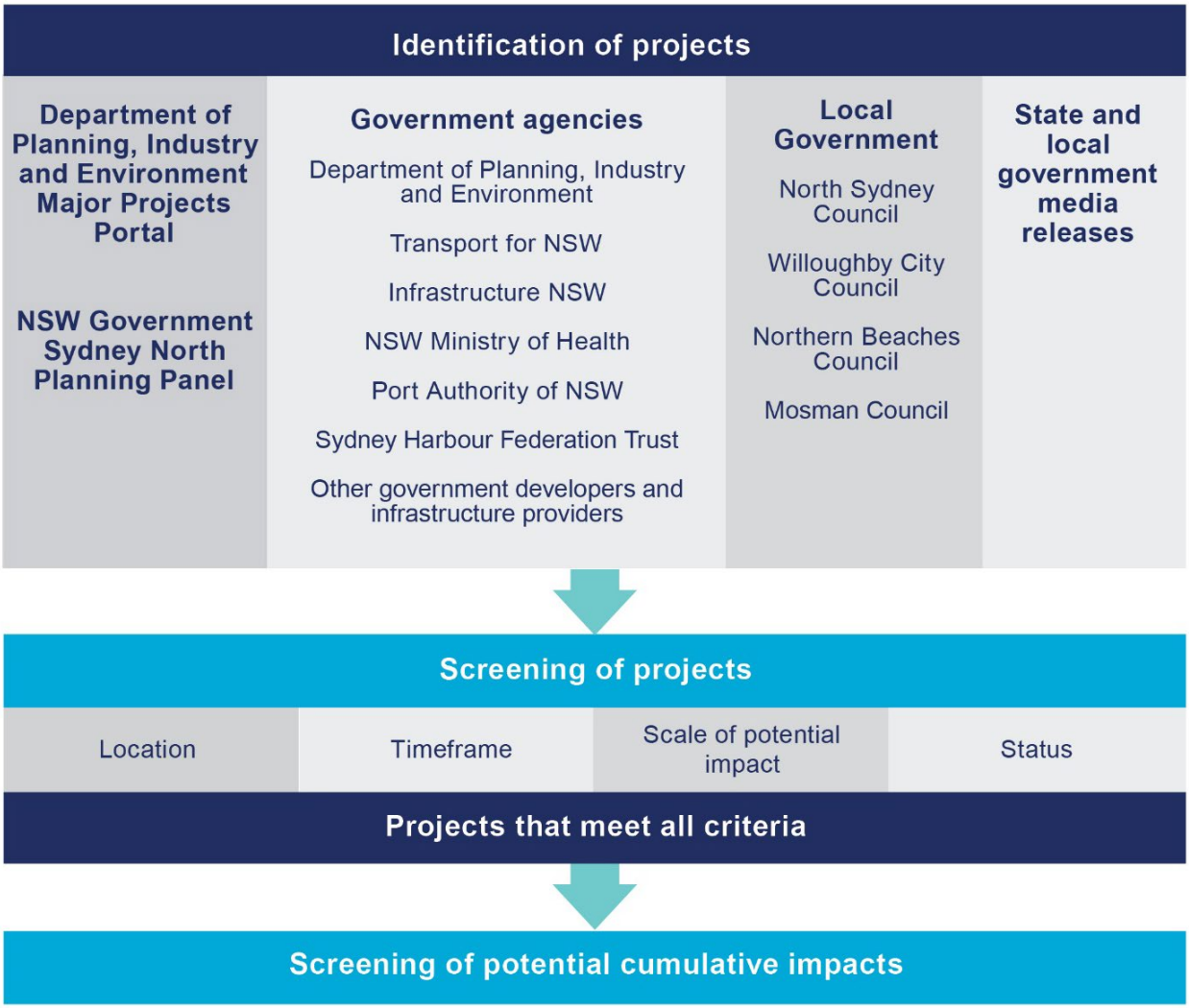

Figure 27-1 Overview of the cumulative impact assessment methodology

27.1.1 Identification of projects

An initial list of projects for potential inclusion in the cumulative impact assessment was identified from the sources outlined in Figure 27-1.

Projects identified for inclusion in the screening assessment were those likely to meet at least one of the screening criteria described in Table 27-2. The list of projects identified can be broadly categorised as:

- **Category 1:** The Western Harbour Tunnel and Beaches Link program of works, including the Western Harbour Tunnel and Warringah Freeway Upgrade
- **Category 2:** Other major transport infrastructure projects, including related Transport for NSW projects and public transport projects
- **Category 3:** Other projects and strategic development, including urban development, other infrastructure projects, and consideration of local strategic planning documents where they may result in future development and lead to potential cumulative impacts with the project.

27.1.2 Screening of projects

The screening criteria shown in Table 27-2 were applied to determine whether a project or strategic plan should be included in the cumulative impact assessment. Projects and plans that satisfied all of these criteria were included and are described in Section 27.2.

Table 27-2 Screening criteria for cumulative impact assessment

Criteria	Relevance
Location A project was considered relevant where that project was within one of the following areas:	• Direct overlap: construction footprints intersect
	• In close proximity: within 500 metres of the construction footprint
	• In the locality: within two kilometres of the construction footprint
Timeframe A project was considered relevant where that project involved one of the following timeframes:	• Concurrent construction programs
	• Consecutive construction programs (ongoing or recently completed projects resulting in construction fatigue considerations)
Scale of potential impact A project was considered relevant where that project involved one or more of the following impacts:	• Substantial temporary changes to existing traffic conditions
	• Substantial temporary changes to the existing noise environment
	• Impacts on numerous heritage items and/or heritage items with State, National, Commonwealth or World significance
	• Substantial changes to the existing land use
	• Substantial changes to the existing urban landscape and/or changes to biodiversity

Criteria	Relevance
Status A project was considered relevant where that project was at one of the following stages of the statutory assessment and approval process:	• Approved projects (statutory approvals received), including approved projects that have not started construction, projects currently under construction, and recently completed projects
	• Proposed projects (currently under statutory environmental impact assessment)
	• Future strategic government projects (where commitment on construction program and methodology has been made)

27.1.3 Screening of potential cumulative impacts

The assessment of potential cumulative impacts has considered the following key locations:

- North Sydney and Cammeray
- Artarmon
- Naremburn and Willoughby
- Middle Harbour
- Balgowlah
- Seaforth, Killarney Heights and Frenchs Forest.

Potential cumulative impacts have been considered based on likely interactions of the Beaches Link and Gore Hill Freeway Connection project with other projects and plans listed in Table 27-3 and Table 27-4.

Where potential cumulative impacts may occur, these could relate to:

- Additional impacts due to concurrent construction periods
- Prolonged impacts due to consecutive construction periods.

The assessment of potential cumulative impacts has considered the key issues identified in Chapters 8 to 26 of this environmental impact assessment. In locations where cumulative impacts relating to a key issue has been assessed as negligible, the issue is not considered further.

The potential cumulative impacts during construction and operation are described in sections 27.3 and 27.4 respectively.

27.2 Projects assessed

Following the application of the screening criteria to identified projects, the projects included in Table 27-3 have been considered in the cumulative impact assessment. The location of these projects is shown in Figure 27-2.

Local strategic plans listed in Table 27-4 have been considered in the assessment where relevant, as they will influence development that has the potential to result in cumulative impacts with the project. The potential impacts are not able to be considered in detail given the uncertainty of the status and timing of associated projects, construction methodologies, and the existing coordination arrangements between Transport for NSW and Sydney Metro for works in North Sydney and Artarmon.

Table 27-3 Projects assessed in the cumulative impact assessment

Project name, status and expected construction period	Brief project description	Relevant locations where cumulative impacts might occur[1]
Category 1: Western Harbour Tunnel and Beaches Link program of works		
Western Harbour Tunnel and Warringah Freeway Upgrade Proposed 2020 – 2026	The Western Harbour Tunnel and Warringah Freeway Upgrade project comprises a new tolled motorway tunnel connection across Sydney Harbour, and an upgrade of the Warringah Freeway to integrate the new motorway infrastructure with the existing road network and connect to the Beaches Link and Gore Hill Freeway Connection project.	• North Sydney and Cammeray • Artarmon • Naremburn and Willoughby
Category 2: Other major transport infrastructure projects		
Sydney Metro City & Southwest (Chatswood to Sydenham) Approved 2017 – 2024	The Chatswood to Sydenham component of Sydney Metro City & Southwest involves the construction and operation of a 15.5 kilometre metro line from Chatswood, under Sydney Harbour and through Sydney's CBD out to Sydenham. Components of the project relevant to this assessment include: • Chatswood dive site • Artarmon substation • Crows Nest Station • Victoria Cross Station.	• North Sydney and Cammeray • Artarmon • Naremburn and Willoughby
Northern Beaches Hospital road upgrade project Completed 2015 – August 2020	This recently completed project involved staged construction works to enhance connectivity to the new Northern Beaches Hospital and to improve the broader road network capacity. The following locations were upgraded as part of the works: • Warringah Road from its intersection with Maxwell Parade to its intersection with Courtley Road • Naree Road/Frenchs Forest Road from its intersection with Forest Way to its intersection with Warringah Road	• Seaforth, Killarney Heights and Frenchs Forest

Project name, status and expected construction period	Brief project description	Relevant locations where cumulative impacts might occur[1]
	• Wakehurst Parkway from about 500 metres north of Frenchs Forest Road to about 500 metres south of Warringah Road • Forest Way from around Adams Street about 750 metres south to its intersection with Warringah Road.	
Category 3: Other projects and strategic developments		
Sydney Metro Victoria Cross over station development Approved 2021 – 2024[2]	This project involves the construction of a 40-storey (plus two storey rooftop plant) commercial office building above the southern entrance of Victoria Cross station.	• North Sydney and Cammeray
Marist Catholic College North Shore Proposed Prepare EIS 2020 – 2026	This project involves the demolition of existing buildings and construction of a new six storey building to accommodate teaching facilities, early learning centre and premises for independent tertiary education.	• North Sydney and Cammeray
Channel 9 site staged residential redevelopment Part 3A concept plan approved Construction stages 1 and 2 under assessment No timeframe information (construction overlap assumed)	Redevelopment of the Channel 9 site (14 Artarmon Road, Willoughby) for up to 400 residential dwellings with non-residential land uses such as retail/commercial space and landscaping and public domain works.	• Naremburn and Willoughby

Note 1: Relevant locations where cumulative impacts might occur includes locations where surface works for the Beaches Link and Gore Hill Freeway Connection project occur within two kilometres of a Category 1, 2 or 3 project

Note 2: Dates as per the Concept Development Application for the Victoria Cross over Station Development

Table 27-4 Strategic plans considered in the cumulative impact assessment

Strategic plan	Brief description	Relevant locations where cumulative impacts might occur
Northern Beaches Sportsground Strategy	The *Northern Beaches Sportsground Strategy* (Northern Beaches Council, 2017a) is a 15 year plan to provide a single approach to the management and long term planning of sporting facilities on the Northern Beaches. The *Northern Beaches Sportsground Strategy* has been informed by the *Northern Beaches Sportsgrounds and Golf Courses Discussion Paper* (Northern Beaches Council, 2017c) which was prepared in response to independent analyses commissioned by Northern Beaches Council to review sportsgrounds supply and demand, and assess the feasibility of golf courses on the Northern Beaches. The discussion paper included strategic directions for addressing a shortfall in sporting fields across the local area including the potential conversion of existing golf courses to provide additional sporting grounds and parkland areas.	• Balgowlah
Northern Beaches Hospital Precinct Structure Plan	The *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017b) defines the desired future land uses and consequent multi-modal transport operation and infrastructure requirements to, from and through Frenchs Forest. The plan acknowledges that a suite of regional transport network upgrades including both public transport and road upgrades would be required to maintain effective transport connections to, from and through Frenchs Forest in the medium to long term. The plan provides the strategic land use planning framework for Frenchs Forest for the next 20 years. The plan includes proposed land use rezoning around the Northern Beaches Hospital to the north and west of the Wakehurst Parkway/Warringah Road intersection as part of a strategy to support long term growth in the area (including a proposed 5360 new dwellings in the next 20 years).	• Seaforth, Killarney Heights and Frenchs Forest
North Sydney Integrated Transport Program	The *North Sydney Integrated Transport Program* (North Sydney Program) is an ongoing multi-agency collaboration between Transport for NSW, North Sydney Council, Greater Sydney Commission and the Government Architect of NSW, to guide future integrated transport planning and investment in the North Sydney CBD and interconnected areas over the next 20 years and beyond. Led by Transport for NSW since 2018, it aims to deliver a shared place-based vision for the North Sydney CBD. The North Sydney Program considers strategic public transport connections to the North Sydney CBD, land use and public domain objectives, improved pedestrian amenity and safety, road network changes, improved access for cyclists to and through the CBD, convenient interchanges between bus and rail services, management of kerbside access to support business activity across the day,	• North Sydney and Cammeray

Strategic plan	Brief description	Relevant locations where cumulative impacts might occur
	and place outcomes within the CBD. As such, a key focus of the North Sydney Program is to ensure major projects, such as the Western Harbour Tunnel and Beaches Link program of works, integrate with the North Sydney CBD in a manner that supports the globally connected 'Harbour CBD' and enables delivery of befitting place-based outcomes. The timing for deliverables in the North Sydney Program would be cognisant of the Western Harbour Tunnel and Beaches Link program of works delivery timeframes. Further information on the North Sydney Program is provided in Section 9.1.1	

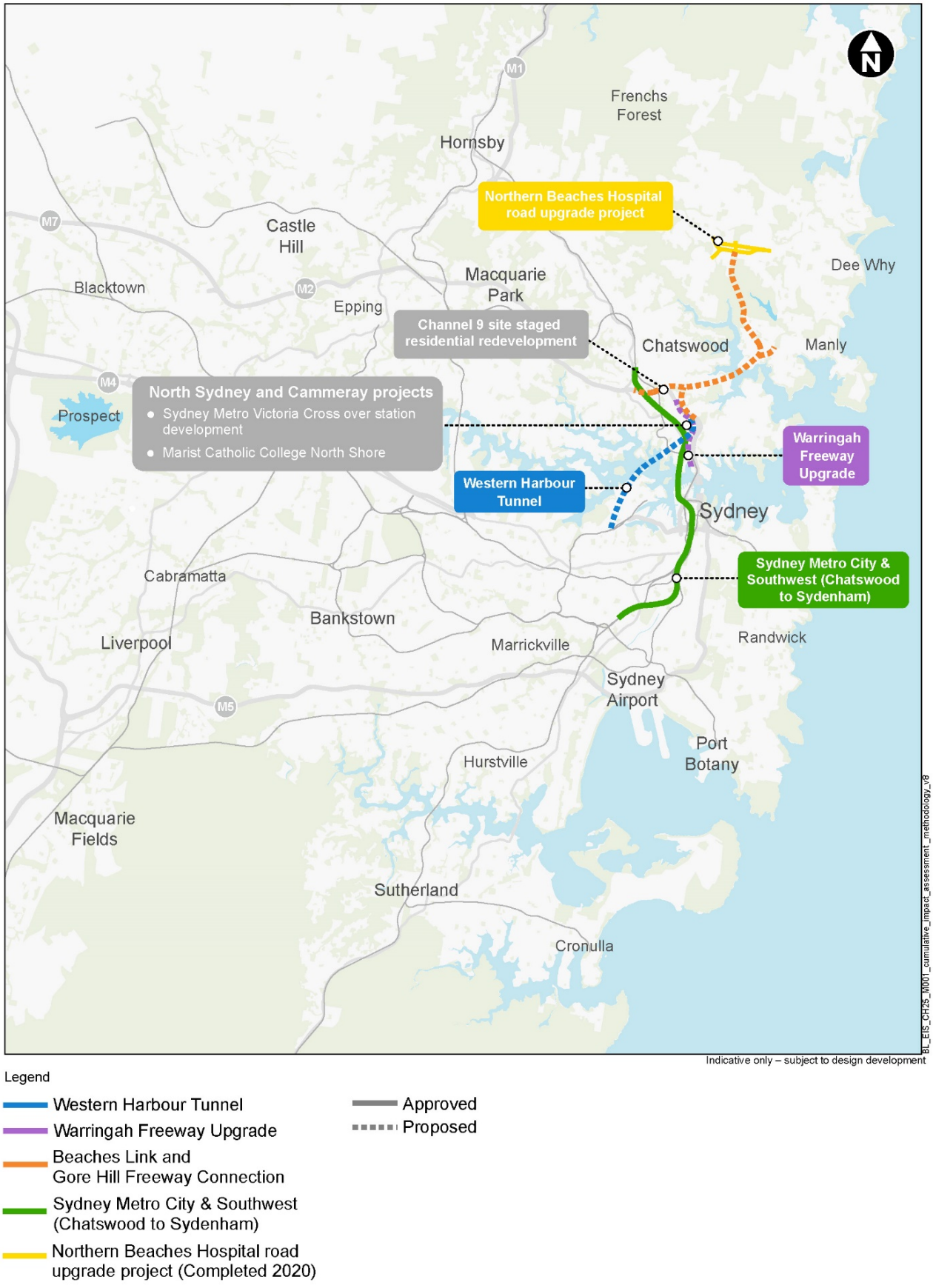

Figure 27-2 Projects assessed in the cumulative impact assessment

27.3 Assessment of potential cumulative construction impacts

The following sections describe the potential cumulative impacts during construction of the project based on likely interactions with the projects and plans listed in Table 27-3 and Table 27-4.

Impacts outlined in each section are unmitigated potential cumulative impacts. Mitigation measures are included in Section 27.5.

27.3.1 North Sydney and Cammeray

Projects

Construction activities at North Sydney and Cammeray would occur in close proximity to the following projects:

- Western Harbour Tunnel and Warringah Freeway Upgrade
- Sydney Metro City & Southwest (Chatswood to Sydenham) – Victoria Cross and Crows Nest stations
- Marist Catholic College North Shore
- Sydney Metro Victoria Cross over station development.

Potential cumulative impacts

Potential cumulative construction impacts at North Sydney and Cammeray are identified in Table 27-5.

In summary, cumulative impacts are most likely to be experienced by receivers around Cammeray Golf Course and the Warringah Freeway corridor in North Sydney and Cammeray as a result of interactions with the Western Harbour Tunnel and Warringah Freeway Upgrade project.

Cumulative traffic impacts have the potential to be experienced at Cammeray due to the interaction of the project with the Western Harbour Tunnel and Warringah Freeway Upgrade project. In particular, the wider road network at the Warringah Freeway and surrounds, including the suburb of Cammeray, is likely to be affected due to the consecutive use of Cammeray Golf Course as temporary construction support sites for the Western Harbour Tunnel and Beaches Link program of works.

Cumulative temporary construction noise, visual amenity, and social and economic impacts may also be experienced by receivers at North Sydney and Cammeray due to the proximity of the project's construction sites to construction sites for the Western Harbour Tunnel and Warringah Freeway Upgrade. It is likely that some construction sites for the two projects would operate both concurrently and consecutively, with prolonged impacts to residential, commercial and recreational receivers.

The concurrent and/or consecutive use of Cammeray Golf Course as temporary construction support sites for the Western Harbour Tunnel and Beaches Link program of works also has the potential to result in prolonged cumulative land use and heritage impacts, and impacts to public open space.

However, these projects may provide cumulative benefits for local construction workers and to local business and services in these areas by increasing passing trade and demand for services during construction periods.

The potential for construction fatigue and complaint fatigue at North Sydney and Cammeray is discussed in Section 27.3.7.

Potential cumulative impacts resulting from the construction of the projects considered are expected to be negligible for the following issues:

- Air quality
- Aboriginal heritage
- Geology, groundwater and soils
- Hydrology and water quality
- Flooding
- Biodiversity
- Hazards and risks
- Resource use and waste management
- Sustainability
- Climate change and greenhouse gases.

As such, these issues are not considered further in Table 27-5.

Negligible cumulative impacts are expected to result from construction activities at North Sydney and Cammeray from the following projects:

- Marist Catholic College North Shore
- Sydney Metro City & Southwest (Chatswood to Sydenham) – Victoria Cross and Crows Nest stations
- Sydney Metro Victoria Cross over station development.

Additional cumulative construction impacts at North Sydney may be generated by future projects associated with the North Sydney Program (refer to Table 27-4). As discussed in Chapter 9 (Operational traffic and transport), the development of the North Sydney Program is ongoing, with validation of the vision for North Sydney currently underway. The timing for deliverables in the North Sydney Program would be cognisant of the Western Harbour Tunnel and Beaches Link program of works delivery timeframes.

As such, these projects and strategic plan have not been considered further in Table 27-5.

Table 27-5 Potential cumulative construction impacts – North Sydney and Cammeray

Environmental impact	Potential cumulative construction impacts
	Category 1 projects
	Western Harbour Tunnel and Warringah Freeway Upgrade
Traffic and transport[1]	Additional and prolonged reduction in level of service Ernest Street, Falcon Street and Miller Street at Cammeray due to construction traffic volumes. Increase in delays at intersections including Brook Street/Warringah Freeway ramps due to introduction of construction traffic. Increases in bus travel times on the Warringah Freeway due to increased traffic demand across the southbound bus lane south of Falcon Street[1].
Health and safety	Health effects for residential receivers around Cammeray from stress and anxiety from changes in the urban environment.
Noise and vibration	Additional and prolonged temporary increase in construction noise from construction work at Cammeray Golf Course construction support site (BL1) and temporary construction support sites at Cammeray Golf Course for the Western Harbour Tunnel and Warringah Freeway Upgrade project[2].
Urban design and visual amenity	Additional and prolonged moderate to high landscape and visual impacts for receivers around the Warringah Freeway corridor, residential receivers around Cammeray, North Cremorne and Neutral Bay, and recreational receivers at Cammeray Park.
Socio-economic, land use and property	Additional temporary and permanent loss of open space, parks and recreation facilities at Cammeray Golf Course. Additional and prolonged: • Increase in passing trade for local businesses and services in North Sydney and Cammeray, particularly along Miller Street • Land use impacts at Cammeray Golf Course due to consecutive construction periods • Amenity impacts for receivers around the Warringah Freeway and for residential and recreational receivers at Cammeray • Impacts to community perceptions of public health and safety due to increases in construction traffic for residential and recreational receivers at Cammeray • Increase in demand for construction workers, providing benefits for local workers.
Non-Aboriginal heritage	• Additional and prolonged moderate impacts on Cammeray Park (including golf course) • Minor temporary impacts to additional heritage items in the vicinity of North Sydney and Cammeray.

Note 1: Quantitative cumulative assessment presented in Chapter 8 (Construction traffic and transport)
Note 2: Cumulative assessment presented in Chapter 10 (Construction noise and vibration)

27.3.2 Artarmon

Projects

Construction activities for the Gore Hill Freeway Connection component of the project would occur in close proximity to the following projects:

- Western Harbour Tunnel and Warringah Freeway Upgrade
- Sydney Metro City & Southwest (Chatswood to Sydenham) – Chatswood dive site and Artarmon substation site. The works at Artarmon substation are anticipated to conclude at the beginning of 2022 and are therefore considered in terms of construction fatigue only.

Potential cumulative impacts

Potential cumulative construction impacts at the Gore Hill Freeway Connection component of the project are identified in Table 27-6.

In summary, cumulative impacts are most likely to be experienced by receivers in the Artarmon area near the Gore Hill Freeway corridor as a result of interactions with the identified projects. The volume of traffic associated with construction works at the Gore Hill Freeway temporary construction support sites has the potential to result in cumulative impacts to the local road network at Artarmon, primarily at Dickson Avenue and Reserve Road.

There is potential that cumulative temporary construction noise, visual amenity, social and economic impacts may also be experienced by receivers at Artarmon due to the number of nearby projects under construction both concurrently and consecutively. Cumulative construction impacts would most likely be experienced by receivers near the Warringah Freeway and Gore Hill Freeway road corridors and around the Artarmon industrial area. There would be around a one year break between the completion of works for the Artarmon substation site as part of Sydney Metro City & Southwest (Chatswood to Sydenham) at the beginning of 2022 and the commencement of construction at the Gore Hill Freeway connections. Works prior to completion are likely associated with the testing/commissioning phase of the project and subsequently construction fatigue impacts may be reduced. These projects may also provide cumulative benefits for local construction workers and to local businesses and services in these areas by increasing passing trade and demand for services during construction periods.

The potential for construction fatigue and complaint fatigue at Artarmon is discussed in Section 27.3.7.

Potential cumulative impacts resulting from the construction of the projects considered are expected to be negligible for the following issues:

- Air quality
- Health and safety
- Non-Aboriginal heritage
- Aboriginal heritage
- Geology, groundwater and soils
- Hydrology and water quality
- Flooding
- Biodiversity
- Hazards and risks
- Resource use and waste management
- Sustainability
- Climate change and greenhouse gases.

As such, these issues are not considered further in Table 27-6.

Table 27-6 Potential cumulative construction impacts – Artarmon

Environmental impact	Potential cumulative construction impacts	
	Category 1 projects	Category 2 projects
	Western Harbour Tunnel and Warringah Freeway Upgrade	Sydney Metro City & Southwest
Traffic and transport	Negligible[1]	Prolonged heavy and light vehicle traffic on the local road network at Artarmon, including Dickson Road and Reserve Road.
Noise and vibration	Additional and prolonged temporary increase in construction noise for commercial, industrial and residential receivers from construction work at the Gore Hill Freeway temporary construction support sites and temporary construction support sites at the Warringah Freeway for the Western Harbour Tunnel and Warringah Freeway Upgrade project[2].	Prolonged temporary increase in construction noise for commercial and industrial receivers near construction works at the Gore Hill Freeway temporary construction support sites[2].
Urban design and visual amenity	Additional and prolonged minor landscape and visual impacts for motorists using the Warringah Freeway and Gore Hill Freeway.	Prolonged minor landscape and visual impacts for industrial and commercial receivers near Dickson Avenue and Reserve Road.
Socio-economic, land use and property	Additional and prolonged: • Increase in passing trade for local businesses and services in Artarmon near the Warringah Freeway and Gore Hill Freeway corridors • Amenity impacts in Artarmon near the Warringah Freeway and Gore Hill Freeway corridors, primarily due to works outside standard construction hours • Impacts to community perceptions of public health and safety due to increases in construction traffic • Increase in demand for construction workers, providing benefits for local workers.	Additional and prolonged: • Increase in passing trade for local businesses and services in the Artarmon industrial area • Amenity impacts in the Artarmon industrial area • Increase in demand for construction workers, providing benefits for local workers.

Note 1: Quantitative cumulative assessment presented in Chapter 8 (Construction traffic and transport)
Note 2: Cumulative assessment presented in Chapter 10 (Construction noise and vibration).

27.3.3 Naremburn and Willoughby

Projects

Construction activities at the Flat Rock Drive construction support site (BL2) would occur in close proximity to the following projects:

- Western Harbour Tunnel and Warringah Freeway Upgrade
- Sydney Metro City & Southwest (Chatswood to Sydenham) – Artarmon substation site. The works at Artarmon substation site are anticipated to conclude at the beginning of 2022 and are therefore considered in terms of construction fatigue only
- Channel 9 site staged residential redevelopment.

Potential cumulative impacts

Potential cumulative construction impacts at Naremburn and Willoughby are identified in Table 27-7.

Cumulative impacts associated with the Western Harbour Tunnel and Warringah Freeway Upgrade project would be limited to potential temporary increases in construction noise for residential and recreational receivers in the Naremburn and Willoughby area resulting from concurrent and consecutive construction programs with the project. Cumulative construction impacts would most likely result from works at the Flat Rock Drive construction support site (BL2) and temporary construction support sites at the Warringah Freeway for the Western Harbour Tunnel and Warringah Freeway Upgrade project.

The construction of the proposed Channel 9 site staged residential development (14 Artarmon Road, Willoughby) is assumed to overlap with construction of the project. Cumulative construction impacts would most likely be experienced by residential receivers in Willoughby and Naremburn and would be associated with concurrent construction activities of the development and the project. Potential cumulative construction impacts for surrounding residents are likely to be associated with increased construction traffic, urban design, visual amenity and social and economic impacts associated with vegetation removal and demolition activities given the proximity of the development to the Flat Rock Drive construction support site (BL2).

The potential for construction fatigue and complaint fatigue at Naremburn and Willoughby is discussed in Section 27.3.7.

Potential cumulative impacts resulting from the construction of the projects considered are expected to be negligible for the following issues:

- Air quality
- Health and safety
- Non-Aboriginal heritage
- Aboriginal heritage
- Geology, groundwater and soils
- Hydrology and water quality
- Flooding
- Biodiversity
- Hazards and risks
- Resource use and waste management
- Sustainability
- Climate change and greenhouse gases.

As such, these issues are not considered further in Table 27-7.

Cumulative impacts expected to result from construction activities at Naremburn and Willoughby due to the Sydney Metro City & Southwest (Chatswood to Sydenham) – Artarmon substation site would be due to construction fatigue. Impacts are considered likely to be negligible and as such this project has not been considered further in Table 27-7.

Table 27-7 Potential cumulative construction impacts – Naremburn and Willoughby

Environmental impact	Potential cumulative construction impacts	
	Category 1 projects	Category 3 projects
	Western Harbour Tunnel and Warringah Freeway Upgrade	Channel 9 site staged residential redevelopment
Traffic and transport	Negligible[1]	Potential for prolonged heavy and light vehicle traffic on the local road network at Naremburn and Willoughby during assumed construction overlap.
Noise and vibration	Additional and prolonged temporary increase in construction noise for residential and recreational receivers from construction works at the Flat Rock Drive construction support site (BL2) and temporary construction support sites at the Warringah Freeway for the Western Harbour Tunnel and Warringah Freeway Upgrade project[2].	Negligible
Urban design and visual amenity	Negligible	Prolonged temporary minor landscape and visual impacts for residential receivers at Naremburn and Willoughby due to demolition and vegetation clearing works at the Channel 9 site and establishment of the Flat Rock Drive construction support site (BL2).
Socio-economic, land use and property	Negligible	Additional and prolonged amenity impacts: • In the Naremburn and Willoughby residential area during assumed construction overlap • To public open space and recreation facilities.

Note 1: Quantitative cumulative assessment presented in Chapter 8 (Construction traffic and transport.

Note 2: Cumulative assessment presented in Chapter 10 (Construction noise and vibration)

27.3.4 Middle Harbour

Works at the Middle Harbour cofferdams and the Spit West Reserve construction support site (BL9) would be unlikely to produce cumulative impacts with the projects identified in Table 27-3 and strategic plans in Table 27-4.

27.3.5 Balgowlah

Construction of the project in Balgowlah would be unlikely to produce cumulative impacts with the projects identified in Table 27-3 and strategic plans in Table 27-4.

Additional cumulative construction impacts at Balgowlah may be generated by future projects associated with the *Northern Beaches Sportsground Strategy* (Northern Beaches Council, 2017a) (refer to Table 27-4), however construction programs and specific scopes for individual projects have not yet been released.

27.3.6 Seaforth, Killarney Heights and Frenchs Forest

Construction of the project in Seaforth, Killarney Heights and Frenchs Forest would be unlikely to produce cumulative impacts with the projects identified in Table 27-3 and strategic plans in Table 27-4.

Additional cumulative construction impacts at Frenchs Forest may be generated by future projects associated with the *Northern Beaches Hospital Precinct Structure Plan* (Northern Beaches Council, 2017b) (refer to Table 27-4), however construction programs and specific scopes for individual projects have not yet been released.

27.3.7 Construction and complaint fatigue

Construction fatigue

There is potential for construction fatigue to be experienced by receivers near the project. Construction fatigue may be experienced by receivers that are near concurrent or consecutive project construction activities where the activities overlap or have little or no break between the activities of one project, or multiple adjacent projects.

Areas considered most likely to experience sustained impacts to receivers that may result in construction fatigue include residential receivers in North Sydney and Cammeray near the Cammeray Golf Course and the Warringah Freeway, and receivers in Artarmon near the Warringah Freeway and Gore Hill Freeway. Construction fatigue in the above areas may occur as a result of the close proximity of multiple construction sites for the project, and from construction activities associated with the following projects:

- North Sydney and Cammeray
  - Western Harbour Tunnel and Warringah Freeway Upgrade
- Artarmon
  - Western Harbour Tunnel and Warringah Freeway Upgrade
  - Sydney Metro City & Southwest (Chatswood to Sydenham) – Artarmon substation site.

Based on the environmental impact assessment for the project and those projects listed above, potential impacts that are considered most likely to result in construction fatigue include traffic and parking, noise and vibration, visual and amenity impacts, and impacts to community perceptions of public health and safety.

There is also potential for residential receivers around Naremburn and Willoughby to experience construction fatigue as a result of the project and its proximity to the Western Harbour Tunnel and Warringah Freeway Upgrade project. Construction fatigue at this location is likely to be limited to

temporary increases in construction noise and are expected to be minor. Work would be coordinated between the various project construction sites, where feasible and reasonable, to minimise construction fatigue.

There would be around a one year break between the completion of works at the Sydney Metro City & Southwest (Chatswood to Sydenham) – Artarmon substation site at the beginning of 2022, and the commencement of construction of the connections to and from the Gore Hill Freeway. Works prior to completion are likely associated with the testing/commissioning phase of the project and as a result, construction fatigue impacts may be reduced.

Community consultation would be carried out to understand key impacts and issues, and identify any unknown impacts from concurrent or consecutive sets of construction work. The community consultation framework is presented in Chapter 7 (Stakeholder and community engagement) and Appendix E (Community consultation framework).

Complaint fatigue

Complaint fatigue may occur where community perceptions of project complaint management systems result in failure to report concerns about construction impacts. Complaint fatigue may be compounded where multiple proponents are responsible for issues in the same area where construction of multiple projects occurs.

Areas considered most likely to generate complaint fatigue include North Sydney and Cammeray, and Artarmon, due to the proximity of the project to the following projects:

- North Sydney and Cammeray
  - Western Harbour Tunnel and Warringah Freeway Upgrade
- Artarmon
  - Western Harbour Tunnel and Warringah Freeway Upgrade
  - Sydney Metro City & Southwest (Chatswood to Sydenham) – Artarmon substation site.

A complaints management system would be implemented for the duration of construction, which would include a number of different complaint mechanisms to cater to different needs and preferences of the community (refer to Chapter 7 (Stakeholder and community engagement)). The complaints management system for the project is outlined in Appendix E (Community consultation framework).

The community relations team for the project would build a working relationship with the project teams for other major projects under construction at the same time as the project to identify stakeholders and community members who may be susceptible to complaint fatigue.

27.3.8 Summary

In summary, the potential cumulative impacts during construction of the project based on likely interactions with other projects may occur around North Sydney and Cammeray, Artarmon, and Naremburn and Willoughby. Potential cumulative impacts would be generated by interactions between the project and the Western Harbour Tunnel and Warringah Freeway Upgrade project at North Sydney and Cammeray, Sydney Metro City & Southwest (Chatswood to Sydenham) at Artarmon, and the Western Harbour Tunnel and Warringah Freeway Upgrade project and Channel 9 staged residential redevelopment at Naremburn and Willoughby.

Without mitigation, key potential cumulative impacts would likely include minor temporary increases in traffic volumes, construction noise and vibration, decreased visual amenity and land use impacts. There is also potential for construction fatigue and complaint fatigue to be experienced by surrounding receivers at these locations as a result of concurrent and consecutive construction programs.

The project design and construction methodology has been developed with consideration of these issues and attempts to mitigate many of these issues where possible. The community consultation

framework presented in Chapter 7 (Stakeholder and community engagement) and Appendix E (Community consultation framework) has also been developed with consideration of complaint fatigue and includes procedures to proactively manage this issue where possible. Potential cumulative construction impacts would be managed in accordance with the measures outlined in Section 27.5.

27.4 Assessment of potential cumulative operational impacts

Potential cumulative impacts during the operation of the project are included in the operational modelling and assessment of various issues. This has been used to inform the assessment of key issues, including for traffic and transport, noise and vibration, air quality and human health.

The operational modelling scenarios have considered cumulative impacts associated with the Category 1 and 2 projects listed in Table 27-3. Category 3 projects were excluded as they were considered unlikely to generate cumulative operational impacts. In addition to Category 1 and 2 projects, some additional projects have been considered outside the two-kilometre radius as they are considered to be relevant to some operational models, which operate on a wider scale to the cumulative assessment in this chapter.

Table 27-8 identifies the projects considered in the operational cumulative impact assessments carried out for some of the key individual issues in the environmental impact statement.

Table 27-8 External projects included in the operational modelling scenarios for the environmental impact assessment

Projects included in operational model	Traffic and transport	Noise and vibration	Air quality	Human health
WestConnex program of works	✓	✓	✓	✓
Sydney Gateway[3]	✓	✓	✓	✓
M6 Motorway (Stage 1)[1, 3]	✓	✓	✓	✓
M6 Motorway (full project)[2, 3]	✓	✓	✓	✓
NorthConnex	✓			
Northern Beaches Hospital road upgrade project	✓			

Note 1: M6 Motorway (Stage 1) is considered as part of the 2027 'Do something – cumulative' scenario
Note 2: M6 Motorway (full project) is considered as part of the 2037 'Do something – cumulative' scenario
Note 3: Since the commencement of this assessment, the M6 Motorway (Stage 1) and Sydney Gateway projects have been approved. As these projects would not have a substantial influence on the current traffic network that would be impacted by the Beaches Link and Gore Hill Freeway Connection project, these projects have not been assumed in the 'Do minimum' scenarios.

The operational modelling considered the following scenarios:

- Without the project ('Do minimum')
- With the project ('Do something')
- With the project and other planned or proposed projects ('Do something cumulative').

Within the operational models:

- The 'Do minimum' scenarios include approved, under construction and/or recently opened motorway projects (NorthConnex and WestConnex) but without Western Harbour Tunnel and Warringah Freeway Upgrade, Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and M6 Motorway (Stage 1) projects. It also reflects the operational effects of approved, under construction and/or recently completed major projects (eg Sydney Metro City & Southwest and Northern Beaches Hospital road upgrade projects)

- The ‘Do something’ scenarios include NorthConnex, WestConnex, Beaches Link and Gore Hill Freeway Connection and Warringah Freeway Upgrade projects but without Western Harbour Tunnel, Sydney Gateway and M6 Motorway (Stage 1) projects. It also includes Sydney Metro City & Southwest and Northern Beaches Hospital road upgrade projects
- The ‘Do something cumulative’ scenarios include NorthConnex, WestConnex, Western Harbour Tunnel and Warringah Freeway Upgrade, Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and M6 Motorway projects. It also includes Sydney Metro City & Southwest and Northern Beaches Hospital road upgrade projects.

The Warringah Freeway Upgrade is considered as part of the ‘Do something’ scenarios (ie with the project) as the Warringah Freeway Upgrade component would need to be constructed and operational to facilitate Beaches Link connections to the Warringah Freeway at Cammeray.

The cumulative assessments for the issues identified in Table 27-8 are discussed in detail in their respective assessment chapters and technical working papers, as listed below, and are therefore not considered further in this chapter:

- Traffic and transport: Chapter 9 (Operational traffic and transport) and Appendix F (Technical working paper: Traffic and transport)
- Noise and vibration: Chapter 11 (Operational noise and vibration) and Appendix G (Technical working paper: Noise and vibration)
- Air quality: Chapter 12 (Air quality) and Appendix H (Technical working paper: Air quality)
- Human health: Chapter 13 (Human health) and Appendix I (Technical working paper: Health impact assessment).

Excluding the assessments identified in Table 27-8, the potential cumulative operational impacts are expected to be limited to social and economic, and visual amenity issues.

Potential cumulative social and economic impacts would be generated by Category 1 and 2 projects. The Category 3 projects identified in Table 27-3 were considered unlikely to generate cumulative operational social and economic impacts. Cumulative operational impacts would be associated with improved travel benefits for communities, business and industry, including freight, across the Sydney transport network. The project, in conjunction with the Western Harbour Tunnel and Warringah Freeway Upgrade project, would help to reduce traffic on major roads, including Military Road/Spit Road/Manly Road, Eastern Valley Way, Brook Street, Miller Street, Warringah Road, Ourimbah Road, Frenchs Forest Road (at Seaforth town centre), Pacific Highway and Western Distributor, supporting local environment and amenity improvements in areas surrounding the project. By providing new underground bypass routes, the Western Harbour Tunnel and Beaches Link program of works would enable express bus services to travel to and from the Northern Beaches region via the new tunnel and motorway network to destinations like North Sydney, the Sydney CBD, Macquarie Park and St Leonards, freeing up surface roads for local buses and local traffic, supporting amenity improvements for town centres and businesses.

In addition, the Western Harbour Tunnel and Beaches Link program of works would result in improved access and connectivity for residents, business and industry between the Northern Beaches and destinations across the Greater Sydney region, including the Sydney CBD.

Through the re-purposing of land at Balgowlah as new and improved open space and recreation facilities for the community, the project would support the implementation of the *Northern Beaches Sportsground Strategy* (Northern Beaches Council, 2017a). The strategy aims to increase sporting fields and recreational facilities in response to a growing shortfall in sporting fields and recreation facilities in the Northern Beaches local government area. Converting existing open space such as golf courses to sports fields was identified as one of six actions to address the need for more sportsgrounds and new and improved facilities. The project would return an area, equivalent to around 90 per cent of the current open space, to the community as new and improved open space and recreation facilities at Balgowlah.

Potential adverse cumulative visual amenity impacts at Cammeray would be generated by the Western Harbour Tunnel and Beaches Link program of works. Operational facilities for both projects introduce new built forms into existing open space at Cammeray Golf Course and generate cumulative landscape character and visual amenity impacts for residential receivers at Cammeray and motorists on the Warringah Freeway and Ernest Street.

There would be no cumulative impacts to geology, groundwater and soils, hydrology and water quality, flooding, hazards and risks, resource use and waste management, sustainability, Aboriginal heritage, non-Aboriginal heritage, climate change and greenhouse gases, and biodiversity during the operation of the project, as impacts related to these aspects would generally be limited to the construction phase of the project.

27.5 Environmental management measures

The implementation of environmental management measures for the project would avoid, to the greatest extent possible, negative cumulative impacts with surrounding development. As each of the study disciplines presented in this environmental impact statement have identified management measures to reduce potential impacts to acceptable levels, cumulative mitigation measures have focused on broader opportunities around inter-project coordination and communication with stakeholders.

Construction fatigue is recognised as an important issue for communities near large construction projects that overlap in time or space. Substantial effort to coordinate with other projects during construction would be made to further manage construction fatigue impacts where possible.

Further opportunities to more effectively manage construction fatigue would be considered during further design development and construction of the project.

Environmental management measures relating to cumulative impacts are outlined in Table 27-9.

Table 27-9 Environmental management measures – cumulative impacts

Ref	Phase	Impact	Environmental management measure	Location
CI1	Pre-construction	Cumulative impacts	Considered and tailored multi-party engagement and cooperation will be established prior to construction to ensure all contributors to impacts are working together to minimise adverse impacts or enhance benefits of multiple projects occurring concurrently or consecutively. Haulage routes and road occupancy will be coordinated with other major transport projects via Greater Sydney Operations.	BL/GHF
CI2	Pre-construction	Construction fatigue	Multi-party engagement and cooperation will be established prior to construction to coordinate with the following projects to manage construction fatigue impacts where possible: • Western Harbour Tunnel and Warringah Freeway Upgrade • Sydney Metro City & Southwest • Channel 9 site staged residential redevelopment.	BL/GHF
CI3	Construction	Cumulative impacts	Communication strategies for the project will be managed consistently across the NSW Government transport portfolio and in	BL/GHF

Ref	Phase	Impact	Environmental management measure	Location
			accordance with the Community consultation framework for the project.	
CI4	Construction	Complaint fatigue	Complaint fatigue will be managed as outlined in Chapter 7 (Stakeholder and community engagement). Complaint management tools for the project are outlined in Appendix E (Community consultation framework).	BL/GHF
CI5	Construction	Spoil management	Co-ordination and engagement with proponents of other major projects, including external to Transport for NSW, will be undertaken prior to construction to identify the opportunity for beneficial reuse of construction spoil where it cannot be reused on site and prior to consideration of disposal options.	BL/GHF

Note: BL = Beaches Link, GHF = Gore Hill Freeway Connection