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Sydney Metro – Western Sydney Airport

Chapter 24
Cumulative impacts

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24 Cumulative impacts

This chapter provides an overview of the potential cumulative impacts associated with the construction and operation of the project. It outlines the approach and methodology adopted for the assessment of potential cumulative impacts, provides a summary of the cumulative impacts identified and recommends mitigation measures to manage potential cumulative impacts.

24.1 Overview

Cumulative benefits or impacts have the potential to occur when benefits or impacts from a project interact or overlap with benefits or impacts from other projects and can potentially result in a larger overall effect (positive or negative) on the environment or local communities. Cumulative impacts may occur during construction stages when projects are constructed or operated concurrently or consecutively. Once Sydney Metro – Western Sydney Airport is operational, other projects which interrelate may enhance the project and create positive cumulative benefits.

The projects identified for inclusion in the cumulative impact assessment are St Marys Intermodal, The Northern Road, the future M12 Motorway and Western Sydney International.

Key issues are outlined below:

- transport – a temporary increase in construction vehicles on the road network, in particular north of Western Sydney International, and associated impacts as a result of overlapping construction activities from the future M12 Motorway and Western Sydney International which are due to be completed in 2025 and 2026 respectively. Longer term, projected future traffic growth in the study area is forecast to be mainly from the future M12 Motorway, Western Sydney International and surrounding urban development, rather than the project
- noise and vibration – in particular cumulative impacts on noise sensitive receivers at St Marys which would be affected by cumulative construction noise from the project and St Marys Intermodal and noise sensitive receivers at Badgerys Creek which would be affected by cumulative construction noise from the project and the future M12 Motorway. During operation, potential cumulative noise impacts are considered negligible in the context of the planned urban growth in the vicinity of the project
- biodiversity – potential cumulative biodiversity impacts north of the Western Sydney International from the interaction of the four projects would result in impacts to 397.15 hectares of Cumberland Plain Woodland which is a Critically Endangered Ecological Community (CEEC), 71.34 hectares of River-flat Eucalypt Forest which is an Endangered Ecological Community (EEC), 19.2 hectares of Shale-Gravel Transition Forest (EEC), 6.64 hectares of Swamp oak floodplain forest (EEC), 0.44 hectares of Moist Shale Woodland (EEC) and 45.16 hectares of other non-threatened native vegetation.

In addition, this chapter addresses cumulative impacts associated with non-Aboriginal and Aboriginal heritage, flooding, hydrology and water quality, soils and contamination, air quality, landscape and visual and social and economic impacts.

24.2 Cumulative impacts defined

Cumulative benefits or impacts have the potential to occur when benefits or impacts from a project interact or overlap with benefits or impacts from other projects and can potentially result in a larger overall effect (positive or negative) on the environment or local communities. Cumulative impacts may occur during construction stages when projects are constructed or operated concurrently or consecutively. Projects constructed consecutively (or sequentially) can have construction activities occurring over extended periods of time with little or no break in construction activities. This has the potential for increased impacts and construction fatigue for local communities. The overall effect of cumulative benefits or impacts could be positive or negative, depending on the nature of the project and the nearby communities and environment. Once Sydney Metro – Western Sydney Airport is operational, other projects which interrelate may enhance the project and create positive cumulative benefits.

The extent to which another development or activity could interact with the construction and/or operation of the project would depend on its scale, location and/or timing of construction. Generally, cumulative impacts would be expected to occur where multiple long-duration construction activities are undertaken close to, and over a similar timescale to, construction activities for the project, or where consecutive construction occur in the same area. Additionally, operation of the project could cause cumulative benefits or impacts when it interrelates or possibly enhances the construction or operation of other projects.

As discussed in Chapter 2 (Strategic need and justification), the population of Greater Western Sydney will continue to grow, requiring services and infrastructure to support the Western Parkland City. Major transport infrastructure planned for the region includes road, rail and airport developments. While new or upgraded infrastructure is essential to support planned growth, multiple developments being undertaken at the same time and in the same geographic area have the potential for cumulative impacts.

Construction fatigue can occur when the same sensitive receivers experience construction impacts from multiple, sequential projects over a prolonged period with few or no breaks between construction activities. Construction fatigue could be experienced if the project and another project occur consecutively or concurrently. Construction fatigue is considered in Chapter 21 (Social and economic) and is also detailed in Technical Paper 10 (Social and economic).

24.3 Cumulative impact assessment methodology

The cumulative impact assessment methodology is illustrated in Figure 24-1 and described in more detail in the following sections.

Figure 24-1 Overview of cumulative impact assessment methodology

24.3.1 Identification of potential projects

Projects identified for consideration as part of the cumulative impact assessment were those that were:

- located in the same local government area as the project
- listed on the NSW Government Major Projects website as State significant development or State significant infrastructure.

The following criteria were used to screen the projects initially identified:

- spatial relevance: a project was considered to be spatially relevant if it overlapped with or was adjacent or in close proximity to the project footprint

- timing: a project was considered to be relevant if the expected timing of its construction would overlap or occur consecutively to the project's timing of construction or operation
- scale: large-scale major development or infrastructure projects that could cause cumulative impacts with the project were considered, as listed on the NSW Government Major Projects website
- publicly available information: projects under consideration must have publicly available information (at the time of preparing this Environmental Impact Statement), with a sufficient level of detail to allow for analysis of potential cumulative impact issues.

All the above criteria need to be met for a project to be included in the cumulative impact assessment.

A number of strategic planning projects identified in NSW transport and land use planning or policy documents may interact with the project in the future, including the East West Rail Link, South West Rail Link extension, Outer Sydney Orbital, the Aerotropolis precincts and potential future metro extensions north to Schofields/Tallawong Station in Rouse Hill and south to Macarthur. These projects generally underpin the development of the Western Parkland City and are discussed further in Chapter 2 (Strategic need and justification). However, as these projects do not meet the criteria described above, and particularly given that their impacts are not known with sufficient precision, they were not considered for inclusion in the cumulative impact assessment for the project.

24.3.2 Projects included in the cumulative impact assessment

Analysis of whether identified projects meet the cumulative impact assessment criteria is provided in Table 24-1. The projects that were identified for inclusion in the cumulative impact assessment are shown on Figure 24-2.

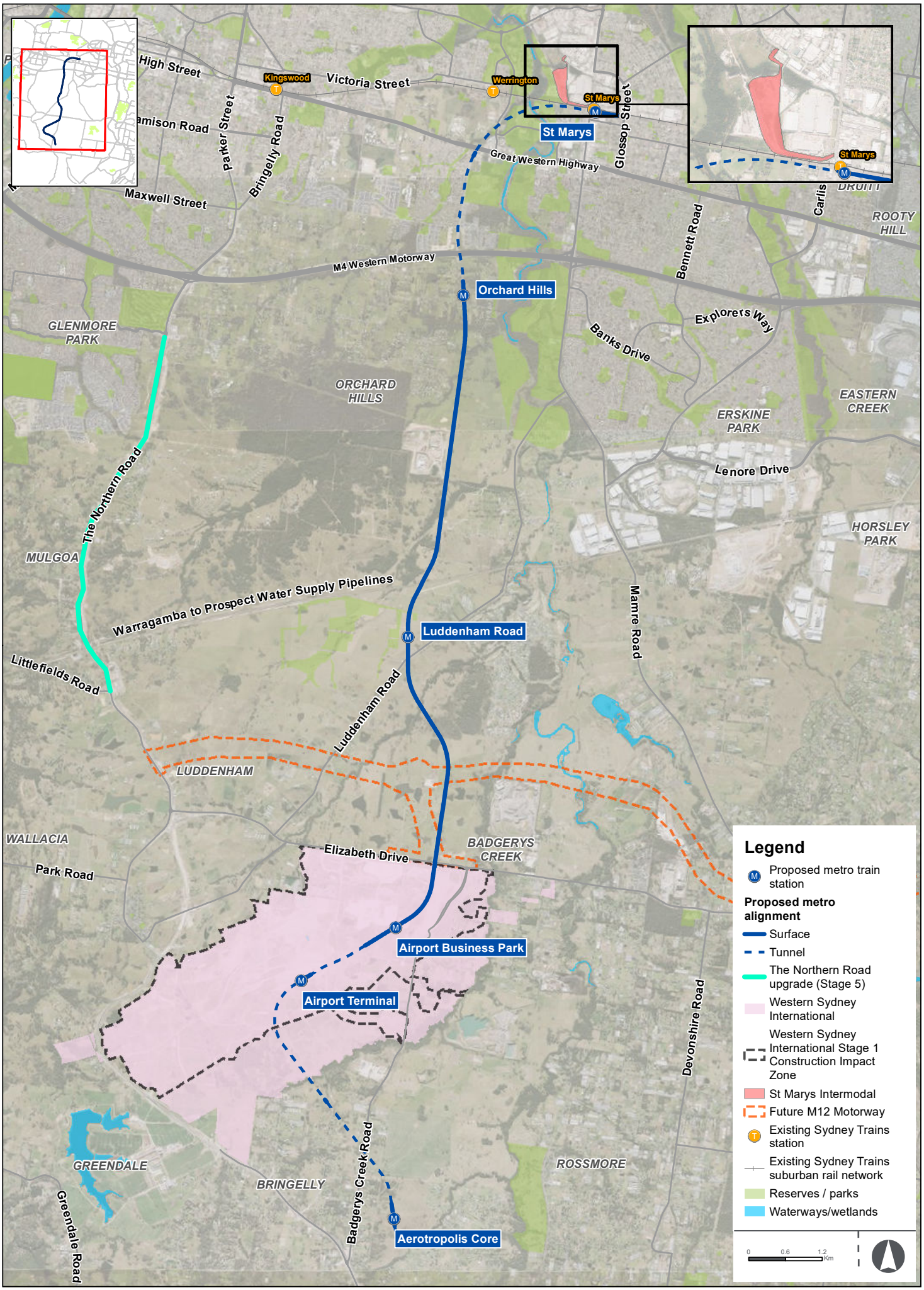
Table 24-1 Projects considered for the cumulative impact assessment

Project	Brief project description	Status	Spatially relevant?	Temporally relevant?	Scale	Publicly available information?	Project included?
St Marys Intermodal	Pacific National is proposing the staged construction and operation of an intermodal terminal (road and rail) and container park near St Marys. The facility will facilitate the introduction of a new container rail shuttle service between Port Botany and Greater Western Sydney, increasing the volume of import and export freight moved via rail. A maximum of five 600 metre trains will run per day and the facility will have an ultimate operating capacity of 300,000 twenty-foot equivalent units (shipping containers) for annual processing.	Approved	Yes. Located on land northwest of the existing St Marys Station. Potential shared traffic routes for both construction and operational traffic associated with the intermodal.	Yes. Construction of the intermodal is assumed to occur during 2021 concurrently with the commencement of construction for the project.	State Significant Development	Yes. Environmental Impact Statement and Submissions Report.	Yes

Project	Brief project description	Status	Spatially relevant?	Temporally relevant?	Scale	Publicly available information?	Project included?
The Northern Road	The upgrade of 35 km of The Northern Road, a key north–south arterial link, as part of the *Western Sydney Infrastructure Plan* (Department of Infrastructure and Regional Development, 2018c) road investment program. The upgrade is being delivered in six stages. All stages are expected to be operational by 2021 except Stage 5: Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park, which is expected to be operational in 2022. Stage 1 has been completed.	Approved and under construction	Yes. The Northern Road project, once completed, will run in a north–south direction to the west of the project including immediately adjacent to Western Sydney International. Stage 5 construction works are generally located between the M4 Western Motorway and Elizabeth Drive.	Yes. Concurrent construction with Stage 5 is possible. Other stages will be operational when project construction commences.	Critical State Significant Infrastructure	Yes. Environmental Impact Statement, Submissions and Preferred Infrastructure Report.	Yes
Future M12 Motorway	A new east–west motorway between the M7 Motorway near Cecil Hills and The Northern Road at Luddenham. The future M12 Motorway will serve as the major access route to Western Sydney International and connect to Sydney's motorway network.	Under assessment	Yes. The project intersects and is located adjacent to the future M12 Motorway in the area between Luddenham Road and Elizabeth Drive.	Yes. Concurrent construction and operation. Construction period is expected between 2022 and 2025. Operation is expected to commence in 2025.	Critical State Significant Infrastructure	Yes. Scoping Report, Environmental Impact Statement.	Yes

Project	Brief project description	Status	Spatially relevant?	Temporally relevant?	Scale	Publicly available information?	Project included?
Western Sydney International	Stage 1 of Western Sydney International will include a 3,700 metre runway, integrated international and domestic passenger terminal, air cargo precinct with landside and airside access and other relevant facilities for an operational capacity of approximately 10 million passengers annually. There will also be an on-airport business park providing opportunities for a range of businesses to locate on the doorstep of the terminal.	Approved and under construction	Yes. A part of the project, including two metro stations, would be constructed and operate within Western Sydney International.	Yes. Construction has commenced and will continue to 2026.	Major infrastructure	Yes. Environmental Impact Statement, Airport Plan, Construction Plan and construction environmental management plans.	Yes
Mamre Road upgrade	Early planning for a future upgrade of a 10 kilometre section of Mamre Road, between the M4 Motorway and Kerrs Road to support economic and residential growth in the area has commenced. The next stage of the project is to prepare a concept design and environmental assessment.	Proposed	Yes. The project is located around 1.2 km west of the Mamre Road upgrade works.	Unknown	Unknown	Limited	No

Project	Brief project description	Status	Spatially relevant?	Temporally relevant?	Scale	Publicly available information?	Project included?
Elizabeth Drive upgrade	Options to improve Elizabeth Drive between Cecil Hills and Luddenham to support Western Sydney International and the Western Parkland City are currently being investigated. The next stage of the project is to prepare the concept road design and environmental assessment.	Proposed	Yes. The project intersects Elizabeth Drive, which forms the northern boundary of Western Sydney International.	Unknown	Unknown	Limited	No
Upper South Creek Advanced Water Recycling Centre	Construction and operation of the Upper South Creek Advanced Water Recycling Centre to collect and treat wastewater from the South West and Western Sydney Aerotropolis Growth Areas, provide recycled water and maintain the potential for any further re-use opportunities in the future.	Proposed	Yes. The Centre would be located north-east of Elizabeth Drive in Kemps Creek, with associated pipelines proposed to run along Elizabeth Drive which forms the northern boundary of Western Sydney International.	Unknown	State Significant Infrastructure	Limited. Scoping Report	No



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Projects included in the cumulative impact assessment

Figure 24-2

24.3.3 Type of assessment

Table 24-2 identifies relevant project issues that may result in potential cumulative impacts during construction and operation. A description of these potential impacts is provided in Section 24.4 and Section 24.5.

Table 24-2 Nature of potential cumulative impacts

Project name	Key construction issues	Key operational issues
St Marys Intermodal	• Transport • Noise and vibration • Biodiversity • Non-Aboriginal heritage • Aboriginal heritage • Social and economic	• Transport • Noise and vibration • Social and economic
The Northern Road	• Transport • Aboriginal heritage • Social and economic	• Transport • Social and economic
Future M12 Motorway	• Transport • Noise and vibration • Biodiversity • Non-Aboriginal heritage • Aboriginal heritage • Flooding, hydrology and water quality • Soils and contamination • Air quality (dust) • Landscape and visual • Social and economic	• Transport • Noise and vibration • Flooding, hydrology and water quality • Landscape and visual • Land use and property • Social and economic
Western Sydney International	• Transport • Noise and vibration • Biodiversity • Non-Aboriginal heritage • Aboriginal heritage • Flooding, hydrology and water quality • Soils and contamination • Air quality (dust) • Landscape and visual • Social and economic	• Transport • Noise and vibration • Flooding, hydrology and water quality • Landscape and visual • Land use and property • Social and economic

Depending on the environmental issue, the type of cumulative impact assessment may be quantitative (such as predictive through modelling), qualitative, or a combination of both. In most cases, a high level qualitative assessment has been undertaken for potential cumulative construction impacts across key issue technical disciplines, as described in Section 24.4.

Figure 24-3 shows the main construction works and operational timeframes for each project considered in the cumulative impact assessment and how these overlap with the project.

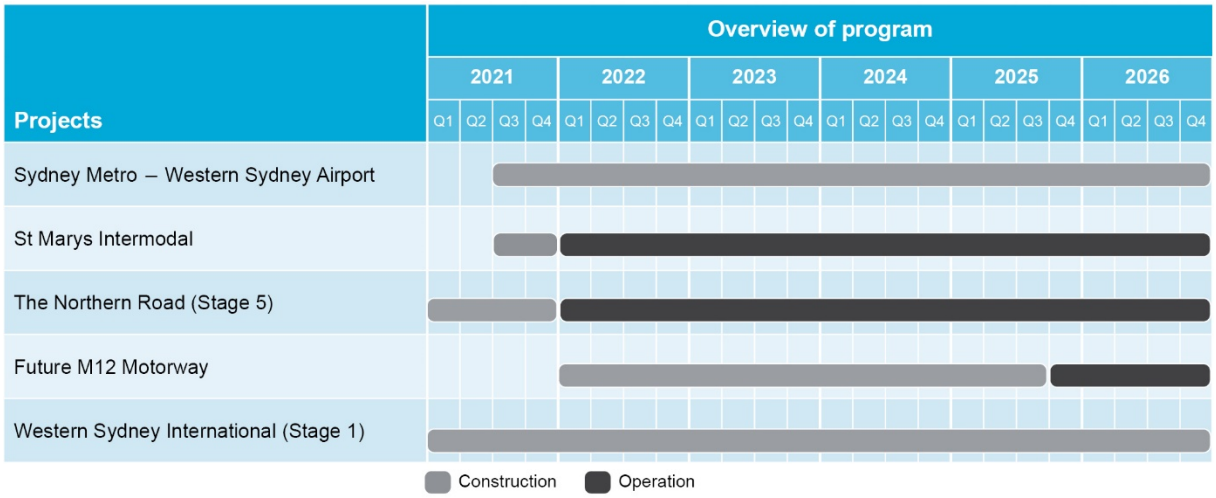


Figure 24-3 Main construction works and operational stages of relevant projects

24.4 Potential cumulative impacts – construction

Potential cumulative impacts during construction are related to:

- transport
- noise and vibration
- biodiversity
- non-Aboriginal heritage
- Aboriginal heritage
- flooding, hydrology and water quality
- soils and contamination
- air quality
- landscape and visual
- social and economic.

These impacts are summarised in Sections 24.4.1 to 24.4.10. Further details on the potential cumulative impacts during construction are presented in the relevant technical papers, noting that there is no technical paper for air quality.

24.4.1 Transport

Limited overlap is anticipated with St Marys Intermodal and The Northern Road as construction of these projects is expected to be completed in 2021 before the peak construction year for the project.

Construction of the project would overlap with the construction activities associated with the future M12 Motorway and Western Sydney International and which are due to be completed in 2025 and 2026 respectively. Potential cumulative transport construction impacts were determined from the WestConnex Road Toll Model (WRTM) outputs developed for the Environmental Impact Statement for the future M12 Motorway project to ensure cumulative impacts from the operation of the project along with the future M12 Motorway and Western Sydney International were considered.

Although the peak year of construction for Western Sydney International (2022 and 2023) and future M12 Motorway (2024) are not forecast to occur during the peak year of construction for the project, for the purposes of this cumulative impact assessment, peak construction activities for all projects are conservatively assumed to occur concurrently in 2023/2024. Cumulative impacts could occur as a result of a temporary increase in construction vehicles on the road network resulting in a reduction in

both mid-block and intersection performance, as well as potential safety impacts arising from increased numbers of heavy vehicles using the road network during construction.

The road network impacted by construction of the project is likely to experience growth in background traffic as a result of broader development of the Western Parkland City and this is anticipated to result in reduced performance of the road network. The transport assessment (Chapter 9 – Transport) indicates that some of the intersections and mid-block sections are forecast to operate at or above capacity due to this forecast growth in background traffic within the study area. This is likely to result in significant delays and queuing at these intersections that would be expected to increase with the addition of traffic forecast to be generated by the project. There are a number of road infrastructure projects being delivered and proposed under the Western Sydney Infrastructure Plan that aim to address road congestion in the study area.

Potential cumulative construction transport impacts are considered in detail in Chapter 6 of Technical Paper 1 (Transport).

Mid-block performance

The weekday AM peak and PM peak traffic volumes were assessed to determine the general performance of the road network configuration in the peak year of construction (2023/2024) for the project only (project construction scenario) as well as the peak year of construction (2023/2024) with construction activity occurring simultaneously for all three projects (cumulative construction scenario). This assessment is provided in Table 24-3. The analysis indicates that all mid-block sections are forecast to operate with a similar Level of Service (LoS) in the peak year project construction scenario and cumulative construction scenario, except at:

- Elizabeth Drive west of Badgerys Creek Road (westbound) which is expected to change from LoS D to LoS E during the AM peak and from LoS E to LoS F during the PM peak
- Elizabeth Drive east of Badgerys Creek Road (eastbound) which is expected to change from LoS E to LoS F during the PM peak.

These exceedances are shown in bold and shaded grey in Table 24-3 and are predicted to be at or above capacity during the future year 2026 without the project due to the forecast growth in background traffic demand within the study area. The LoS criteria used to analyse mid-block LoS is outlined in Chapter 2 of Technical Paper 1 (Transport).

Intersection performance

A summary of the forecast performance of intersections around the project during the peak year of construction (2023/2024) for the project construction scenario compared to the cumulative construction scenario is summarised in Table 24-4. This analysis indicates a deterioration in intersection performance at several intersections shaded grey in Table 24-4. During the cumulative construction scenario, all intersections operate at LoS D or better, except the intersection of Badgerys Creek Road/Badgerys Creek Road site access, which operates at LoS E during the AM peak. The Badgerys Creek Road/Badgerys Creek Road site access is proposed to be shared with the Western Sydney International construction access. However, this intersection is forecast to operate at LoS D during the AM peak with only project construction traffic included.

Mitigation measures to manage this potential impact are outlined in Chapter 27 (Synthesis).

Table 24-3 Peak construction year (2023/2024) cumulative mid-block performance

Location	Direction[1]	TC[2] (pcu[3]/h)	Future year without construction scenario (2023/2024)				Future year with project construction scenario (2023/2024)				Future year with cumulative construction scenario[4] (2023/2024)			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Volume (pcu/h)	LoS	Volume (pcu/h)	LoS	Volume (pcu/h)	LoS	Volume (pcu/h)	LoS	Volume (pcu/h)	LoS	Volume (pcu/h)	LoS
Luddenham Road (north of Elizabeth Drive)	NB	900	1080	F	590	C	1280	F	660	C	1280	F	660	C
	SB	900	300	A	860	E	370	B	1070	F	370	B	1070	F
Elizabeth Drive (west of Badgerys Creek Road)	EB	900	560	C	580	C	720	D	680	D	740	D	740	D
	WB	900	690	D	730	D	790	D	880	E	840	**E**	910	**F**
Elizabeth Drive (east of Badgerys Creek Road)	EB	900	770	D	620	C	840	E	850	E	880	E	920	**F**
	WB	900	930	F	1000	F	1160	F	1070	F	1220	F	1100	F
Badgerys Creek Road (south of Elizabeth Drive)	NB	900	420	B	380	B	510	C	690	D	530	C	710	D
	SB	900	440	B	610	C	750	D	710	D	780	D	730	D
Badgerys Creek Road (north of The Northern Road)	NB	900	500	C	340	B	1320	F	440	B	1360	F	450	B
	SB	900	280	A	550	C	400	B	1370	F	410	B	1420	F
The Northern Road (west of Badgerys Creek Road)	NB	1900	880	B	770	B	960	C	840	B	960	C	880	B
	SB	1900	1100	C	1100	C	1170	C	1180	C	1190	C	1180	C

Location	Direction[1]	TC[2] (pcu[3]/h)	Future year without construction scenario (2023/2024)				Future year with project construction scenario (2023/2024)				Future year with cumulative construction scenario[4] (2023/2024)			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Volume (pcu/h)	LoS	Volume (pcu/h)	LoS	Volume (pcu/h)	LoS	Volume (pcu/h)	LoS	Volume (pcu/h)	LoS	Volume (pcu/h)	LoS
The Northern Road (east of Badgerys Creek Road)	NB	1900	1550	D	1380	C	2330	F	1440	D	2390	F	1450	D
	SB	1900	1110	C	1260	C	1180	C	2040	F	1190	C	2130	F

Notes:
1. NB – northbound, SB – southbound
2. TC – theoretical capacity
3. PCU – passenger car unit (traffic volumes have been rounded to the nearest 10)
4. Cumulative construction scenario includes the project, the future M12 Motorway and Western Sydney International

Table 24-4 Peak construction year (2023/2024) cumulative intersection performance

Intersection[1]	Future year without construction scenario (2023/2024)				Future year with project construction scenario (2023/2024)				Future year with cumulative construction scenario (2023/2024)			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	Average delay (sec)	LoS	Average delay (sec)	LoS	Average delay (sec)	LoS	Average delay (sec)	LoS	Average delay (sec)	LoS	Average delay (sec)	LoS
Luddenham Road/Elizabeth Drive (P)	10	A	12	A	15	B	16	B	16	B	21	B
Elizabeth Drive/Adams Road (P)	9	A	16	B	13	A	32	C	18	**B**	53	**D**
Elizabeth Drive/Badgerys Creek Road (R)	13	A	14	A	17	B	28	B	25	B	48	**D**
Badgerys Creek Road/Badgerys Creek Site Access (P)	-	-	-	-	33	C	36	C	60	**E**	50	**D**
Badgerys Creek Road/Aerotropolis Site Access (P)	-	-	-	-	43	D	42	C	46	D	50	**D**
Badgerys Creek Road/The Northern Road (S)	34	C	28	B	53	D	32	C	56	D	33	C
The Northern Road/Derwent Road (S)	6	A	6	A	7	A	6	A	7	A	6	A

Notes:
Intersection control type as indicated against each (P - priority-controlled, R - roundabout, S - signalised)
Cumulative construction scenario includes the project, the future M12 Motorway and Western Sydney International
For traffic signals, the average movement delay and level of service over all movements is used. For roundabouts and priority control intersections (with stop and give way signs), the critical movement for level of service assessment with the worst movement delay is used
Dashes indicate new construction site accesses that would only be constructed and used by construction vehicles and hence would not exist during the base year scenario

24.4.2 Noise and vibration

No potential cumulative construction noise and vibration impacts are anticipated for The Northern Road as this project is anticipated to have completed construction in the vicinity of the project before commencement of main construction for the project and the project would not affect the same noise and vibration sensitive receivers.

Construction for the project would overlap with construction activities for St Marys Intermodal, the future M12 Motorway and Western Sydney International. An overview of the noise sensitive receivers most likely to be adversely impacted by cumulative construction noise from the project and concurrent projects at St Marys is shown in Figure 24-4 and at Badgerys Creek in Figure 24-5.

The figures presents the locations where the cumulative construction noise levels during standard hours exceed 50 dBA $L_{eq,15min}$ for more than one project (i.e. this is not the cumulative sum of construction noise, rather an indication of where the project and concurrent projects are predicted to exceed 50 dBA $L_{eq,15min}$ during standard hours). Potential cumulative noise and vibration impacts outside standard hours would be considered at a later stage when further details are known about the future M12 Motorway project.

The assessment is based on the worst case (highest) predicted noise level over the duration of construction of the project. The noise level of 50 dBA $L_{eq,15min}$ was selected as it represents the project's typical standard hours construction noise target for most noise catchment area (NCAs) (where the typical range is around 45-55 dBA across the project) and for consistency with the approach adopted for the future M12 Motorway cumulative impact assessment.

It has not been possible to assess cumulative construction noise impacts in a quantitative manner due to the different stages of these projects.

Potential cumulative construction noise and vibration impacts are considered in detail in Chapter 6 of Technical Paper 2 (Noise and vibration).

St Marys

Noise sensitive receivers at St Marys may be affected by cumulative construction noise from the project and construction activities for the St Marys Intermodal. Based on the assessment of areas where the construction noise levels would exceed 50 dBA $L_{eq,15min}$ for the project and St Marys Intermodal, the most sensitive receivers would be those located within NCA01 of the project bounded by Kalang Avenue, Camira Street, Carinya Avenue and Kungala Street (see Figure 24-4). These receivers comprise medium density single and multi-storey residential dwellings. These receives would only be affected for a short duration while construction of these two projects overlaps.

Badgerys Creek

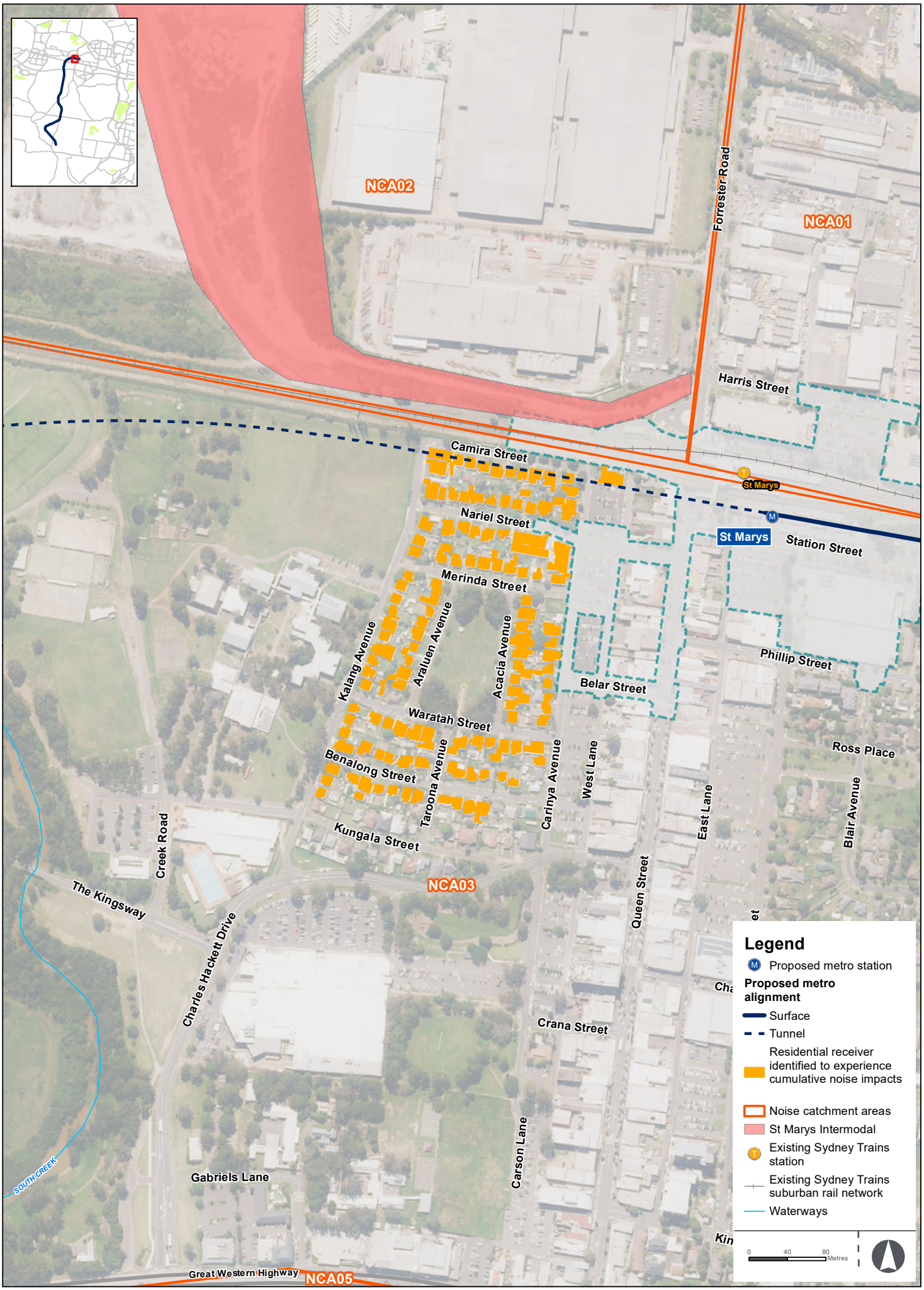
Noise sensitive receivers at Badgerys Creek may be affected by cumulative construction noise from the project and the future M12 Motorway, which if approved would occur concurrently with the planned construction period of the project. The future M12 Motorway would be constructed in an east-west direction across the southern portion of NCA10 of the project (see Figure 24-5). The nearest noise sensitive receivers would be located within NCA10 and NCA11 of the project.

Exceedances of the standard hours Interim Construction Noise Guideline (ICNG) noise targets by more than 20 dB for construction of the future M12 Motorway are predicted to occur in NCA10 of the project, and up to 20 dB in NCA11 of the project (M12 Motorway Environmental Impact Statement (Transport for NSW, 2019b)). Based on the assessment of areas where the construction noise levels would exceed 50 dBA $L_{eq,15min}$ for the project and future M12 Motorway, the most sensitive receivers are shown on Figure 24-5 and would include:

- low density single storey residential dwellings on the eastern and western sides of Luddenham Road, and Farmingdale Court, Luddenham around 1.5 to 2 kilometres north of Elizabeth Drive
- low density single storey residential dwellings immediately to the north and south of Elizabeth Drive near Lawson Road, Badgerys Creek.

Sydney Metro would work closely with Transport for NSW as the proponent for the future M12 Motorway to manage potential construction noise impacts on sensitive receivers.

Due to the large size of the Western Sydney International site, there are no areas beyond its site boundary that are predicted to have construction noise levels in excess of 50 dBA $L_{eq,15min}$ (*Western Sydney Airport – Environmental Impact Statement* (Australian Government, 2016b)). As a result, construction of the project and Western Sydney International is not anticipated to result in cumulative noise impacts at any sensitive receiver locations.



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Cumulative construction noise impacts at St Marys

Figure 24-4

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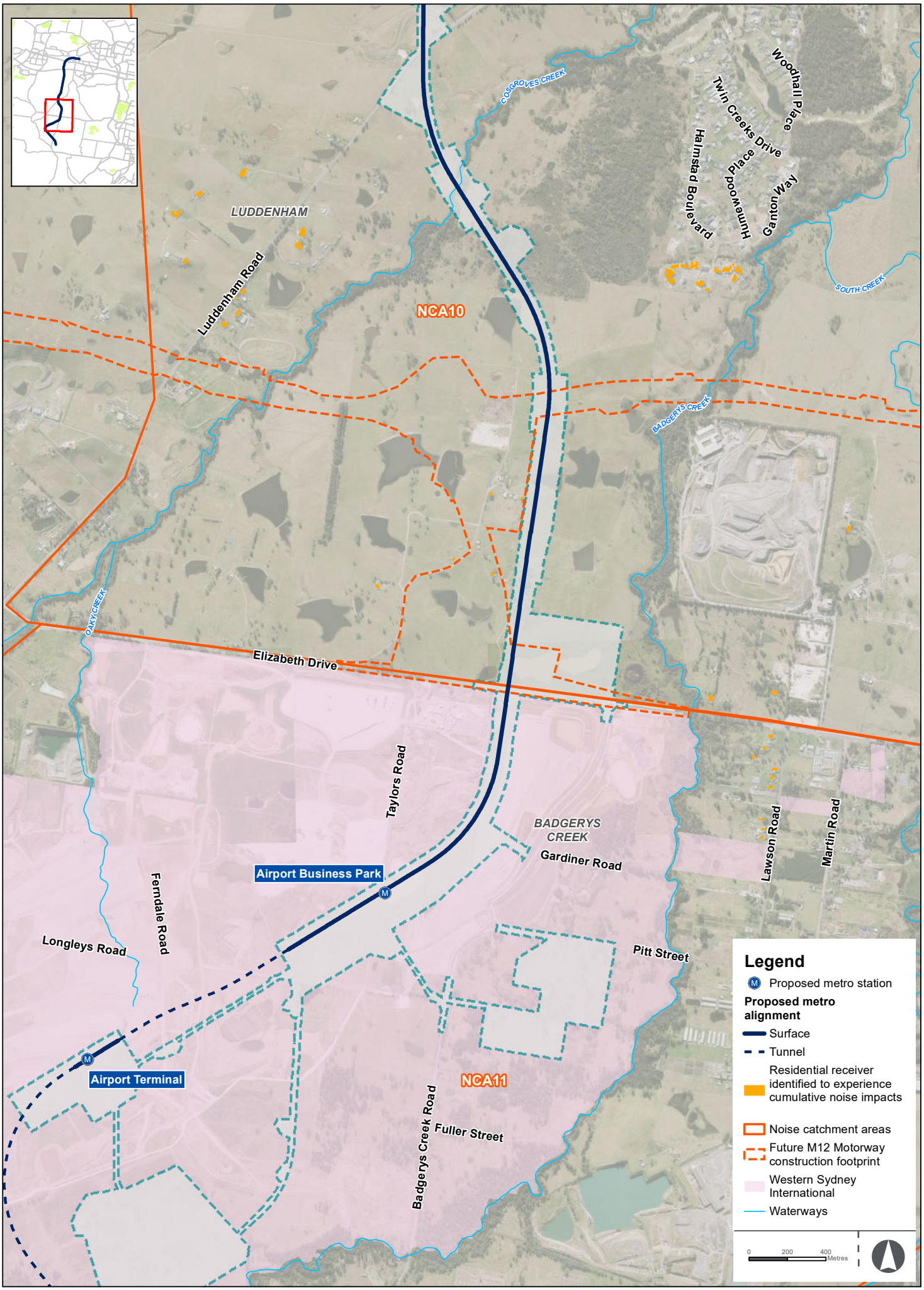

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Cumulative construction noise impacts at Badgerys Creek

Figure 24-5

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24.4.3 Biodiversity

Potential cumulative impacts as a result of the project combined with St Marys Intermodal, The Northern Road, the future M12 Motorway and Western Sydney International are summarised in Table 24-5 and include:

- increased removal of native vegetation and fauna habitat resources
- increase in displacement of native fauna species
- increase in edge effects and habitat fragmentation
- increase in noise, light, vibration and other disturbance for fauna that may inhabit or use resources near the project
- increase in the impact of Key Threatening Processes.

Table 24-5 Summary of cumulative biodiversity impacts

Vegetation type	Western Sydney International[1]	Future M12 Motorway	The Northern Road	St Marys Intermodal	Sydney Metro – Western Sydney Airport	Total
	Area (Ha)[2]					
Cumberland Plain Woodland (CEEC)	272.80	60.16	30.87	0	33.32	**397.15**
River-flat Eucalypt Forest (EEC)	47.6	3.23	3.86	0.72	15.93	**71.34**
Shale-Gravel Transition Forest (EEC)	5.9	6.91	0	0	6.39	**19.2**
Swamp oak floodplain forest (EEC)	0	2.53	0	0	4.11	**6.64**
Moist Shale Woodland (EEC)	0	0.44	0	0	0	**0.44**
Other non-threatened native vegetation	37.20	0.38	6.06	1.51	0.01	**45.16**
Total	**363.50**	**73.65**	**40.79**	**2.23**	**59.76**	**539.93**

Notes:
1. Impacts are derived from the Western Sydney International Biodiversity Offsets Delivery Plan (Commonwealth of Australia, 2018)
2. Areas subject to change

CEEC – Critically endangered ecological community
EEC – Endangered ecological community

The project is located within Greater Western Sydney, an area already subject to historic environmental pressures which encompasses a highly fragmented landscape with areas of agricultural, residential and commercial land use. Together these projects may result in the further loss of habitat from an already modified environment with fragmented natural biodiversity values.

The implementation of standard mitigation measures consistently across projects would mean that cumulative impacts on biodiversity from this project are not considered to be substantial.

For the land north of the Western Sydney International, strategic conservation planning is currently being undertaken in the form of the *Cumberland Plain Conservation Plan 2020–56* (CPCP) (Department of Planning, Industry and Environment, 2020b) to manage cumulative biodiversity impacts for the Western Parkland City. While the CPCP has not been used for the assessment of project impacts specifically, it will provide the appropriate mechanism for the long-term management of cumulative biodiversity impacts for land north of the Western Sydney International.

For land south of Western Sydney International, cumulative biodiversity impacts are substantially addressed through the strategic assessment completed as part of the *Sydney Growth Centres Strategic Assessment* (DECCW and DoP, 2010c). The cumulative impact assessment in this Environmental Impact Statement therefore only considers potential cumulative biodiversity impacts within and to the north of the airport. Potential cumulative impacts south of Western Sydney International are unlikely as there are no other projects identified occurring in this area that could interact with the project. In addition, the project won't remove non-certified vegetation so no impacts are anticipated beyond those already assessed in the Sydney Growth Centres Strategic Assessment.

Potential cumulative biodiversity impacts are considered in detail in Chapter 10 of Technical Paper 3 (Biodiversity Development Assessment Report).

24.4.4 Non-Aboriginal heritage

Potential cumulative impacts on non-Aboriginal heritage values have been considered for the project in combination with St Marys Intermodal, future M12 Motorway and Western Sydney International.

No potential cumulative impacts are anticipated for The Northern Road given the approximate two kilometre separation distance from the project.

Potential cumulative non-Aboriginal heritage impacts are considered in detail in Chapter 8 of Technical Paper 4 (Non-Aboriginal heritage).

St Marys Railway Station

The St Marys Intermodal would involve the development of a freight rail terminal around 500 metres to the northwest of St Marys Station, which is listed on the State Heritage Register as having Stage significance and the *Penrith Local Environmental Plan* (LEP) *2008* as having local significance.

The Environmental Impact Statement prepared for the St Marys Intermodal project indicated that the size and mass of the new intermodal, despite the significant set-back from the existing St Marys Station, would still increase the modern visual clutter in the vicinity of the station, resulting in a minor indirect impact to the heritage item.

The construction of the proposed aerial concourse for St Marys Station would involve the introduction of further large-scale modern materials into the St Marys Station precinct, which would further affect the heritage significant setting of the station. Overall, the project would contribute a negligible cumulative heritage impact to the St Marys Railway Station heritage item.

Luddenham Road

The future M12 Motorway would involve a new motorway crossing over Luddenham Road around five kilometres south of the project works near Luddenham Road.

This would not involve altering the heritage significant alignment of Luddenham Road, although it may further impede on the rural landscape setting within which the Luddenham Road heritage item is located.

There may be minor cumulative impacts from the alteration of the setting of Luddenham Road in conjunction with similar landscape changes from the introduction of the metro viaduct over part of the heritage item.

McMaster Farm

Neither the future M12 Motorway nor the project would impact any of the moderately significant structures present on the McMaster Farm, an item identified as having potential heritage significance. The future M12 Motorway would traverse the central portion of the property but would be located on the western side of the group of significant structures to be retained, while the project would traverse predominantly along its eastern boundary.

While all significant structures would be conserved, the development of new infrastructure on either side of the buildings would remove the heritage significant setting of the item, as well as removing remaining agricultural infrastructure elements (dams, out-sheds, former feeding troughs). This would result in moderate cumulative impacts to the McMaster Farm.

McGarvie-Smith Farm

Heritage item McGarvie-Smith Farm may be affected by the cumulative impacts from construction of the project and the future M12 Motorway. McGarvie-Smith Farm is a local heritage item listed on the Penrith LEP 2010.

The future M12 Motorway would involve the removal of six heritage significant structures on the property. The project would involve the removal of a further three structures as well as the majority of dams and canals on the same property.

Two of the original buildings would remain, which are considered of high heritage value to the site.

The majority of the curtilage of this item (around 80 per cent) would be removed by both projects. Remnant fabric at the McGarvie-Smith Farm is in poor condition, and with the loss of all other structures and farm infrastructure, as well as the complete renovation of the rural topography into modern rail and roadways, the cumulative impact on this heritage item would be major.

Kelvin / Kelvin Park Group

Heritage item Kelvin (also listed as Kelvin Park Group) would be indirectly affected by the cumulative impacts from construction of the project and Western Sydney International. Kelvin is a homestead listed on the State Heritage Register as having State significance and Liverpool LEP 2008 as having local significance (refer to Figure 12-4).

Western Sydney International would introduce a large new airport complex around three kilometres northwest of the Kelvin item resulting in an indirect impact due to the reduction in the extent of the surrounding rural setting for the item.

The introduction of Aerotropolis Core Station would noticeably alter the rural setting of Kelvin to the west of the heritage item; however, heritage significant rural landscapes to the north and north-east would be preserved.

Given the significant separation distance between Western Sydney International and the proposed Aerotropolis Core Station, indirect impacts from the construction of the airport would not exacerbate the change in setting to the Kelvin Park Group. The cumulative impact to Kelvin is considered negligible.

24.4.5 Aboriginal heritage

Potential cumulative construction impacts on Aboriginal heritage values have been considered for the project in combination with St Marys Intermodal, The Northern Road, the future M12 Motorway and Western Sydney International.

The project would impact one known artefact scatter site located within the Aerotropolis Core construction site in the off-airport environment. This scatter site is one of many similar sites represented across the wider region (i.e. no rarity value by site type).

All other sites in proximity to but outside the construction footprint are proposed to be avoided and protected.

In addition to this one known site impact, the project could potentially impact a number of unidentified surface and subsurface archaeological sites and identified cultural values which could result in potential cumulative impacts on identified cultural and archaeological values (such as values of significance to Aboriginal people resulting from traditions, customs, beliefs and history, and those associated with waterways surrounding the project). Further consultation with Registered Aboriginal Parties as well as archaeological fieldwork during design development as described in Chapter 13 (Aboriginal heritage) would determine potential cumulative impacts on places of cultural significance such as creeks and waterways.

The future M12 Motorway would impact known Aboriginal sites. While the section of the project that intersects with the future M12 Motorway immediately north of Western Sydney International does not have any previously identified AHIMS sites within its bounds or landform elements with potential associated cultural value (such as waterways), areas of archaeological potential have been identified within this area and further investigation has been proposed.

There are known Aboriginal sites, areas of cultural value and areas of archaeological potential within the on-airport environment. The *Western Sydney Airport Aboriginal Cultural Heritage Construction Environmental Management Plan* (Western Sydney Airport, 2019b) contains protocols for the removal and protection of all known sites within Western Sydney International.

For sites that are not removed as part of the Western Sydney International development, Sydney Metro would prepare an Aboriginal Cultural Heritage Construction Environment Management Plan (CEMP) for the on-airport rail works which would include the related methodologies for collection and salvage of sites that remain within the construction footprint where required, unexpected finds, and outlining nominated sites for protection. The CEMP would align with the Western Sydney International Survey and Salvage Plan.

Potential cumulative Aboriginal heritage impacts are considered in detail in Chapter 9 of Technical Paper 5 (Aboriginal heritage).

24.4.6 Flooding, hydrology and water quality

Potential cumulative construction impacts on flooding, hydrology and water quality have been considered for the project in combination with St Marys Intermodal, The Northern Road, the future M12 Motorway and Western Sydney International. All of these projects are located within the South Creek catchment and therefore there is the potential for cumulative construction impacts on local water quality from concurrent construction activities including vegetation clearing, earthworks, materials handling and from exposed surfaces and stockpiles.

During design development and construction planning for the project, opportunities to combine construction water quality mitigation and/or treatment measures to ensure a consistent approach to minimising water quality impacts in the downstream catchment would be considered.

Potential cumulative construction flooding, hydrology and water quality impacts are considered in detail in Chapter 7 of Technical Paper 6 (Flooding, hydrology and water quality).

24.4.7 Soils and contamination

No potential cumulative construction soil and contamination impacts are anticipated for St Marys Intermodal or The Northern Road given their distance from the project.

Potential cumulative construction impacts on soils and contamination have been considered for the project in combination with the future M12 Motorway and Western Sydney International. These include increased volumes of spoil going to landfill, cross contamination of soils between the projects or disturbance of already remediated areas within the Western Sydney International site.

Consultation would occur with stakeholders for the future M12 Motorway and Western Sydney International during design development and construction planning to ensure a coordinated approach to the management of soil and contamination for the projects.

24.4.8 Air quality

The highest potential for cumulative air quality impacts is where construction of other projects would occur concurrently with the project, including where the project intersects the future M12 Motorway project to the north of Elizabeth Drive and Western Sydney International. Bulk earthworks would be the highest dust generating activity associated with construction of Western Sydney International, however this activity is expected to be completed in Q3 2022 and therefore cumulative dust impacts in this area are expected to be minor.

24.4.9 Landscape and visual

No potential cumulative construction impacts are anticipated for The Northern Road due to the separation distance from the project and that each project would be experienced and viewed separately.

Potential cumulative construction impacts on landscape and visual values have been considered for the project in combination with St Marys Intermodal, the future M12 Motorway and Western Sydney International.

Potential cumulative construction landscape and visual impacts are considered in detail in Chapter 11 of Technical Paper 9 (Landscape and visual).

St Marys

During construction of the project and St Marys Intermodal, there may be combined effects on the general landscape of St Marys with regard to wayfinding, legibility and accessibility in the vicinity of the existing St Marys Station due to temporary alterations to roads and footpaths adjacent to construction sites supporting the projects. The removal of trees within both sites and intensive construction activities being undertaken in areas adjacent to the public realm may also reduce the level of comfort and amenity for people approaching the station and local businesses in areas to the north of the station, particularly along Harris Street. The potential for cumulative construction impacts is likely to be short term.

It is unlikely that both projects would be visible in any one view, as the St Marys Intermodal is set back from the road, and largely screened by the large scale commercial and industrial built form along Forrester Street. However, additional heavy vehicles may be seen from Harris Street and Forrester Street. The removal of vegetation may also be visible at both construction sites when viewed from the station, the adjacent multi-storey car park and from Forrester Street and Harris Street. No cumulative construction visual impacts are expected at night as any additional light sources from construction would be generally absorbed into the existing brightly lit night scene of the existing St Marys Station and adjacent industrial area.

Badgerys Creek

Potential impacts for the area of Badgerys Creek where cumulative construction landscape and visual impacts could occur from the project, the future M12 Motorway and Western Sydney International include:

- a moderate adverse landscape impact as a result of removed vegetation as well as road, rail and airport infrastructure which may divide this landscape
- a minor adverse visual impact in views from Elizabeth Drive as a result of extensive large-scale concurrent construction activity associated with these projects.

On-airport

There would be negligible landscape and visual impacts at Western Sydney International as this site is currently under construction and the project would be absorbed into this changing landscape and the scale of the project during construction would be largely consistent or of a lesser scale than the airport construction works.

24.4.10 Social and economic

The cumulative social and economic benefits of the identified projects during construction may include increased opportunities for economic development and employment opportunities, contributing to increased household incomes across the Western Sydney region.

The potential cumulative social and economic impacts during construction may include:

- concurrent construction activities may cause a temporary increase in construction traffic with the potential to produce a potential cumulative traffic noise impact along common haulage routes
- increased traffic on local roads, as well as construction activities may cause temporary changes in the rural character and lifestyle impacting the amenity of nearby properties and communities due to construction noise, vibration and dust
- concurrent construction may produce a temporary spike in temporary workers in an area which may create a temporary shortage of accommodation
- extended construction periods and potential associated impacts on traffic, noise, air quality and amenity may result in construction fatigue in surrounding communities.

Potential cumulative construction social and economic impacts are considered in detail in Chapter 7 of Technical Paper 10 (Social and economic).

24.5 Potential cumulative impacts – operation

Potential cumulative impacts during operation are related to:

- transport
- noise and vibration
- flooding, hydrology and water quality
- landscape and visual
- land use and property
- social and economic.

These impacts are summarised in Sections 24.5.1 to 24.5.6. Further details on potential cumulative impacts during operation are presented in the relevant technical papers, noting that there is no technical paper for land use and property.

24.5.1 Transport

The cumulative operational assessment considers two future operational year scenarios; 2026 (opening) and 2036 (10 years after opening). The project, the future M12 Motorway and Western Sydney International would be operational by 2026 and 2036. This assessment is shown in the following tables in Chapter 9 (Transport):

- 2026 (opening) mid-block performance is provided in Table 9-7
- 2026 (opening) intersection performance is provided in Table 9-8
- 2036 (10 years after opening) mid-block performance is provided in Table 9-9
- 2036 (10 years after opening) intersection performance is provided in Table 9-10.

Potential cumulative transport operational impacts were determined from the WRTM outputs developed for the Environmental Impact Statement for the future M12 Motorway project to consider cumulative impacts from the operation of the project along with the future M12 Motorway and Western Sydney International. This assessment considers the traffic model used in the M12 Motorway Environmental Impact Statement as this was the most current data available at the time of the assessment.

Projected future traffic growth in the study area is forecast to be mainly from Western Sydney International, the future M12 Motorway and surrounding urban development, rather than the project. The additional road-based traffic, including park and ride, kiss and ride, point to point and bus movements forecast to be generated by the project is minimal. It is also expected that the project may shift drivers and passengers accessing the Western Parkland City, including Western Sydney International, off the road and on to public transport.

The cumulative operational scenarios are forecast to perform satisfactorily along the main transport corridors, including Mamre Road, Luddenham Road, Elizabeth Drive and The Northern Road. However, intersections north of the M4 Western Motorway around St Marys are forecast to operate with significant delays and limited capacity as a result of the forecast background traffic growth in the future years. Future improvements to the performance of these intersections is considered to be required to support the forecast population and employment growths as the Western Parkland City develops. This would be undertaken as part of further development of the Western Parkland City separate to the project.

Mitigation measures to manage this potential impact are outlined in Chapter 27 (Synthesis).

Potential cumulative operational transport impacts are considered in detail in Chapter 6 of Technical Paper 1 (Transport).

24.5.2 Noise and vibration

The future noise environment during operation of the project is expected to be largely different to that currently experienced. This is due to the future urban development occurring in the area including infrastructure such as the future M12 Motorway and Western Sydney International. The cumulative impact of these projects would increase the level of background noise in the surrounding environment, particularly south of the M4 Western Motorway.

Due to the varying nature of noise assessment metrics used in the assessment of impacts from aircraft, road and rail noise, it is not possible to quantitatively assess cumulative operational noise impacts from these projects.

24.5.3 Flooding, hydrology and water quality

The future M12 Motorway is predicted to have local flooding impacts at Cosgrove Creek and Badgerys Creeks, however the cumulative impact on flooding with the project is considered insignificant for peak flood levels. The duration of inundation and the peak velocities at these creek crossings may temporarily change during operation.

The key changes to flood behaviour resulting from operation of the project and Western Sydney International site would include changes to runoff volumes and direction of runoff across the Western Sydney International site. Potential cumulative impacts would be mitigated through the joint management of velocity and duration across a range of flood events to minimise geomorphic changes to Badgerys and Cosgroves Creek. Mitigation measures to manage this potential impact are outlined in Chapter 27 (Synthesis) and include updating of the flood model for the project having regard to flood modelling undertaken for the South Creek Sector Review.

Cumulative water quality impacts may also occur in the vicinity of Badgerys Creek where the project, future M12 Motorway and Western Sydney International are located as a result of changed catchment conditions from rural to impervious surfaces. Road drainage of the future M12 Motorway would typically include gross pollutant and sediment traps to remove the majority of sediment particles, as well as design measures and scour protection to prevent erosion and sedimentation within receiving waterways. As such the risk of cumulative water quality impact to the receiving waterways during operation is considered low.

Opportunities to combine operational water quality mitigation and/or treatment measures to ensure a consistent approach to minimising water quality impacts in the downstream catchment would be considered. This would include consideration of opportunities to use the existing Western Sydney International stormwater management measures comprising bioretention basins and drainage swales to provide water quality treatment for stormwater runoff prior to discharge to Badgerys Creek, Oaky Creek, Cosgroves Creek and Duncans Creek.

24.5.4 Landscape and visual

No potential cumulative operational impacts are anticipated for The Northern Road or the St Marys Intermodal as these projects are visually separated from the project.

Potential impacts for the area of Badgerys Creek where cumulative operational landscape and visual impacts could occur from the project in combination with the future M12 Motorway and Western Sydney International include:

- a minor adverse landscape impact due to the introduction of built elements associated with road, rail and airport infrastructure
- a minor adverse visual impact in views from Elizabeth Drive as the project alignment would be a small change to a view in the context of the visual transformation that would be associated with operation of the future M12 Motorway and Western Sydney International
- a moderate adverse visual impact during night-time, due to the introduction of lit infrastructure associated with the projects.

While not included in this cumulative impact assessment, there is significant development planned to occur in the area surrounding the project as part of the Western Parkland City and Western Sydney Aerotropolis. In the longer term the project would be visually absorbed into this surrounding urban landscape.

On-airport

During operation, the Western Sydney International site will have undergone a substantial landscape and visual change and include a single runway, airport terminal, airport access roads and other support facilities. Cumulative impacts from the project in combination with the operational Western Sydney International would not be significant as the project would be seen within the context of the airport site.

Potential cumulative operational landscape and visual impacts are considered in detail in Chapter 11 of Technical Paper 9 (Landscape and visual).

24.5.5 Land use and property

Cumulative land use impacts may occur during operation as the project is located within an area subject to extensive land use change arising from other infrastructure projects (such as the future M12 Motorway and Western Sydney International) and broader strategic planning processes. The implementation of mitigation measures are expected to adequately manage potential land use and property impacts of the project.

While the future strategic planning projects identified in the *Greater Sydney Region Plan* (Greater Sydney Commission, 2018a), and *Western City District Plan* (Greater Sydney Commission, 2018b) for the Western Parkland City do not meet the criteria to be included in this cumulative impact assessment, they would result in significant future land use changes in the area surrounding the project. These planned land use changes are described in Chapter 19 (Land use and property).

During operation, potential cumulative impacts on land use and property may include:

- changes to the traditional rural residential land use to include road, rail and airport transport infrastructure in the area south of M4 Western Motorway
- possible property severance and/or fragmentation where the project is located at surface level or on viaduct, particularly where the project alignment is located in proximity to the future M12 Motorway
- property acquisition (some partial and some full) and property adjustments (access, fences and farm infrastructure) for the projects.

24.5.6 Social and economic

During operation, the cumulative social and economic benefits may include:

- the availability of jobs and increased economic activity may drive economic and employment growth in Western Sydney
- greater transport efficiencies by relieving pressure on existing roads, and reducing traffic volumes and congestion along some of western Sydney's main arterial roads
- improved access to the future Western Sydney Aerotropolis and the South West Growth Area including direct access to Western Sydney International
- increased road capacity for future growth and development as well as increased opportunities for pedestrian and cyclist infrastructure and associated reduced congestion impact on the community and businesses
- generation of diverse employment opportunities to support the airport operations, as well as the commercial activities at the Western Sydney Aerotropolis.

Potential cumulative social and economic impacts may include changes in local character and potential impacts on social amenity. Any potential residual cumulative adverse impacts would be offset by the benefits of the project.

Potential cumulative construction social and economic impacts are considered in detail in Chapter 7 of Technical Paper 10 (Social and economic).

24.6 Proposed management and mitigation measures

Environmental management for the project would be undertaken through an environmental management approach as detailed in Chapter 25 (Environmental management and mitigation). The construction and operational environmental management frameworks are discussed in Section 25.2 and 25.3 respectively.

Under these broad frameworks, a series of performance outcomes have been developed to define the minimum environmental standards that would be achieved during construction and operation (see Section 24.6.1), and mitigation measures that would be applied during construction and operation to manage identified impacts (see Section 24.6.2).

This chapter assumes that the mitigation measures for each environmental aspect would be applied. Therefore, the mitigation measures discussed here focuses on more strategic measures that may be implemented in coordination with other relevant projects.

24.6.1 Performance outcomes

The performance outcome identified in relation to cumulative impacts is listed in Table 24-6.

Table 24-6 Cumulative impact performance outcome

Project performance outcome	Timing
Cumulative impacts are minimised through coordination of construction activities and communication processes with nearby major projects (Western Sydney International, M12 Motorway, The Northern Road, St Marys Intermodal)	Construction

24.6.2 Mitigation measures

The mitigation measure to manage potential cumulative construction impacts is listed in Table 24-7.

Table 24-7 Cumulative impact mitigation measures

Ref	Mitigation measure	Applicable location(s)
Construction		
CL1	A Cumulative Construction Impacts Management Plan would be developed and would detail co-ordination and consultation requirements with the following stakeholders (as relevant) to manage the interface of projects under construction at the same time: • Western Sydney Airport • Transport for NSW • Western Parkland City Authority • Sydney Water • Emergency service providers • Utility providers Co-ordination and consultation requirements with these stakeholders would be detailed in the plan to include: • provision of regular updates to the detailed construction program, construction sites and haul routes • identification of key interfaces with other construction projects • development of mitigation strategies to manage cumulative impacts associated with these interfaces	All

24.6.3 Consideration of the interaction between measures

Mitigation measures in other chapters that are relevant to the management of potential cumulative impacts include:

- Chapter 9 (Transport) specifically measures which addresses coordination with stakeholders to manage potential cumulative transport impacts during construction and operation.