# 18 Socio-economic impacts

*This chapter assesses the potential socio-economic impacts associated with the project. It has been informed by the social impact assessment undertaken by GHD. A full copy of the social impact assessment report is provided as Technical Report 11 – Social impact assessment.*

## 18.1 Assessment approach

### 18.1.1 Methodology

#### *18.1.1.1 Study area*

Data from the 2016 Census of Population and Housing (ABS, 2016) is available at the Statistical Areas Level 2 (SA2) level. The SA2 is the smallest area for the release of ABSA statistics. The study area for the assessment covers two SA2 areas within the Fairfield and Liverpool LGAs.

The two SA2 areas of relevance to this assessment are:

- Cabramatta-Lansvale – which encompasses the suburb of Cabramatta in which the project site is located
- Warwick Farm – which encompasses the suburb of Warwick Farm in which the project site is located.

#### *18.1.1.2 Key tasks*

The assessment involved:

- confirming the study area for the purposes of the assessment (see above)
- describing the existing social environment of the study area, including developing a demographic profile for communities in the study area with the potential to be affected by the project
- identifying and mapping community infrastructure and facilities with the potential to be affected by the project
- reviewing information on the project, including the indicative construction methodology, and the proposed operational features and details
- reviewing other technical papers prepared for the EIS to understand the nature, scale and significance of potential impacts, and identify resultant social impacts
- assessing the potential social impacts and benefits of the project, in accordance with relevant principles and guidelines such as:
    - *Social Impact Assessment Guideline* (Department of Planning, Industry and Environment, 2017)
    - *Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects* (Vanclay et al, 2015)
    - *Environmental Impact Assessment Practice Note: Socio-economic assessment* (Roads and Maritime, 2013)
    - *International Principles for Social Impact Assessment 2003* (Vanclay, 2003)
- taking into account issues raised by the community and relevant stakeholders (described in Chapter 4 (Consultation))
- identifying measures to mitigate the potential impacts.

A detailed description of the assessment methodology is provided in section 2 of Technical Report 11.

### 18.1.2 Risks identified

The preliminary environmental risk assessment undertaken for the project included potential risks associated with socio- economics. Potential risks were considered according to the impacts that may be generated by the construction and/or operation of the project, pre-mitigation. The purpose of the preliminary environmental risk assessment was to inform the impact assessment. Further information on the preliminary risk assessment, including the approach and methodology is provided in Appendix D.

The assessed risk level for the majority of potential socio-economic risks was high. Risks with an assessed level of high include:

- impacts on the use and functionality of community facilities, including Jacquie Osmond Reserve and Warwick Farm Recreation Reserve
- amenity impacts (noise, air, traffic, visual) to nearby residential receivers and users of recreational grounds
- impacts to local amenity due to increased frequency of trains.

These potential risks and impacts were considered as part of the assessment. The assessment also considered matters identified by the SEARs and stakeholders, as described in Chapter 3 (Approval and assessment requirements) and Chapter 4 (Consultation).

### 18.1.3 How potential impacts have been avoided/minimised

As described in Chapter 6 (Project features and operation) and Chapter 7 (Construction), design development and construction planning has included a focus on avoiding and/or minimising the potential for environmental impacts during all key phases of the process.

Potential social impacts have been avoided/minimised where possible by:

- maintaining the existing functionality of Broomfield Street
- making retaining walls as narrow as possible to minimise operational impacts on Broomfield Street
- assessing the options to identify a parking configuration that would minimise the loss of car parking capacity in Broomfield Street
- reducing the footprint of compound C3 in Jacquie Osmond Reserve to minimise potential impacts on the sports field and use of the reserve.

## 18.2 Existing environment

A general description of the project site and study area is provided in Chapter 2 (Location and setting). Key socio-economic indicators (mainly from 2016 ABS census data) are summarised below.

The LGAs have a combined population of 403,143 (ABS, 2016), with about 50 per cent living in each LGA. The study area is characterised by socially and culturally diverse communities.

### 18.2.1 Demographic characteristics

The LGAs have a combined population of 403,143 (ABS, 2016), with about 50 per cent living in each LGA. The study area is characterised by socially and culturally diverse communities.

Cabramatta-Lansvale has a population of 24,708 and Warwick Farm 5,799 (ABS, 2016).

About 80 per cent of the population in Cabramatta-Lansvale speak a language other than English at home compared to 58 per cent in Warwick Farm and 36 per cent in Greater Sydney.

There are also higher levels of disadvantage in Cabramatta-Lansvale and Warwick Farm compared to the LGAs which they are within and the Greater Sydney. These measures include lower income, educational attainment,

English language skills, unemployment, dwellings without motor vehicles, and higher need for assistance with self-care, communication or mobility services, due to illness, age or disability.

The key demographic characteristics of Cabramatta-Lansvale and Warwick Farm compared to the LGAs they are within and Greater Sydney include:

- higher proportions of people born overseas and people who speak a language other than English
- lower median household weekly income
- higher unemployment (about 14 per cent in Cabramatta-Lansvale and Warwick Farm which is over double that for Greater Sydney)
- higher levels of disadvantage with a lower household income and educational attainment compared to Greater Sydney
- generally fewer children and smaller households than the LGAs although Greater Sydney has a smaller average household size compared to the LGAs and Cabramatta-Lansvale
- higher levels of public transport use, with lower usage of cars and higher rates of walking to work.

### 18.2.2 Community infrastructure and facilities

Cabramatta and Warwick Farm both contain a large range of community facilities and services, including educational facilities, places of worship, sport and recreational areas, health and community services. Community infrastructure is located throughout the study area. Concentrations of facilities are located in the Cabramatta town centre and in the centre of the study are where land uses are dominated by public recreation space.

Community infrastructure and facilities within 500 metres of the project site is shown in Figure 18.1 and listed in Table 18.1. Further information on community infrastructure in the study area is provided in section 18.2.2 and Technical Report 11.

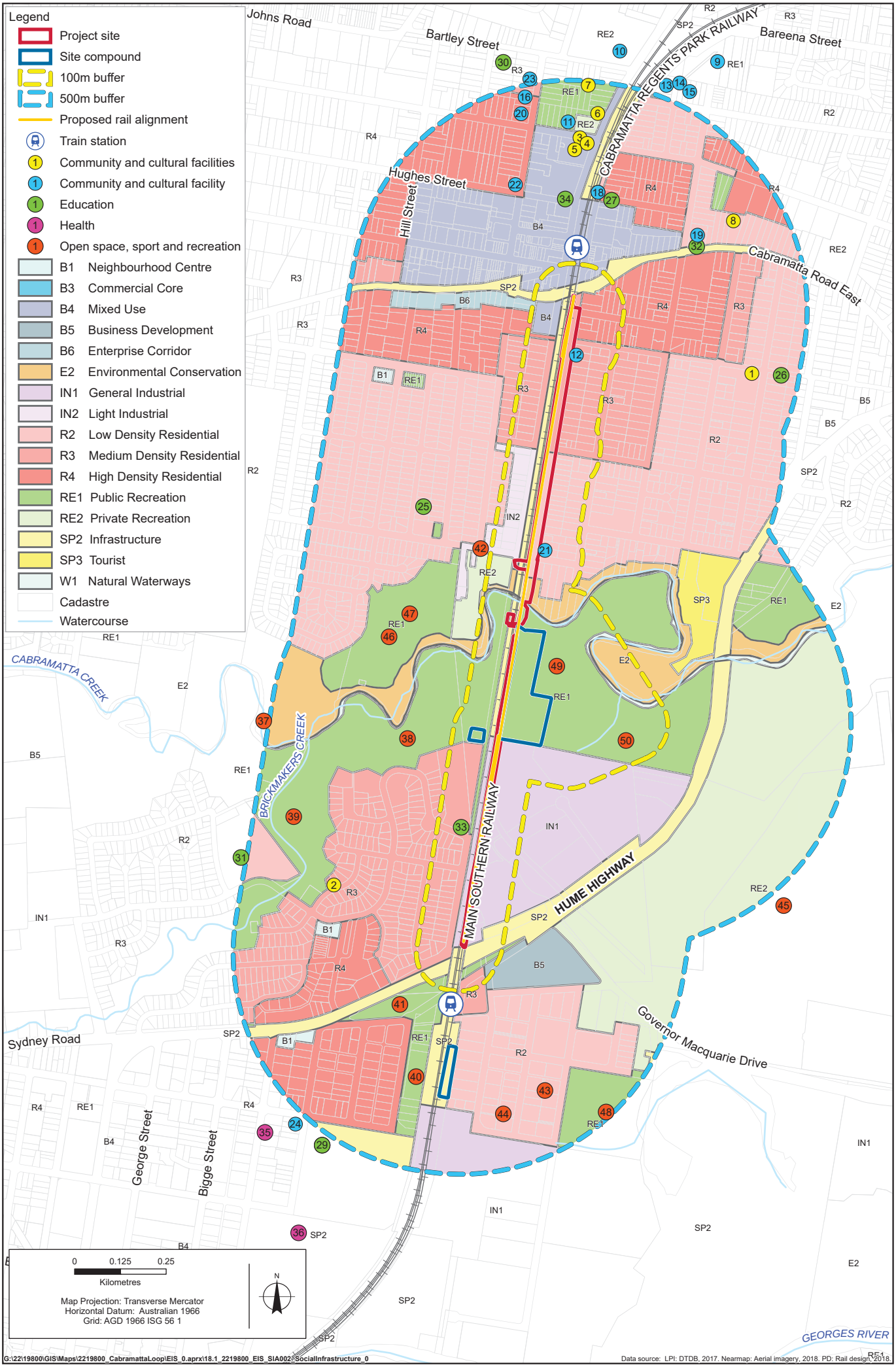


Figure 18.1 Community infrastructure

Table 18.1 Community infrastructure within 500 metres of project site

| ID | Type | Name | Description |
|---|---|---|---|
| **Community and cultural facilities** | | | |
| 1 | Aged care | Lansdowne Nursing Home | Large aged care facility with 161 beds. It is located at 25 Lovoni Street, around 300 m east of the project. |
| 2 | Community centre | Liverpool Neighbourhood Connections | Community facility supporting accessible services and community development, around 400 m west of the rail corridor. |
| 3 | Community centre | Cabra-Vale (Cabramatta) Senior Citizens Centre | Public community facility operated by Fairfield City Council with 80 person capacity, around 230 m northwest of Cabramatta Station. |
| 4 | Community centre | CORE Community Services | Community facility providing Children's Services, Youth Services, Multicultural Communities, Aged and Disability Care and Community Engagement, around 240 m northeast of Cabramatta Station. |
| 5 | Community library | Whitlam Library | Public library around 230 m northeast of Cabramatta Station. |
| 6 | Cultural facility | PCYC Fairfield-Cabramatta | Community facility around 270 m northwest of Cabramatta Station. |
| 7 | Open space/park | Cabra-Vale Memorial Park and Bandstand | First World War memorial and park close to the main Cabramatta retail area and next to the project. It is located around 350 m northwest of Cabramatta Station. |
| 8 | Places of worship | Macedonian Orthodox Church | Place of worship around 400 m east of Cabramatta Station. |
| 9 | Community centre | Cabravale Leisure Centre | Cabravale Leisure Centre's facilities include a modern gymnasium, swimming pool, sauna and a multipurpose indoor aerobics/program room; community function room, meeting and training facilities with computer access. Located around 600 m north east of Cabramatta Station. |
| 10 | Community centre | Cabra-Vale Diggers Club | Cabra-Vale Diggers Club is an entertainment and restaurant venue with full-service function rooms available for hire, around 470 m north of Cabramatta Station |
| 11 | Community centre | Arthur West Memorial Hall | Arthur West Memorial Hall is a community hall available for hire located around 280 m northwest of Cabramatta Station |
| 12 | Cultural facility | Kampuchea Krom Cultural Centre of NSW | Public place of worship on Broomfield Street adjacent to the existing SSFL. |
| 13 | Cultural facility | Ukrainian Hall and Shaolin Temple | Ukrainian Hall and Shaolin Temple is a cultural facility located around 430 north of Cabramatta Station |
| 14 | Cultural facility | The German-Austrian Society | The German-Austrian Society is a cultural facility located around 430 north of Cabramatta Station |
| 15 | Cultural facility | Kin Fu Ma Zu Association | Kin Fu Ma Zu Association is a cultural facility located around 430 m north of Cabramatta Station |

| ID | Type | Name | Description |
|---|---|---|---|
| 16 | Cultural facility | Australian Chinese Teo Chew Association Inc. | Australian Chinese Teo Chew Association Inc. is a cultural facility located around 400 m northwest of Cabramatta Station |
| 17 | Education | Seven day Adventist English Language School | Seven day Adventist English Language School is a cultural facility that holds English language classes, located around 80 m northeast of Cabramatta Station |
| 18 | Places of worship | Seven Day Adventist Church | Public place of worship around 80 m northeast of Cabramatta Station. |
| 19 | Places of worship | Cabramatta Anglican Church | Public place of worship around 260 m east of Cabramatta Station. |
| 20 | Places of worship | Baptist Union of NSW | Public place of worship around 350 m northwest of Cabramatta Station. |
| 21 | Places of worship | Buddhist Temple | Public place of worship on Broomfield Street adjacent to the existing SSFL. |
| 22 | Places of worship | Cabramatta Multi-Centre Uniting Church | Public place of worship around 420 m northwest of Cabramatta Station. |
| 23 | Places of worship | Sacred Heart Catholic Church | Public place of worship around 430 m northwest of Cabramatta Station. |
| 24 | Places of worship | Saint Raphael Nicholas And Irene Greek Orthodox Church | Public place of worship around 2.5 km south of Cabramatta Station. |
| **Education** | | | |
| 25 | Child care | Cabramatta Early Learning Centre | Cabramatta Early Learning Centre is a public centre operated by Fairfield City Council, about 200 m west of the rail corridor. |
| 26 | Child care | Vattana Early Learning Centre | Vattana Early Learning Centre is a private centre open from 7.00 am to 6.00 pm, about 500 m east of the rail corridor. |
| 27 | Combined school | Khmer Adventist Language School | Khmer Adventist Language School is a community service about 120 m north east of Cabramatta Station. |
| 28 | High school | Liverpool Boys High School | Boys secondary public school catering for years 7-12, with around 563 students enrolled. Located at 18 Forbes Street, about 550 m southwest of Warwick Farm Station. |
| 29 | High school | Liverpool Girls High School | Girls secondary public high school with around 940 students. Also located on Forbes Street next to Liverpool boys High School. |
| 30 | Primary school | Sacred Heart Catholic Primary School | Catholic primary school located around 460 m northwest of Cabramatta Station. |
| 31 | Primary school | Warwick Farm Public School | Small, culturally diverse public school with around 230 pupils. It is located 500 m northwest of Warwick Farm Station. |
| 32 | Primary school | Cabramatta Public School | A large school with around 730 students 96% of those are from a non-English speaking background. It is located 350 m east of Cabramatta Station. |

| ID | Type | Name | Description |
|---|---|---|---|
| 33 | Specialist school (e.g. SSP) | Lawrence Hargrave | Lawrence Hargrave Special Education School supports 63 students with mild intellectual disability, emotional disturbance and a range of behaviour difficulties, located adjacent to the western side of the rail corridor. |
| 34 | Tertiary institution | Navitas English Language School | Navitas English Language School is a government supported English learning school, about 100 m northwest of Cabramatta Station. |
| **Health facilities** | | | |
| 35 | Hospital | Sydney South West | Private hospital located about 500 m southwest of Warwick Farm Station. |
| 36 | Hospital | Liverpool Hospital | Public hospital about 700 m southwest of Warwick Farm Station. |
| **Open space, sports and recreation** | | | |
| 37 | Open space/park | Warwick Farm Recreation Reserve | Public open space next to the rail corridor, opposite Jacquie Osmond Reserve. |
| 38 | Open space/park | Stroud | Public multi-purpose sport field around 100 m west of rail corridor. |
| 39 | Open space/park | Durrant Oval | Sport field located in Warwick Farm Reserve around 420 m west of the rail corridor. |
| 40 | Open space/park | Hart Park | Park and playground located adjacent to the Warwick Farm Station parking facility. |
| 41 | Open space/park | Berryman Reserve | Nature reserve located adjacent to Warwick Farm Station. |
| 42 | Sport facility | Cabramatta Rugby League Club | Private sport club adjacent to the western side of the rail corridor. |
| 43 | Sport facility | Warwick Farm Equine Centre | 24/7 equine veterinary service and hospital. About 300 m southwest of Warwick Farm Station and close to Warwick Farm Racecourse. |
| 44 | Sport facility | Matthew C Smith Stable | Private horse stables and training around 420 m southeast of Warwick Farm Station. |
| 45 | Sport facility | Warwick Farm Race Course | Racecourse for thoroughbred horse racing owned by the Australian Turf Club. Located around 700 m east of Warwick Farm Station. |
| 46 | Sport facility | Cabramatta Sports Ground | Public multi-purpose sport fields around 200 m west of rail corridor. |
| 47 | Sport facility | Don Dawson Oval | Public cricket grounds around 200 m west of rail corridor. |
| 48 | Sport facility | Rosedale Oval | Australian Football League (AFL) sporting field around 200 m southeast of Warwick Farm Station. |
| 49 | Open space/park | Jacquie Osmond Reserve | Jacquie Osmond Reserve consists of 12 baseball pitches used for local, district and State competitions and weekly training sessions. The Reserve is next to the rail alignment.<br>Vehicular access is via Railway Parade access road which runs along the western side of the rail corridor and connects to the Reserve via an underpass. |

| ID | Type | Name | Description |
|---|---|---|---|
| 50 | Sport facility | Jacquie Osmond Softball Centre | Administration office for the Southern Districts Softball Association (SDSA) and facilities for softball training and team play. Located at Jacquie Osmond Reserve. |

### 18.2.3 Community values

Community values refer to tangible and intangible characteristics and aspects of a community, such as amenity, character, lifestyle, access, connectivity, community cohesion, and community health and safety. A project may affect these aspects by changing noise levels, visual amenity, traffic conditions and access, movement across the community, the use and enjoyment of community spaces, and by requiring relocation as a result of property acquisition.

The values held by communities in the study area were identified by analysing community feedback received to date (refer to Chapter 4 (Consultation)), and reviewing relevant State and local government strategic and community planning documents such as the following documents:

- Liverpool City Council, *Our Home, Liverpool 2017 - 2027: Community Strategic Plan*
- Liverpool City Council, *Draft Liverpool Community Safety and Crime Prevention Strategy 2019 – 2022*
- Fairfield City Council, *Fairfield City Plan 2016 – 2026*.

#### *18.2.3.1 Liverpool LGA*

##### Community cohesion, access and connectivity

Liverpool's communities value opportunities to create connections between each other. They aspire for more community events and activities, and community facilities for social cohesion. Celebrating diversity, promoting participation and recognising people's history are all recognised as key values.

The communities also aspire to have an improved transport network to increase accessibility while also facilitating economic growth. Equitable access is also a key value, with communities aspiring for more inclusive urban environments.

The community are concerned about existing issues affecting access and connectivity. These include poor wayfinding signage in the local area, particularly near Jacqui Osmond Reserve. It was also noted that an access road to Jacquie Osmond Reserve was lost during the SSFL works and was not reinstated.

The area currently has a deficit of sport and recreation facilities. Loss of open space at Jacquie Osmond Reserve could be perceived to be a considerable impact to the local community.

##### Local amenity and character

Liverpool's communities aspire to have well planned, attractive people-friendly urban environments and more green spaces. These should be clean and well managed, with an emphasis on improved access and safety in public areas.

The safety of public areas is a key community concern, which is supported by Liverpool City Council's recently released draft *Liverpool Community Safety and Crime Prevention Strategy 2019–2022*. Developed in consultation with the communities, the strategy aims to encourage social inclusion and build community capacity as a means to increase community safety.

Community members are also concerned about the protection of local bushland, rivers and the visual landscape.

Specific consultation concerns included construction and operation impacts on students and staff at the Principal of Lawrence Hargrave Special Education School. This includes potential loud and intrusive construction impacts which have the potential to impact school activities. There are existing noise and vibration impacts from freight train operations which interrupt teaching activities and affects student's learning, and there is concern this will increase during operation.

The community also expressed concern regarding the need for reinstatement of trees and foliage along the rail corridor, construction impacts on nearby residents (for example from night works) and noise impacts associated with increased freight volumes.

#### *18.2.3.2 Fairfield LGA*

##### Community cohesion, access and connectivity

Fairfield's communities value cultural diversity and the importance of increasing inclusivity and community cohesion. Consultation with Fairfield City Council confirmed the importance of key local events that celebrate cultural diversity, such as the annual Moon Festival in Cabramatta (held in September/October). In addition, Chinese New Year celebrations are also widely celebrated in the LGA, with key events held in Cabramatta over the New Year weekend.

Communities aspire to have improved access to public transport, decreased traffic congestion and increased access to parking in the Fairfield City area.

Local communities also aspire for increased support for youth and elderly citizens.

Car parking including loss or relocation of parking is a key community concern in the local area. The community raised concerns regarding impacts to the continuity of and access to businesses through impacts to parking and access in the area. Additionally, road closures and the works on Sussex Street Bridge could affect community access to the Cabramatta Rugby League Club.

##### Local amenity and character

Fairfield's communities aspire to live in an attractive and lively city, with more activities in town centres. Communities also aspire for both the built and natural environment, including public open space, to be inviting, well maintained and well used.

Community wellbeing and safety is a key concern of local communities. They desire a reduction in crime rates and road and traffic accidents, and an increase in perceptions of community safety. Community development was seen as a means to strengthen community participation and connection to improve perceptions of safety and increase activity in public spaces.

The community living along Broomfield Street had input into the design of the existing noise wall art work, which contributed to the community's sense of place.

## 18.3 Assessment of construction impacts

The main potential for socio-economic impacts during construction would occur as a result of:

- changes to access arrangements and connectivity
- amenity impacts as a result of construction works
- impacts to community infrastructure and facilities
- employment generation and other economic benefits, including increased trade.

A summary of the results of the assessment in relation to these potential impacts is provided below.

### 18.3.1 Access and connectivity

As described in Chapter 8 (Traffic, transport and access), construction of the project would result in temporary impacts to traffic and access within the study area, and an increase in both heavy and light vehicle movements on the local and regional road network. This would impact existing access for residents, visitors, customers, businesses, and service providers along and around the project site. These impacts would include:

- changes to access for pedestrians and cyclists around the construction work areas
- altered movement patterns and traffic routes in some areas due to road closures and diversions

- changed access or increased travel time to community places and facilities
- loss of some areas of parking during construction due to construction workers or the presence of construction activities
- restricted access to private properties located adjacent to the project site
- potential safety risks associated with haulage routes adjacent to Lawrence Hargrave Special Education School.

Changes to traffic, pedestrian, and cyclist access could result in a temporary increase in the distance travelled, increased travel times, inconvenience and delays for some community members.

These potential impacts would be temporary and would be minimised as far as possible by the implementation of the construction traffic, transport, and access management measures provided in section 8.5. These measures would include the development and implementation of a construction traffic management plan, which would aim to:

- minimise disruption to traffic operation, road users, pedestrians, cyclists and access to adjoining properties (private and public)
- limit access restrictions, and where required, provide alternatives to maintain access for the local community.

Road reconfiguration activities on Broomfield Street would affect local parking capacity, with Technical Report 1 - Traffic, transport and access impact assessment indicating that there would be a loss of up to 66 parking spaces depending on the stage of construction. It is likely that the surrounding road network would absorb the loss of parking spaces, however this may have a temporary impact on businesses who use those spaces for employee, customer or visitor parking, commuters who access Cabramatta Station and residents/property owners along Broomfield Street.

Additionally, the following key festivals occur near the project site and could be impacted due to access restrictions associated with the construction works:

- the Cabramatta Moon Festival which occurs on a Sunday in September or October each year in the Cabramatta CBD and involves a number of road closures in the area. Identified haulage routes do not intersect with any of the roads discussed for road closures during the event
- the Chinese Lunar New Year Festival which occurs over the New Year weekend in January or February each year and is usually held in the Freedom Plaza which is located directly west of Cabramatta Station, to the north west of the project site.

Communication with potentially affected users and information provision would assist in reducing uncertainty and the impacts of changes to access and movement patterns. A comprehensive community and stakeholder awareness program would be implemented during construction (as described in Chapter 4 (Consultation)), which would assist in managing these impacts and communicating changes to relevant stakeholders.

### 18.3.2 Amenity

'Amenity' refers to the pleasant or normally satisfactory aspects of a location which contribute to its overall character and the enjoyment of residents or visitors. Construction of the project may result in the following amenity impacts being experienced by members of the community surrounding the project site:

- increase in noise levels as a result of construction plant and equipment
- increase in traffic movements and congestion (and associated road traffic noise), around the project site and construction haulage routes
- increase in dust generated during construction

- changes in the visual outlook in the vicinity of compounds and construction work areas – particularly potential impacts on existing character and ultimately the overall user experience (particularly for Jacquie Osmond Reserve and Warwick Farm Recreation Reserve), introduction of additional visual clutter (particularly with the removal of the existing noise wall), and interruption of existing sight lines.

These potential impacts and relevant mitigation measures are considered in Chapter 8 (Traffic, transport and access), Chapter 9 (Noise and vibration), Chapter 10 (Air quality) and Chapter 17 (Landscape and visual amenity). Amenity impacts would be temporary, and managed by the mitigation measures outlined in these chapters.

### 18.3.3 Community infrastructure and facilities

Construction has the potential to affect community infrastructure and facilities located near the project site, as a result of changes in amenity, local access, or requirements for acquisition or temporary use. Key impacts are summarised in Table 18.2.

The amenity impacts noted above may affect the enjoyment of community facilities located close to the project site, particularly outdoor areas.

In addition to the impacts noted in Table 18.2, changes to traffic and transport conditions in the vicinity of the project site could also affect the time and route taken to travel to community facilities. Further information on potential social impacts as a result of access changes is provided above (under access and connectivity). These potential impacts would be temporary, and would be minimised as far as possible by the implementation of the construction traffic, transport, and access management measures provided in section 8.5.

Impacts to specific community facilities in or adjacent to the project site are summarised in Table 18.2.

**Table 18.2 Community facilities potentially affected by the project**

| Community facility | Impact overview |
|---|---|
| Kampuchea Krom Cultural Centre of NSW | The Kampuchea Krom Cultural Centre of NSW is a registered charity that provides services for the Khmer Community, especially with Buddhist ceremonies. It is located on Broomfield Street directly adjacent (east) of the project site, so would likely be impacted by amenity impacts and impacts to access particularly while utility works are being undertaken. Amenity impacts are not expected to restrict the use or function of the centre. However, implementation of the noise mitigation measures provided in section 9.6 will help mitigate impacts associated with noise on this receiver. |
| Thien Phuoc Buddhist Association Inc | The Thien Phuoc Buddhist Association Inc. is a registered charity and Buddhist Temple that collects money for poor Vietnamese. It is located on Broomfield Street directly adjacent (east) of the project site, so would likely be impacted by amenity impacts and impacts to access particularly while utility works are being undertaken. Amenity impacts are not expected to restrict the use or function of the temple. However, implementation of the noise mitigation measures provided in section 9.6 will help mitigate impacts associated with noise on this receiver. |
| Cabramatta Rugby League Club | The Cabramatta Rugby League Club is located about 220 metres west of the project site. The construction of Sussex Street bridge could impact access to the club as Sussex Street is a key access point for community members to walk/cycle/drive to the club. As described in the traffic, transport and access assessment (Technical Report 1- Traffic, transport and access impact assessment) Sussex Street will be closed for some of the bridge construction works due to the movements and placement of cranes. Full closure of the street would be limited to either a possession weekend (two days) or mid-week nights (Sunday to Thursday). Fairfield City Council have noted that many people visit the club during the World Cup event which occurs annually in January, and the rugby league season which occurs from March to October, with large crowds expected for semi-finals and finals games. If inadequately managed, bridge construction activities have the potential to affect community access to the club. This may affect the club itself, as well as disrupt community connections to these sports events. However, implementation of the traffic mitigation measures provided in section 8.5 will help mitigate access impacts, which would only be temporary. |

| Community facility | Impact overview |
|---|---|
| Jacquie Osmond Reserve | Jacquie Osmond Reserve and the Jacquie Osmond Softball Centre (located within the reserve) would be directly impacted during construction due to the presence of construction compound C3. Due to construction there would be reduced access to three of the softball diamonds located closest to the compound during construction. This has the potential to affect softball training and competition and cause community concern for way of life and wellbeing. The softball fields are used by the Southern Districts Softball Association as well as a number of secondary schools located near the project site. Parking within the reserve (which is accessed via the access road on the western side of the corridor) would also be restricted due to the presence of the compound, with park users having to park near Warwick Farm Hometown shopping centre and access the park through the southern entry. There is also potential for amenity impacts (mainly noise and visual) to be experienced by users of the park. ARTC would work closely with Liverpool City Council and users of the park to manage how it would be used during construction. |
| Warwick Farm Recreation Reserve | Warwick Farm Recreation Reserve would be directly impacted due to the presence of work site W1 and construction compound C2. During construction access for pedestrians and cyclists using the shared path from Broomfield Street (via Cabramatta Creek) would be temporarily restricted due to construction vehicles entering W1 and compound C3 in Jacquie Osmond Reserve. Traffic control measures would be implemented to mitigate this impact (refer to section 8.5). Additionally there is a potential for amenity impacts (noise and visual) to users of the reserve due to activities being undertaking within the construction compound and work site. ARTC would work closely with Liverpool City Council and users of the park to manage how it would be used during construction. |
| Lawrence Hargrave Special Education School | Lawrence Hargrave Special Education School is located adjacent to one of the identified haulage routes (refer to Technical Report 1 – Traffic, transport and access impact assessment), therefore there is the potential for road safety impacts to students, teachers and parents associated with the school, particularly given the vulnerable nature of the students. While there may be the potential for amenity impacts (particularly noise and air), the noise and vibration assessment did not identify the school as a highly affected receiver during construction works. ARTC would consult with the school to understand potential impacts due to construction. |

### 18.3.4 Employment and other economic benefits

Construction of the project would generate employment. It is estimated that the peak workforce required would range from 80 to 220.

This could benefit the local community, as the workforce is likely to include local workers. These jobs are only limited to the workforce that would be directly employed to construct the project, and do not include additional jobs or increased demand stimulated by the project to downstream providers of goods and services. Industries that support construction of the project would also experience economic benefits.

New employment opportunities would also provide the opportunity for training and the development of new skills, which has the potential to benefit the local area and region.

Construction activities also have the potential to result in increased trade for local businesses, particularly those located to the north of the project site near Cabramatta Station.

As existing passenger and freight operations will continue to operate throughout the construction period (other than during programmed rail possession period), minimal impact is expected on rail-reliant industries.

### 18.3.5 Cumulative impacts

Other projects that have the potential to occur at the same time as the project are described in Appendix E. Of these the following two projects are located within 500 metres of the project site and have the potential to occur at the same time as the project:

- a multistorey residential centre at the corner of Broomfield Street and Cabramatta Road adjacent to Cabramatta Station which would be developed by Moon Investments. The site is zoned B4 Mixed Use and consists of 22 privately owned lots and a section of public laneway owned by Fairfield City Council and has a total area of approximately 12,487 square metres. The site is currently being rezoned to mixed use high density for up to 600 residential/commercial units.
- a new car park is proposed in the Cabramatta town centre by Fairfield City Council, on the corner of Hughes Street and Dutton Lane. Work on the new car park is expected to start in mid-2019 and take around nine months to complete. The 220 space car park connects to the existing multi-deck car park with access to a new lift and pedestrian connection to the existing Dutton Plaza lifts.

Potential cumulative social impacts during construction could include safety risks as a result of increased traffic, and increased amenity impacts as a result of noise, visual change, and dust emissions.

Cumulative traffic and access impacts leading to delays in travel time or difficulties accessing public transport during construction could also lead to indirect social impacts such anxiousness and concern during the construction period. Additionally, as the project will be located next to the SSFL alignment, which was completed in December 2012, there may be a perception of 'construction fatigue' in the local community. Although this occurred more than seven years prior to the construction of the project, with a relatively high proportion of residents living in the area for more than five years (Cabramatta-Lansvale 57 per cent, Warwick Farm 37 per cent), there is potential for these residents to be frustrated with the construction of the project. Genuine consultation with the affected communities and provision of adequate, advance information in different languages, will be critical to maintain trust.

## 18.4 Assessment of operation impacts

The main potential for socio-economic impacts and benefits during operation would occur as a result of:

- changes to access arrangements, specifically loss of parking
- community amenity impacts
- impacts to community infrastructure and facilities
- economic impacts and benefits.

A summary of the results of the assessment in relation to these potential impacts is provided below.

### 18.4.1 Access and connectivity

As Broomfield Street and the shared path would be restored to their existing functionality following construction there would be no impacts on local community access during operation.

The reconfiguration of Broomfield Street would result in a permanent loss of up to 11 parking spaces along Broomfield Street. As described in Technical Report 1 - Traffic, transport and impact access assessment this loss is not considered significant as Broomfield Street has the capacity to absorb the potential loss. However, local community members who currently use these parking spaces may perceive the changes in Broomfield Street as a negative impact on their lifestyles, particularly given parking is an existing community concern. This impact is only likely to be temporary as the community adapts to the change.

### 18.4.2 Amenity

There is the potential for operational noise impacts at selected locations adjacent to the rail corridor. The Technical Report 2 - Noise and vibration assessment identified only one location along Broomfield Street where noise levels were predicted to exceed relevant noise criteria. However, consultation with Lawrence Hargrave Special Education School has indicated that the students are currently impacted by noise from trains, therefore this has the potential to be exacerbated due to the increase in freight train volumes. Where necessary, reasonable and feasible mitigation measures would be incorporated into the final design and project delivery. Further information is

provided in Chapter 9 (Noise and vibration). Additionally ARTC would consult directly with the school to understand the impacts further and

The project would also result in the need to remove trees along Broomfield Street and in Jacquie Osmond Reserve, to facilitate construction works and construction of the retaining wall, embankment and noise wall. The loss of trees in Jacquie Osmond Reserve may affect use of the reserve due to loss of shade provided by the mature trees, which may contribute to the comfort of softball participants and spectators during training and competitions. Potential impacts due to loss of trees and vegetation would be minimised as far as possible by the implementation of the landscape and visual management measures provided in section 17.6.

### 18.4.3 Community infrastructure and facilities

Apart from the potential amenity impacts, described above there would be no permanent impact on the majority of community infrastructure and facilities located near the project site as a result of operation of the project. The acquisition of land for the passing loop and embankment in Jacquie Osmond Reserve would mean that potentially three of the existing 12 softball diamonds may need to be moved to the east, which could impact on the use of the softball fields. The need to move the softball diamonds, including the associated impacts, would be determined during detailed design in consultation with Liverpool City Council and the Southern Districts Softball Association.

### 18.4.4 Economic benefits

The main objective of the project is to increase capacity of the freight rail line to meet forecast demand, by increasing efficiency, flexibility and reliability. This has the potential to contribute to long-term economic benefits and both direct and indirect positive impacts on the livelihood of those employed directly by the rail and freight industries and those supplying and supporting those industries.

Increased freight rail efficiency and functionality, and a greater capacity for freight to be transported using rail, would assist in increasing the modal share of freight rail. This could contribute to less congestion on Sydney's roads, with particular relevance to the main roads currently supporting the transportation of freight through the area.

### 18.4.5 Cumulative impacts

The cumulative benefit of the project with other projects currently occurring in Sydney, such as the Botany Rail duplication project (discussed in Appendix E), during operation is expected result in a net benefit for the community. Considered together with these other projects, the project would:

- increase the capacity of the freight network to support the predicted growth of freight to Port Botany and from the Moorebank Intermodal Terminal
- minimise the reliance on road and other infrastructure to transport freight, resulting in an improvement to local amenity
- help support economic growth and productivity for the Greater Sydney Region
- encourage a shift in freight transport from road to rail, and support a reduced rate of growth in truck movements and associated traffic congestion around Sydney.

## 18.5 Management of impacts

### 18.5.1 Approach

#### *18.5.1.1 Approach to mitigation and management*

Implementation of a comprehensive approach to consultation, communication, and environmental management during construction would assist in minimising the potential for socio-economic impacts.

Environmental management during construction would be guided by the approach described in Chapter 22 (Approach to environmental management). This would involve preparation of a construction traffic management plan and noise and vibration management plan, to minimise amenity impacts and disruption to the community, and

manage access arrangement during construction. It would also involve preparation of a community and stakeholder engagement plan developed in consultation Fairfield City Council and Liverpool City Council that would aim to detail the approach to communication between ARTC and its Construction Contractor(s), and the community and government authorities.

#### *18.5.1.2 Expected effectiveness*

ARTC have experience in managing potential impacts on local communities and businesses as a result of rail developments of a similar scale and scope to this project. Many of the mitigation measures outlined involve effective and ongoing communications with the community and affected land owners.

Community and stakeholder involvement has been and would continue to be tailored to each phase of the project enabling appropriate consideration and balancing of community and stakeholder's social, economic, environment and functional issues to achieve best for project outcomes. A key approach to consultation would be to provide two-way communication channels enabling timely intervention aimed at resolving issues raised by the community and stakeholders.

The CEMP prepared prior to construction would also address the requirements of the project approvals, the environmental management measures outlined in the EIS and all applicable legislation. With regard to socio-economic aspects, mitigation measures are expected to minimise and manage impacts on community life throughout the construction phase. The local and broader community would be notified in advance of construction activities, temporary arrangements, traffic management arrangements and any special construction activities of short duration. As such, impacts to the community are expected to be relatively minor and temporary.

Audits and reporting on the effectiveness of environmental management measures is generally carried out to show compliance with management plans and other relevant approvals and would be outlined in detail in the CEMP prepared for the project. As such, the management of socio-economic impacts throughout the project through implementing the measures outlined in Table 18.3 are considered to be effective.

### 18.5.2 List of mitigation measures

The mitigation measures that would be implemented to address potential socio-economic impacts are listed in Table 18.3.

**Table 18.3 Mitigation measures**

| Stage | Impact | Measure |
|---|---|---|
| Design | Socio-economic impacts | ARTC will continue to work with stakeholders and the community to ensure they are informed about the project and have opportunities to provide feedback to the project team.<br>The existing community contact and information tools will remain in place throughout the duration of the project.<br>Consultation prior to and during construction will involve the use of appropriate tools, including, but not limited to, tools such as community information sessions, briefings, and displays; distribution of project materials in a variety of languages; door knocks; and site signage. |
| | Community facilities | Prior to construction, consultation will be undertaken with community facilities and event organisers (Cabramatta Moon Festival and Chinese New Year's) with the potential to be impacted by the project, including the cultural centres along Broomfield Street, Fairfield City Council, Liverpool City Council, the SDSA and Lawrence Hargrave Special Education School. Consultation will aim to identify and develop measures to manage the specific construction impacts for individual community facilities and events. These measures would be incorporated into the relevant management plans. |

| Stage | Impact | Measure |
|---|---|---|
| | Community facilities | During design development consultation will be undertaken with Liverpool City Council and the SDSA to minimise impacts on use of the softball fields due to the presence of the embankment and passing loop. |
| | Community facilities | During design development consultation will be undertaken with Lawrence Hargrave Special Education School regarding existing and future construction noise impacts to identify appropriate mitigation measures. |
| | Amenity impacts | The community will be given the opportunity through implementation of the existing Stakeholder Engagement Strategy (refer Chapter 4 (Consultation) to provide comment on design and project features which provide local community benefits. |
| Construction | Economic benefits | Local suppliers will be identified and approached for procurement of goods and services where practicable. |
| | Community facilities | Access to community facilities and infrastructure will be maintained during construction. Where alternative access arrangements need to be made, these would be developed in consultation with relevant service providers, and communicated to users. |

### 18.5.3 Consideration of the interaction between measures

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

- Chapter 4 (Consultation) with respect to ongoing consultation during the EIS process, construction and operation phases
- Chapter 8 (Traffic, transport and access), particularly with respect to the management of traffic, public transport arrangements, and access during construction
- Chapter 9 (Noise and vibration) with respect to management of potential noise impacts during construction, to minimise amenity impacts
- Chapter 10 (Air quality) with respect to management of potential air quality impacts during construction
- Chapter 17 (Landscape and visual amenity) with respect to management of potential visual amenity impacts during construction and operation
- Chapter 20 (Health, safety and hazards) with respect to managing potential risks to the community during construction and operation.

Together, all these measures would minimise the potential socio-economic impacts of the project.

### 18.5.4 Managing residual impacts

A residual risk analysis was undertaken following the impact assessment summarised in this chapter. The results of the residual risk analysis are provided in Appendix D and summarised below.

Residual impacts and benefits following implementation of the mitigation measures described in section 18.5.2, and those provided in other chapters, are predicted to include:

- visual and character changes on along Broomfield Street and at Jacquie Osmond Reserve, which may be considered to be either detrimental or beneficial by different members of the community
- broader economic benefits.

# 19 Waste

*This chapter assesses the predicted waste generation and resource use during construction and operation, and provides a description of how waste and resources will be managed. This chapter was written to address the relevant SEARs which are outlined in Appendix A.*

## 19.1 Assessment approach

A summary of the approach to the assessment is provided in this section, including the legislation, guidelines and/or policies driving the approach and the methodology used to undertake the assessment.

A desktop assessment was carried out to consider potential waste streams likely to be generated as part of the construction and operational stages of the project. Indicative quantities and types of waste have been estimated through a review indicated scale and extent of the project as outlined in the Project Description chapter, the construction methodology and a review of waste quantities for similar projects. Management and mitigation measures were then developed with respect to the relevant legislation and guideline as outlined below.

Further details outlining the methodology are provided in section 19.1.1.

Consideration was given to the *NSW Waste Avoidance and Resource Recovery Strategy 2014-21* (EPA, 2014b). The primary goal of this strategy is to enable NSW to improve environment and community well-being by reducing the environmental impact of waste and using resources more efficiently. This strategy is informed and driven by the waste hierarchy defined in the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). It is supported by various Acts, regulations and policies including the POEO Act and the Protection of the Environment Operations (Waste) Regulation 2014 (NSW) (POEO Regulation). To support the primary goal of the strategy, the project would be constructed and operated with consideration to the waste hierarchy. Additionally, any waste generated from the project would be disposed of in accordance with regulatory requirements.

### 19.1.1 Methodology

The assessment involved:

- reviewing key strategic planning policies and documents for waste management relevant to the study area
- identifying potential resource requirements
- identifying potential waste generating activities
- identifying the likely classification of waste generated by the project in accordance with relevant legislation and guidelines
- estimating quantities of waste, where feasible
- identifying available waste management options
- developing a conceptual waste management plan for construction and operation
- identifying lawful disposal or recycling locations.

### 19.1.2 Risks identified

The preliminary environmental risk assessment undertaken for the project included potential risks associated with waste management. Potential risks were considered according to the impacts that may be generated by the construction and/or operation of the project, pre-mitigation. The purpose of the preliminary environmental risk assessment was to inform the impact assessment. Further information on the preliminary risk assessment, including the approach and methodology is provided in Appendix D.

The assessed risk level for the potential risks to waste management during construction and operation was low to medium. The potential risks identified included:

- inappropriate management of waste generated during construction resulting in excessive waste being directed to landfill
- impacts associated with poor waste management during maintenance works.

These potential risks and impacts were considered as part of the assessment. The assessment also considered matters identified by the SEARs and stakeholders, as described in Chapter 3 (Approval and assessment requirements) and Chapter 4 (Consultation).

### 19.1.3 How potential impacts have been avoided/minimised

As described in Chapter 6 (Project features and operation) and Chapter 7 (Construction), design development and construction planning has included a focus on avoiding and/or minimising the potential for environmental impacts during all key phases of the process.

Potential air quality impacts have been avoided/minimised where possible by:

- minimising the project footprint
- reusing existing structures such as the existing noise wall.

## 19.2 Assessment of construction impacts

### 19.2.1 Resource requirements

The materials and estimated quantities required for the project are outlined in Table 19.1. The project would require about 8,500 cubic metres of fill for the purpose of embankment widening and fill behind retaining walls. There is the potential for materials, including excavated spoil, to be reused within the project site where practicable to construct the rail formation. The approach to managing excess spoil and other construction wastes is considered in section 19.2.2.

**Table 19.1 Resource material requirements and quantities**

| Activity | Material | Estimated quantity (tonnes unless indicated) |
|---|---|---|
| New track/track realignment | Electrical conduit | TBC |
| | Wiring | 6000 |
| | Pre-cast pits | 50 |
| | Signal Posts | 300 |
| | Aluminium case cabinet | 4 |
| | General fill | 1,800 $m^3$ |
| | Concrete, general fill material | 4,200 $m^3$ |
| | Fine crushed rock (engineers material) | 1,330 $m^3$ |
| | Ballast | 11,000 |
| | Rail | 1388 TM |
| | Sleepers | 2135 no. |
| | Steel handrail/walkway | TBC |

| Activity | Material | Estimated quantity (tonnes unless indicated) |
|---|---|---|
| Road works | Asphalt | 2248 |
| | Concrete (footpath) | 372 $m^3$ |
| | Sand | TBC |
| | Concrete (Kerbs, Dish Drain, Driveway, Pram Ramp) | 486 $m^3$ |
| | Services pipes | TBC |
| | Electrical wiring/telegraph poles | TBC |
| | Imported Select Fill | 2954 |
| | Imported Sub-base | 2182 |
| | Road base (fine crushed rock) | |
| | Binding layer | 186 $m^3$ |
| | Pre-cast concrete | 76 $m^3$ |
| | Grates | 30 |
| | Line making | 2250 m |
| | Traffic barricades | TBC |
| Drainage | 1200dia RCP installation | 575 m |
| | 750dia RCP installation | 300 m |
| | 350dia RCP installation | 65 m |
| | Concrete In-Situ Pits | 10 no. |
| | Precast Pits/Headwalls | 17 no (pits), 2 no. (headwalls) |
| Retaining walls | RW01 | 172 m |
| | RW02 | 552 m |
| | RW03 | 30 m |
| New bridges | Pre-cast girders | 36 no. (Sussex), 42 no. (Cabramatta) |
| | Pre-cast Super T Girders | 3 no. (Cabramatta) |
| | Concrete reinforcement | TBC |
| | Piles | 28 no. (Sussex), 36 no. (Cabramatta) |
| | Lighting | TBC |
| | Fencing | 312 m |
| | Engineers fill | TBC |
| | Steel handrail/walkway | 175 m |

| Activity | Material | Estimated quantity (tonnes unless indicated) |
|---|---|---|
| | Concrete (Piles) | 314 $m^3$ (assumed 10 m depth) |
| | Concrete (Headstock & Abutment) | 364 $m^3$ |
| Noise and retaining walls | Hebel panels | 697 $m^2$ |
| | Structural steel | TBC |
| | Piling casing | TBC |
| Embankment along Jacquie Osmond Reserve | General fill | 2,500 $m^3$ |
| Other | Landscaping (plants and associated materials) | TBC |
| | Paint | TBC |

The volumes provided in Table 19.1 are estimates only and based on potential maximum volumes that may be required. The actual volumes would be confirmed during detailed design and provided in the CEMP.

### 19.2.2 Waste generation and management

#### *19.2.2.1 Waste generation*

All waste generated during the construction of the project would be managed using the waste hierarchy approach of avoidance and re-use before consideration is given to disposal. All wastes generated would be managed in accordance with the waste provisions contained within the POEO Act.

Soil, sand, ballast, rock or aggregate excavated from within the rail corridor can be reused in accordance with the *Australian Rail Track Corporation excavated material order 2019* which allows for the re-use of ARTC excavated material under Part 9, Clause 93 of the POEO Regulation.

Should waste be found to be unsuitable for reuse or recycling, disposal methods used be selected based on the classification of the waste material in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (NSW EPA 2014). The Waste Classification Guidelines provide direction on the classification of waste, specifying requitements for management, transportation and disposal of each waste category.

Recourse recovery will be applied to the management of generated constructed waste and will include:

- recovery of resources for reuse-reusable, materials generated by the project will be selected for reuse on site, or off site where possible, including the reuse of the major waste streams (general solid waste as per the Preliminary Waste Classification in Chapter 12 (Soils and contamination))
- recovery of resources for recycling-recyclable resources (such as metals, plastics and other recyclable materials) generated during construction will be segregated for recycling and sent to an appropriate recycling facility for processing.

The preliminary waste classification undertaken as part of the limited contamination assessment (Chapter 12 (Soils and contamination)) indicated that soils within the project site would likely meet the classification of General Solid Waste, in accordance with the *NSW EPA Waste Classification Guidelines Part 1: Classifying Waste* (EPA, 2014).

The limited contamination assessment confirmed that the soils are considered suitable to remain within the project site for the uses proposed during operation (rail corridor and road corridor). Based on the findings of the contamination assessment, the project site does not contain gross contamination and does not meet the criteria requiring it to be notified to the EPA under section 60 of the CLM Act.

#### *19.2.2.2 Classification of waste to be generated*

The main construction activities anticipated to generate waste are listed in Table 19.2 together with the materials that may be produced, and likely waste classifications where this material cannot be reused or recycled.

Table 19.2 Waste estimates and classification – construction

| Activity | Waste | Potential classification | Estimated quantity (tonnes unless indicated) |
|---|---|---|---|
| Clearing and grubbing | Green waste from the removal of trees, shrubs and ground cover that are unable to be mulched and reused within the project | General solid waste (non-putrescible) | TBC |
| | Rubbish and debris | General solid waste (non-putrescible) | 20 tonnes |
| Topsoil stripping | Topsoil | General solid waste (non-putrescible) or virgin excavated natural material | Included in cut and fill below |
| Operation of construction machinery | Waste from vehicle/ plant equipment maintenance | General solid waste (non-putrescible) - drained oil filters (mechanically crushed), rags and oily rags only if they contain non-volatile petroleum hydrocarbons and no free liquids.<br>Hazardous waste - containers holding oil, grease and lubricants if residues have not been removed by washing (see Appendix 2 of the *Waste Classification Guidelines Part 1: Classifying Waste* (EPA, 2014)). | Less than one tonne |
| Rail formation | Sleepers rail | General solid waste (non-putrescible) | In cut and fill |
| Fencing (temporary and permanent) | Waste metal/timber posts | General solid waste (non-putrescible) | TBC |
| Utility relocation works | Waste muds | Liquid waste | 1200 cubes from potholing |
| Earthworks (new track/alignment, embankment along Jacquie Osmond Reserve) | Spoil | General solid waste (non-putrescible) as per the preliminary waste classification (refer to Chapter 12 (Soils and contamination)) | 8,100 metres cubed |
| | Contaminated spoil (if encountered) | Special waste | TBC |
| Drainage structures/stormwater | Waste wood and concrete | General solid waste (non-putrescible) | TBC |

| Activity | Waste | Potential classification | Estimated quantity (tonnes unless indicated) |
|---|---|---|---|
| structures and bridge construction | | | |
| | Waste metal | General solid waste (non-putrescible) | 1600 tonnes |
| Installing new kerbs and gutters | Waste concrete (from existing kerbs) | General solid waste (non-putrescible) | 440 tonnes |
| | Waste plastic | General solid waste (non-putrescible) | NA |
| Diversion of pedestrian pathway | Waste concrete (from existing pathway) | General solid waste (non-putrescible) | TBC |
| Demolition and replacement of existing noise walls and retaining walls | Waste concrete (panels not reused) | General solid waste (non-putrescible) | 1300 tonnes |
| | Concrete waste (sandstone look blocks) | General solid waste (non-putrescible) | TBC |
| Welding | Waste metal | General solid waste (non-putrescible) | TBC |
| Ballasting and tamping | Waste ballast | General solid waste (non-putrescible) | 300 tonnes |
| Site compound operation | Food waste | General solid waste (putrescible) | 400 tonnes |
| | Wastewater | Liquid waste | 380 litres |
| | Waste paper and cardboard | General solid waste (non-putrescible) | 2 tonnes |
| | Waste plastic and glass | General solid waste (non-putrescible) | Less than one tonne |

The capping, structural, general fill and ballast quantities in Table 19.2 were taken from three dimensional models prepared as part of the reference design and have been used to calculate the number of truck movements to and from the project site. The volumes provided in Table 19.2 are estimates only and based on potential maximum volumes that may be generated. Approximate waste volumes and the potential classification would be estimated and/or confirmed following finalisation of the detailed design and incorporated into the CEMP prepared for the project.

#### *19.2.2.3 Spoil generation and management*

Spoil is soil, rock or dirt excavated and removed from its original location. It is estimated that a total of 4,000 cubic metres of spoil would be generated during construction. The majority of spoil is expected to be reused for either track formation or construction (as described in Chapter 7 (Construction)).

The majority of spoil would be generated during excavation required for the new passing loop, retaining walls and bridges at Cabramatta Creek and Sussex Street. Relatively smaller quantities would be generated during site preparation activities, and from other earthworks such as for the formation treatment. At this stage it is estimated that minor quantities of contaminated spoil may be generated that could not be reused on site. This material would require off-site disposal at an appropriately licenced facility. The amount of spoil to be reused would continue to be refined during detailed design.

Consistent with the waste minimisation hierarchy, the approach to spoil management would follow the hierarchy of options listed in Table 19.3.

Table 19.3 Spoil management hierarchy for the project

| Priority | Re-use options | Approach |
|---|---|---|
| 1 | Avoid | Detailed design would include measures to minimise spoil generation. |
| 2 | Re-use for construction of the project | There would be a focus on the reuse of material, and optimisation of the design to minimise spoil volumes. Spoil generated during construction would be re-used for the project, including:<br>• re-use spoil for fill, embankment along Jacquie Osmond Reserve and mounds within a short haulage distance of the source<br>• re-use spoil to restore any pre-existing contaminated sites within the project site. |
| 3 | Re-use on other projects | Re-use spoil for fill, embankments and mounds on other projects within a financially feasible transport distance of the project site. |
| 4 | Disposal | Excess spoil would be disposed of in accordance with the waste management procedure prepared as part of the CEMP. |

#### *19.2.2.4 Waste handling and management*

##### Approach to waste minimisation and reuse

Waste management measures have been developed for the identified types of waste in accordance with the waste management hierarchy (refer to Table 19.3). Although the waste management hierarchy has been considered for each waste type, not all waste management options are applicable to a given waste type. For example, some types of waste are non-recyclable. As such, only the applicable waste management options are applied.

##### Recycling and disposal

The majority of the waste transfer stations are operated by local councils for use by residents. However, the larger landfills and transfer stations are able to accept commercial waste. Arrangements would be made with landfill operators prior to the delivery of waste and recycling to any rural facility to ensure that the waste types and quantities could be accepted.

The approach to waste management during construction is described in section 19.4. The waste management measures proposed to align with the waste management hierarchy are listed in Table 19.5. This table also outlines

the contingency measures (disposal) for wastes that cannot be avoided, reused, recycled or treated. Measures to facilitate segregation and prevent cross contamination are also provided.

### 19.2.3 Cumulative impacts

Other projects that have the potential to occur at the same time as the project are described in Appendix E

There is the potential for cumulative impacts associated with demand on resources, including workers, however given the size of this project and other projects occurring in the vicinity of the project site and the type of resources required, the cumulative impacts due to resource demand are considered minimal.

Potential cumulative impacts regarding waste would be avoided in the first instance through development of a waste management procedure and engagement with waste management facilities to ensure that sufficient capacity is available to manage the received waste.

Given the range of waste management facilities identified in the area, and the relatively conventional nature of the waste predicted to be generated by the project, it is expected that appropriate waste management facilities with sufficient capacity will be identified and utilised. No significant cumulative impacts as a result of waste generation are anticipated.

## 19.3 Assessment of operation impacts

### 19.3.1 Waste generation and management

The main waste generating activity during operation would relate to track maintenance. Small quantities of green waste may be generated during maintenance activities as a result of vegetation control, herbicide use, and maintenance of the entire rail corridor. Other general debris and litter are also expected to be collected during maintenance. These activities already occur under existing operational conditions.

Maintenance of plant and vehicles would be undertaken at ARTC's existing provisioning centres and not within the project site. Therefore waste from maintenance of plant and vehicles during operation has not been considered further.

The anticipated waste types and likely classifications during operation are listed in Table 19.4.

Table 19.4 Waste estimates and classification – operation

| Activity | Waste | Classification |
|---|---|---|
| Track maintenance | Green waste | General solid waste (non-putrescible) |
| | Rubbish and debris | General solid waste (non-putrescible) |
| | Materials | Suitable rail offcuts or scrap metal (including metal bands from packaging of materials for maintenance and hot waste from welding) |

#### Approach to waste minimisation and reuse

The approach to waste management during operation is described in section 19.4.1. The waste management measures proposed to align with the waste management hierarchy are listed in Table 19.6. This table also outlines the contingency measures (disposal) for wastes that cannot be avoided, reused, recycled or treated. Measures to facilitate segregation and prevent cross contamination are also provided.

Standard ARTC maintenance activities would be undertaken during operations. Typically, these activities include minor maintenance works, such as bridge and culvert inspections, rail grinding and track tamping, through to major maintenance, such as replacement and repair of existing bridge components, culvert repairs and cleaning, reconditioning of track and topping up of ballast as required.

Maintenance activities would continue to be undertaken in accordance with ARTC's Environmental Management System and ARTC's existing EPL (# 3142).

### 19.3.2 Cumulative impacts

No cumulative impacts would be expected as a result of the operation of the project.

## 19.4 Management of impacts

### 19.4.1 Approach

#### *19.4.1.1 Approach to mitigation and management*

A construction waste management procedure would be developed for the project as part of the CEMP. Operational procedures would continue to consider waste management in accordance with regulatory requirements. Waste management during construction and/or operation would also be undertaken in accordance with ARTC's existing procedures and EPL. Implementation of these measures would help ensure that waste from the project is managed in an environmentally sound manner, and in accordance with any legislated requirements for waste disposal and waste tracking.

#### *19.4.1.2 Expected effectiveness*

ARTC have experience managing potential impacts associated with waste generation as a result of rail developments of similar scale to the project.

All mitigation measures would be consolidated and described in the environmental management plans for construction and operation. The plans would identify measures that are common between waste types and or impact categories. ARTC would engage waste contractors to manage the collection, recycling and disposal of waste that cannot be reused onsite. Waste contractors would also be required to provide evidence of the works compliance with legislation requirements, conditions of approval and standards and guidelines.

In addition, waste auditing and monitoring would be undertaken to ensure that the waste management procedure for construction is scaled with actual waste volumes. As such, the management of waste throughout the project through implementing the measures outlined in Table 19.5, Table 19.6 and Table 19.7 are considered to be effective.

Table 19.5 Approach to waste management – construction

| Waste | Hierarchy | Management |
|---|---|---|
| Green waste | Avoid | Clearing would be minimised by placing temporary infrastructure in areas that have been previously cleared, degraded or have naturally lower above ground biomass. |
| | Reduce | Areas to be cleared would be marked to reduce incidental clearing. |
| | Reuse | As far as practicable, cleared material would be chipped, mulched and stockpiled for reuse during finishing works. Materials with special habitat value, such as hollow bearing logs or trees, would be selectively removed for reuse, or placed in nearby bushland. |
| | Dispose | Noxious weeds would be disposed of in accordance with relevant guidelines/requirements. |
| Rubbish and debris | Reuse | Domestic waste to be minimised where possible and other options investigated to promote reuse such as a water filling station instead of disposable water bottles. |
| | Recycle | Where recycling is considered feasible, rubbish and debris would be stored for collection by an authorised contractor for offsite recycling. |
| | Dispose | Where rubbish and debris is not recyclable, the waste would be removed to a storage location for collection by an authorised contractor for offsite disposal. |
| Food waste | Disposal | Putrescible waste would be stored at allocated bins at each site compound, for collection by an authorised contractor, and disposed of offsite. |
| Wastewater | Dispose | Wastewater/sewage from site compound amenities/ablutions would be removed by an authorised contractor for disposal in accordance with regulatory requirements. |
| Spoil | Reduce | The project is designed to adhere to the natural ground profile, where practicable, in order to reduce earthworks. |
| | Reuse | As much spoil as possible will be reused either for track formation/construction or used to create the embankment at Jacquie Osmond Reserve. |
| | Recycle | Options to recycle spoil would be investigated where practicable and would include consideration of the *Australian Rail Track Corporation excavated material order 2019.* |
| | Dispose | Only minor quantities of contaminated spoil will require offsite disposal at an appropriately licenced facility. |
| Topsoil | Reuse | Topsoil would be stockpiled for reuse during rehabilitation. Stockpiles would be managed to maintain soil structure and fertility. |
| | Treat | Low quality topsoil would be treated with ameliorants to improve structure and fertility. |
| | Dispose | Surplus or unusable topsoil would be disposed at locations within the rail corridor. |
| Waste concrete | Avoid | Procurement of surplus concrete powder would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Reuse | Sleepers would be reused where appropriate. |
| | Recycle | Waste concrete would be crushed and recycled where practicable. |

| Waste | Hierarchy | Management |
|---|---|---|
| | Dispose | Waste concrete that cannot be recycled would be collected and stored in designated storage areas for offsite disposal by an authorised contractor. |
| Waste ballast | Avoid | Procurement of surplus ballast would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Recycle | Options to recycle ballast would be investigated where practicable and would include consideration of the *Australian Rail Track Corporation excavated material order 2019.* |
| | Disposal | All unusable ballast would be placed into spoil mounds. |
| Waste metal | Avoid | Procurement of surplus metal, including rail, would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Reduce | Waste metal would be reduce by limiting offcuts. |
| | Recycle | Suitable rail offcuts or scrap metal (including metal bands from packaging of construction materials and hot waste from welding) would be stored for collection by an authorised contractor and recycled offsite. Market demand for this recyclable waste would also be considered. |
| Waste plastic | Avoid | Procurement of surplus plastic would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Recycle | Waste plastic would be stored at recycling bins at each site compound, for collection by an authorised contractor and recycled offsite. |
| | Dispose | Where recycling is not considered feasible, the waste would be collected and stored in designated waste storage areas for collection by an authorised contractor for offsite disposal. |
| Waste paper | Avoid | Procurement of surplus paper would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Reduce | Waste paper from office/administration facilities would be minimised by enabling 'secure print' feature on all printers and by encouraging double-sided printing. |
| | Recycle | Waste paper would be stored at recycling bins at each site compound, for collection by an authorised contractor, and recycled offsite, where feasible. |
| | Dispose | Where recycling is not considered feasible, the waste would be collected and stored in designated waste storage areas for collection by an authorised contractor for offsite disposal. |
| Waste cardboard | Avoid | Procurement of surplus cardboard would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Recycle | Waste cardboard would be stored at recycling bins at each site compound, for collection by an authorised contractor, and recycled offsite, where feasible. |
| | Dispose | Where recycling is not considered feasible, the waste would be collected and stored in designated waste storage areas for collection by an authorised contractor for offsite disposal. |
| Waste aluminium cans | Recycle | Waste aluminium would be stored at recycling bins at each site compound, for collection by an authorised contractor, clubs or charities, and recycled offsite. |

| Waste | Hierarchy | Management |
|---|---|---|
| Electrical waste | Avoid | Procurement of surplus appliances and cabling would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Reuse | Product stewardship arrangements would be sought, with a view to some electrical appliances being reused under return to supplier arrangements. |
| | Recycle | Electrical waste would be stored at recycling bins at each site compound, for collection by an authorised contractor, and recycled offsite, where feasible. Market demand for this recyclable waste would also be considered. |
| | Dispose | Where recycling is not considered feasible, the waste would be collected and stored in designated waste storage areas for collection by an authorised contractor for offsite disposal. |
| Waste oil, grease, lubricants, oily rags and filters | Avoid | Procurement of surplus appliances and cabling would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Recycle | Only waste oil and oil filters to be recycled through storage in recycling bins at each site compound, collection by an authorised contractor, and recycling offsite, where feasible. |
| | Dispose | The waste would be collected and stored in designated waste storage areas for collection by an authorised contractor for offsite disposal. Where feasible, containers holding oil, grease and lubricants would be washed prior to disposal or stored separately for disposal as hazardous waste. |
| Waste pallets | Avoid | Procurement of surplus pallets would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Reduce | Delivery of material on pallets would be limited wherever possible. If materials have to be delivered to site on pallets, ensure that pallets are returned to the supplier at time of delivery, where practicable. |
| | Reuse | Product stewardship arrangements would be sought, with a view to pallets being reused under the stewardship of the supplier. |
| | Recover | Options to recover wood from pallets by chipping, for reuse as mulch, would be pursued where practicable. |

**Table 19.6 Waste management measures – operation**

| Waste | Hierarchy | Management |
|---|---|---|
| Green waste | Reuse | As far as practicable, green waste generated from maintenance activities would be chipped, mulched and reused for vegetation management or collected by an authorised contractor and recycled offsite. |
| | Dispose | Noxious weeds would be disposed of in accordance with relevant guidelines/requirements. |
| Rubbish and debris | Recycle | Rubbish and debris includes any unexpected waste encountered during general track and corridor maintenance, and may include scrap metal, plastic, wood and other litter. Such wastes would be would be collected by an authorised contractor and recycled offsite, where recycling is considered feasible. |

| Waste | Hierarchy | Management |
|---|---|---|
| | Dispose | Where rubbish, debris and litter is not recyclable, the waste would be collected by an authorised contractor and disposed offsite at a suitably licenced facility. |
| Waste metal | Avoid | Procurement of surplus metal, including rail, would be avoided by adhering to the *Sustainable Procurement Guide* (Australian Government, 2013) and the *NSW Government Resource Efficiency Policy* (OEH, 2014). |
| | Reduce | Waste metal would be reduced by limiting offcuts. |
| | Recycle | Suitable rail offcuts or scrap metal (including metal bands from packaging of materials for maintenance and hot waste from welding) would be collected by an authorised contractor and recycled offsite. Market demand for this recyclable waste would also be considered. |

### 19.4.2 List of mitigation measures

The mitigation measures that would be implemented to manage waste are listed in Table 19.7.

**Table 19.7 Mitigation measures**

| Stage | Impact | Measure |
|---|---|---|
| Detailed design | Excess waste generation | Detailed design will include measures to minimise excess spoil generation during construction of the project. This will include a focus on optimising the design to minimise spoil volumes, and the reuse of material on-site. |
| Construction | Waste generation and recycling | A recycling target of at least 90 per cent will be adopted for the project. Where possible and fit for purpose; materials will be reused within the project before off-site reuse or disposal options are pursued |
| | Waste management | A waste management procedure will be prepared and implemented as part of the CEMP. It will include measures to minimise the potential for impacts on the local community and environment, including those listed in Table 19.5. |
| | Waste segregation | A waste segregation bin scheme will be included in the CEMP and will include locations of segregated bins within compounds, to facilitate segregation and prevent cross contamination. |
| | Materials | Material quantities will be recorded to monitor usage during each stage of construction. |
| | Waste and spoil management | Spoil will be managed in accordance with the spoil management hierarchy provided in Table 19.3. |
| | Waste and spoil management | A reusable spoil target of 90 percent will be adopted for the project. Where possible and fit for purpose, spoil will be beneficially reused within the project before off-site reuse or disposal options are pursued. |
| | Waste and spoil management | Construction waste will be minimised by accurately calculating materials brought to the site and limiting materials packaging. |
| | Waste and spoil management | All waste will be assessed, classified, managed and disposed of in accordance with the Waste Classification Guidelines (EPA, 2014a) and waste would be managed in accordance with *The Australian Rail Track Corporation excavated material order 2019*. |

| Stage | Impact | Measure |
|---|---|---|
| | Waste and spoil management | Waste segregation bins will be located at various locations within the project area, if space permits, to facilitate segregation and prevent cross contamination. |
| Operation | Waste management | Waste management measures will be implemented in accordance ARTC's standard environmental management measures included within its Environmental Management System and the mitigation measures listed in Table 19.6. |

### 19.4.3 Consideration of the interaction between measures

There are interactions between the mitigation measures for waste management and soils and contamination (provided in Chapter 12), and health safety and hazards (provided in Chapter 20). Together, all these measures would ensure appropriate handling of waste materials to minimise the potential for impacts to the community and environment.

### 19.4.4 Managing residual impacts

A residual risk analysis was undertaken following the impact assessment summarised in this chapter. The results of the residual risk analysis are provided in Appendix D and summarised below.

Construction waste quantities, including estimated spoil generation, spoil reuse, and spoil surplus, would be confirmed during detailed design. Classifications and reuse/recycling/disposal locations would also be confirmed at this stage. However, it is recognised that there is potential for unexpected volumes of potentially contaminated spoil to be generated. Any spoil classified as contaminated in accordance with Waste Classification Guidelines would be directed to a waste management facility that is lawfully permitted to accept that type of contaminated waste. There are a number of solid waste landfills in Sydney that are licensed to accept contaminated soils. Based on the results of the limited contamination assessment (refer Chapter 12 (Soils and contamination)) it is anticipated that the volumes of contaminated spoil generated by the project, if any, would be minor and could be readily accommodated at these facilities.

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# 20 Health, safety and hazards

*This chapter considers potential hazard, risk, and safety impacts associated with the project, and how these would be mitigated and managed during construction and operation. This chapter was written to address the relevant SEARs which are outlined in Appendix A.*

## 20.1 Assessment approach

### 20.1.1 Methodology

#### *20.1.1.1 Study area*

The study area varies for each health and safety related issue being considered and aligns with studies that support this assessment. For example the study area for the air quality impact assessment (Technical Report 3) is around a 1.5 kilometre concentric circle study area from the project and the noise and vibration impact assessment (Technical Report 2) is around a 1 kilometre study area from the project site. The area considered for public safety is in the immediate vicinity of the project where the public may come into contact with construction sites and road works.

#### *20.1.1.2 Scope of assessment*

The assessment focuses on those construction and operational activities with the potential to result in the following:

- potential health impacts, arising from changes such as the loss of public space, changes in air quality or noise impacts
- the likely risks of the project to public safety, such as risks to pedestrian safety from construction works and the handling and use of dangerous goods impacting the community.

A desktop level assessment was undertaken to identify potential impacts from the construction and operation of the project to the health and safety of the surrounding community and environment. The assessment involved:

- reviewing the relevant regulatory framework and applicable guidelines
- identifying sensitive receivers and community infrastructure within the existing environment
- identifying construction and operational activities with the potential to cause health and safety impacts to off-site receivers
- considering the potential impacts associated with hazardous materials, as defined by the guidelines to *State Environmental Planning Policy No 33 – Hazardous and Offensive Development* (SEPP 33)
- qualitatively assessing potential impacts to public health and safety
- consideration of the recommended mitigation measures identified in the EIS technical studies and where necessary, additional mitigation measures that may need to be considered to address community health and safety impacts.

The assessment does not take into account potential health and safety risks to on-site workers associated with normal construction operations, as these are regulated by workplace health and safety legislation (including the *Work Health and Safety Act 2011*), and are not relevant to approval of the project under Division 5.2 of the EP&A Act. Site management would be the responsibility of the construction contractor, who would be required (under the *Work Health and Safety Act 2011*) to manage the site in accordance with relevant regulatory requirements.

#### *20.1.1.3 Health and safety*

This health impact assessment draws together and assesses impacts from changes in air quality, noise, public safety and a range of community/social aspects, as these relate to and may impact on the health of the community. As a result, the health impact assessment draws directly on a wide range of other Technical Reports,

to evaluate how the impacts identified in these studies may then either benefit or impact on the health of the community. This study has considered the findings of the following Technical Reports:

- Technical Report 1 – Traffic, transport and access impact assessment
- Technical Report 2 – Noise and vibration impact assessment
- Technical Report 3 – Air quality impact assessment
- Technical Report 6 – Soils and contamination impact assessment
- Technical Report 11 – Social impact assessment

The health impact assessment considered the following guidance:

- *Environmental health risk assessment, guidelines for assessing human health risks from environmental hazards* (Enhealth 2012)
- *Methodology for Valuing the Health Impacts of Changes in Particle Emissions* (EPA, 2013)
- *Health Impact assessment guidelines 2017* (Enhealth, 2017)
- *Health impact assessment: A practical guide* (NSW Health, 2007).

This assessment has reviewed key aspects of the project that may affect the health of the local community. The assessment includes both qualitative and quantitative assessment methods. The approach adopted in for this assessment is as follows:

- an assessment of potential impacts on health associated with project related changes in noise. This is a qualitative assessment of construction and operational noise impacts for the community based on the quantitative findings of Technical Report 2 - Noise and vibration impact assessment.
- an assessment of potential impacts on health associated with project include changes in air quality and noise. This involves a qualitative assessment of construction and operational impacts on community health based on the quantitative findings of Technical Report 3 – Air quality impact assessment.
- an assessment of potential impacts of the project on public safety. This is a qualitative review of impacts that have the potential to impact on public safety during construction and operation.
- an assessment of potential impacts of a range of other project related impacts on community health. This is a qualitative assessment of project related impacts related to traffic, contamination of land and water, changes in green space and access to recreational facilities, public transport, active transport and acquisitions as outlined in the various relevant technical studies.

### Dangerous goods and hazardous materials

Hazardous materials are classified based on their health effects, while dangerous goods are classified according to their physical or chemical effects, such as fire, explosion, corrosion and poisoning, which may impact property, the environment or people.

As the project is State significant infrastructure, *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Department of Planning, 2011*)* (Applying SEPP 33) does not apply to the project (refer to section 3.2). However, consideration of SEPP 33 provides a process for identifying a potentially hazardous development by identifying storage and transport screening thresholds. The thresholds in Applying SEPP 33 represent the maximum quantities of hazardous materials that can be stored or transported without the potential for causing a significant off-site risk.

Hazardous materials are defined by Applying SEPP 33 as substances falling within the classification of the Australian Code for the Transport of Dangerous Goods by Road & Rail (National Transport Commission, 2017) ('the Dangerous Goods Code'). Dangerous goods are substances that, because of their physical, chemical (physico-chemical) or acute toxicity properties, present a risk to people, property or the environment. Types of

substances classified as dangerous goods include explosives, flammable liquids and gases, corrosives, chemically reactive or acutely (highly) toxic substances.

### 20.1.2 Risks identified

The preliminary environmental risk assessment undertaken for the project included potential risks associated with health, safety and hazards. Potential risks were considered according to the impacts that may be generated by the construction and/or operation of the project, pre-mitigation. The purpose of the preliminary environmental risk assessment was to inform the impact assessment. Further information on the preliminary risk assessment, including the approach and methodology is provided in Appendix D.

The assessed risk level for the majority of potential health and safety risks ranged from low to high. Risks with an assessed level of medium or above included:

- impacts from transport, storage and use of hazardous substances and dangerous goods
- adverse health from noise and air pollution during construction
- reduced safety for road users and pedestrians during construction particularly in the vicinity of houses, businesses, and areas of public recreation
- safety impacts due to the presence of construction activities (moving vehicles etc) particularly within recreational areas and near Lawrence Hargrave Special Education School
- impact from spill or accident during the transport, storage and use of hazardous substances and dangerous goods
- increased safety risks due to changes to infrastructure (eg additional length of shared path under bridge) adverse health from noise during operation.

These potential risks and impacts were considered as part of the assessment. The assessment also considered matters identified by the SEARs and stakeholders, as described in Chapter 3 (Approval and assessment requirements) and Chapter 4 (Consultation).

### 20.1.3 How potential impacts have been avoided/minimised

As described in Chapter 6 (Project features and operation) and Chapter 7 (Construction), design development and construction planning has included a focus on avoiding and/or minimising the potential for environmental impacts during all key phases of the process.

Potential noise and vibration impacts have been avoided/minimised where possible by the following:

- The noise wall would be progressively removed and reinstated as works progress along Broomfield Street and would provide shielding effects during construction. This is to minimise the length of time that sensitive receivers would be exposed to potential noise impacts from existing train operations.
- Closure of active transport routes has been minimised by providing a temporary path between Sussex Street and Cabramatta Creek around the proposed worksites to maintain access to public recreation and through traffic for the majority of the construction period.

Potential air quality and contamination impacts have been minimised by minimising the project footprint.

## 20.2 Existing environment

The existing environment with regards to traffic and access, noise, air quality, contamination and social impacts is described in chapters 8, 9, 10, 12 and 18 respectively.

Other aspects relevant to the consideration of health and safety impacts are discussed below.

### 20.2.1 Sensitive receivers

The urban setting of the project means that there is the potential for the community to be impacted. The mitigation measures provide in section 20.5.2 will be implemented to manage any construction and operational impacts. A description of existing land use patterns and sensitive receivers surrounding the project area is provided in Chapter 16 (Land use and property).

Sensitive receivers include members of the community travelling through the study area or are situated in close proximity to the project site and operational rail corridor and residents living near the project site.

The study area for the assessment covers two statistical areas (level 2 areas) within the Fairfield and Liverpool LGAs. The two areas of relevance to this assessment are:

- Cabramatta-Lansvale – which encompasses the suburb of Cabramatta in which the project site is located.
- Warwick Farm – which encompasses the suburb of Warwick Farm in which the project site is located.

A detailed profile of the local communities is provided in section 18.2.

### 20.2.2 Community infrastructure

The suburbs of Cabramatta and Warwick Farm both contain a large range of community facilities and services including:

- residential homes and gardens with the closest receivers residing on Broomfield Street and Sussex Street
- community facilities eg including the Lawrence Hargrave Special Education School (refer to section 18.2.2 for a complete list of community facilities)
- footpaths and shared paths including the Cycleway
- roads including local roads such as Broomfield Street, Sussex Street, Station Street and Railway Parade and arterial roads such as Hume Highway
- Jacquie Osmond Reserve including the sports facilities predominantly used for softball
- Warwick Farm Recreation Reserve
- Hometown Warwick Farm retail area, Peter Warren Automotive and other local businesses.

The project site and surrounding area contains the usual overhead and underground utilities common to a suburban area. This includes:

- stormwater drainage pipes on the eastern and western sides of Broomfield Street
- sewer rising main and gravity main located parallel to the rail corridor in Jacquie Osmond Reserve and Peter Warren Automotive
- power poles and power lines on the eastern side of Broomfield Street

No known high pressure dangerous goods pipelines are located within or adjacent to the project site.

### 20.2.3 Existing health of the population

There are a large number of factors to consider in relation to the existing health of a local community. The health of the community is influenced by a combination of interacting factors including age, socio-economic status, social networks, behaviours, beliefs and lifestyle, life experiences, country of origin, genetic predisposition and access to health and social care. While it is possible to review existing health statistics for the local health district surrounding the project and compare them to the Greater Sydney area and NSW, it is not possible to identify a causal source or specifics of the project site and surrounding communities.

There are higher levels of disadvantage in Cabramatta-Lansvale and Warwick Farm compared to the LGAs which they are within and the Greater Sydney (ABS, 2016). These measures include lower income, educational attainment, English language skills, unemployment, dwellings without motor vehicles, and higher need for assistance with self-care, communication or mobility services, due to illness, age or disability. Health related behaviours that are linked to poorer health status and chronic disease, including cardiovascular and respiratory diseases (such as asthma), cancer, and other conditions, that account for much of the burden of morbidity and mortality in later life.

## 20.3 Assessment of construction impacts

### 20.3.1 Public safety

#### *20.3.1.1 Safety for road user, pedestrians and cyclists*

Construction of the project would require the temporary closure and diversion of pedestrians and cyclists and road and traffic lane closures (refer to section 7.6.5). This is likely to include the following changes:

- partial road closures would be required on Broomfield Street and Sussex Street to allow for road reconfiguration and rail bridge construction
- potential full road closures on Broomfield Street and Sussex Street for short periods at night with appropriate diversions in place to ensure minimal disruption to transport networks
- temporary diversion of a section of the Cycleway would be required. A temporary shared path would be provided between Sussex Street and Cabramatta Creek during construction of the new bridges
- the temporary shared path over Cabramatta Creek would be closed when the crane is being operated for the construction of Cabramatta Creek bridge (up to two weeks).

These changes can result in the following impacts and risks:

- confusion about available routes and access, resulting in traffic collisions between road users and pedestrians and cyclists crossing at unsafe locations
- injury to sensitive receivers passing construction areas adjacent to roads and active transport routes from falling objects, collapse of structures such as walls or materials being dropped during loading/unloading
- injury to sensitive receivers or property damage from collision with construction vehicles.

A construction traffic management plan would be prepared prior to the commencement of works as part of the CEMP. The aim of the CEMP would be to ensure appropriate practices are adopted to maintain the safety of road users within and near to the site. This would include providing safe movement of traffic for both the general public and construction workers through defined routes, diversions, signage, safe crossing points for pedestrians and cyclist and where needed traffic management staff. Deliveries and loading/unloading activities would be restricted to areas specified within the construction traffic management plan and separated from the general public and transport routes.

Standard mitigation measures such as appropriate layout of compounds sites, construction methodology and hoardings would be detailed in the CEMP. Construction methodologies would include avoiding lifting of equipment above pedestrian routes and appropriate hoarding to contain construction activities within the project site.

The potential for the above activities to cause safety impacts is considered to be low, based on works being undertaken in accordance with NSW workplace safety laws. These laws require construction sites to have adequate site security, which includes appropriate fencing and hoarding to separate construction activities from the community.

#### *20.3.1.2 Safety for public recreation users and neighbouring residential areas*

Compound sites are proposed within Jacquie Osmond Reserve and Warwick Farm Recreation Reserve and access to the project site would be required through both these reserves and would use the unnamed track on the eastern side of the rail corridor.

This would result in the movement of construction vehicles near the point where shared path users cross underneath the rail corridor between Jacquie Osmond Reserve and Warwick Farm Recreation Reserve.

Construction work relating to vegetation clearance, replacing the noise wall, Sussex Street bridge and associated changes to the road corridor will take place in close proximity to residences on Broomfield Street, Sussex Street and streets intersecting with these. This would mean that residents and vehicles will be accessing properties in proximity to the use of construction vehicles and equipment.

Where impacts are not mitigated through the use of hoarding (separating the person from the risk) active traffic management would be used to minimise the potential for impacts as construction vehicles and equipment access the project site.

### 20.3.2 Underground and aboveground utilities

As described in Chapter 7 (Construction) a number of utilities are present in the project site and would need to be adjusted, relocated and/or protected to enable construction. In addition, there is the potential for unidentified underground utilities to be present within the project site. The potential rupture of underground utilities during excavation or collision of plant and equipment with aboveground services could pose risks to public safety. Rupture or contact with services during works could also result in releases and/or short-term outages, as could the relocation of utilities and services.

The potential for rupture or contact with services during construction activities would be minimised by undertaking utilities investigations, to confirm the location of utilities prior to intrusive or relocation works, and consulting with service providers as part of the detailed design phase. Mitigation measures would be employed during construction works in accordance with relevant service provider requirements. This could include use of tiger tails or a spotter when operating machinery within proximity to overhead power lines. Potential contamination

Previous assessment undertaken for the design and construction of the SSFL (Parson Brinkerhoff (2006)) identified a number of contaminants of potential concern based on current and former land uses within the project site. These include heavy metals, hydrocarbons (TRH/BTEX/PAHs), pesticides/herbicides, arsenic and asbestos.

Exposure to these contaminants could result in health and safety impacts to the community and environment through.

- direct contact or incidental ingestion of contaminants
- inhalation of volatile compounds or dust
- vertical and horizontal migration of contaminants from the shallow soil into the underlying groundwater. subsequent migration could then occur into the wider groundwater aquifer
- surface water runoff and migration into surface water.

Analytical results from a limited contamination assessment undertaken in the project site to inform this EIS (refer to Technical Report 6- Soils and contamination impact assessment) were below the nominated health investigation criteria at all sample locations and asbestos was not encountered during the investigation or in analysed soil samples. This indicates a low health risk from existing contaminants, noting that there is potential for unexpected finds to be identified during construction works.

Health and safety impacts associated with potential exposure to contaminated and hazardous materials would be minimised through implementation of an unexpected finds protocol and standard management measures within the CEMP.

Additional contamination could be created during the construction stage due to spills and leaks from construction vehicles, equipment or from materials stored in the site compound area. This is discussed further in section 20.3.5.

### 20.3.3 Emergency vehicle movements

As described in section 7.6.5, construction of the project would result in temporary impacts to traffic and access within and around the project site. The construction of the Sussex Street bridge would require the full closure of this street for a short period during night works to minimise disruption to the road network. This could cause delays and/or potential access restrictions to some emergency vehicle movement in the area. Emergency vehicles would be provided with priority access. This could include traffic management stopping other traffic or works temporarily stopping to allow emergency vehicles to pass.

The traffic impact assessment concluded that the road network performance would not decline as a result of construction and alternate routes would be established during full street closures. Sussex Street bridge has an existing low clearance level of two metres, which limits its current use for some emergence vehicles. Therefore, any delays from vehicles using an alternate route to Sussex Street would likely be minor.

Impacts from delays and potential access restrictions would be managed through the implementation of a traffic management plan and appropriate traffic controls, which would consider emergency vehicle access, the required width of roads and movements. Ongoing liaison with local councils, Roads and Maritime Services, and emergency services organisations would be undertaken as part of the detailed design phase to confirm any additional measures to mitigate potential impacts to emergency vehicle movements. Consultation would continue through construction to ensure emergency access protocols are managed effectively as the traffic management and location of construction works change.

### 20.3.4 Storage, handling, and transport of dangerous goods and hazardous materials

Dangerous goods that may be used during construction are listed in Table 20.1 The storage and handling of these dangerous goods and hazardous materials during the construction work has the potential to impact the surrounding community and environment if leaks and spills occur or if excessive amounts of dangerous goods are stored or transported exacerbating the potential for fire, explosion or inhalation impacts.

These potential dangerous goods and hazardous materials have been compared to the storage and transport thresholds in the guidance document Applying SEPP 33 (refer to Table 20.1). These thresholds represent the maximum amounts of dangerous goods that can be stored or transported to and from the project site without causing a significant risk to the community or environment.

Table 20.1 Dangerous goods volumes and thresholds

| Material | Dangerous Good Code Class | Storage method | SEPP 33 thresholds | | |
|---|---|---|---|---|---|
| | | | Storage volume | Minimum storage distance from sensitive receivers | Transport |
| Diesel | C11; 3 PG III2 | 20 litre drums/ carry cans | Greater than 5 tonnes, if stored with other Class 3 flammable liquids | 5 metres | Not applicable if not transported with Class 3 dangerous goods |
| Petrol | C11; 3 PG III2 | 20 litre drums | Greater than 5 tonnes, if stored with other Class 3 flammable liquids | 5 metres | Not applicable if not transported with Class 3 dangerous goods |
| Lubricating and hydraulic oils and greases | C2 | 20 litre drums | n/a | n/a | Not applicable, if not transported with Class 3 dangerous goods |
| Acetylene | 2.1 | Cylinders (up to 55 kg) in rack | Greater than 0.1 tonnes (100 kg) | 15 metres | 2 tonnes; 30 times per week |
| Cement | n/a | Bags/pallets (in container) | n/a | n/a | Not subject to Applying SEPP 33 transport thresholds |
| Premix concrete | n/a | Bags/pallets (in container) | n/a | n/a | Not subject to Applying SEPP 33 transport thresholds |
| Concrete curing compounds | n/a | 20 litre drums | n/a | n/a | Not subject to Applying SEPP 33 transport thresholds |
| Concrete retardant | 3 PG III | 205 litre drums | Greater than 5 tonnes | 5 metres | 10 tonnes; 60 times per week |
| Epoxy glue | 3 PG III | Small containers | Greater than 5 tonnes | 5 metres | 10 tonnes; 60 times per week |
| Coagulants | n/a | 1,000 litre intermediate bulk containers | n/a | n/a | Not subject to Applying SEPP 33 transport thresholds |
| Acids | 8 PG II | 1,000 litre intermediate bulk containers | Greater than 25 tonnes | n/a | 2 tonnes; 30 times per week |
| Bases | 8 PG II | 1,000 litre intermediate bulk containers | Greater than 25 tonnes | n/a | 2 tonnes; 30 times per week |

| Material | Dangerous Good Code Class | Storage method | SEPP 33 thresholds | | |
|---|---|---|---|---|---|
| | | | Storage volume | Minimum storage distance from sensitive receivers | Transport |
| Disinfectant | 8 PG III | 500 litre intermediate bulk containers | Greater than 50 tonnes | n/a | 2 tonnes; 30 times per week |
| Anti-scalent | n/a | 100 litre drums | n/a | n/a | Not subject to Applying SEPP 33 transport thresholds |
| Membrane preservative | 8 PG III | 10 litre drums | Greater than 50 tonnes | n/a | 2 tonnes; 30 times per week |
| De-bonding agents | n/a | Drums/ containers | n/a | n/a | Not applicable |
| Contaminated waste | Dependent on nature of material | Bunded areas or removed directly from site | Dependent on nature of material | Dependent on nature of material | Dependent on nature of material |
| Paint | n/a | 20 litre drums | n/a | n/a | Not subject to Applying SEPP 33 transport thresholds |

In general, low volumes of dangerous goods would be stored in construction compounds adjacent to the rail corridor. The quantity of goods stored would be commensurate with the demand for those goods so that excess goods are not sitting idle.

The incorrect storage or mishandling of these goods and chemicals could also result in the potential contamination of air, soils, surface water and/or groundwater. This could result in health and safety impacts to the community through inhalation and/or direct contact, fires and explosions or impacts to the environment due to the contamination of land and water.

Health and safety impacts associated with potential exposure to dangerous goods and hazardous materials would be minimised through implementation of standard management measures within the CEMP relating to storage requirements and handling protocols. This would accord with ARTC's risk management framework, environmental management system and safety management system (refer to section 20.5.1). In addition, the storage, handling and transport of dangerous goods would be undertaken in accordance with the Dangerous Goods (Road and Rail Transport) Regulation 2009 and the Code of practice for the storage and handling of dangerous goods (WorkCover NSW, 2005)

Storage of dangerous goods and hazardous materials would be avoided where possible in the proposed Warwick Farm Recreation Reserve compound site (C2) due to its location near Lawrence Hargrave Special Education School.

### 20.3.5 Health impacts

#### *20.3.5.1 Access*

Construction of the project would require the temporary diversion of pedestrians and cyclists around the construction site, a short-term closure of the shared path and occasional road and traffic lane closures (refer to section 7.6.5).

A portion of the local population walk to work (Cabramatta-Lansvale 5 per cent, Warwick Farm 10.8 per cent), and catch a train to work (Cabramatta-Lansvale 18.5 per cent, Warwick Farm 22.8 per cent) (ABS, 2018). This impact may affect local residents that use the Parramatta to Liverpool Rail Trail Cycleway and the shared path over Cabramatta Creek to access their place of employment, train stations or public facilities. This may change people's daily commute routes and times, or how they access facilities.

Compound sites are proposed within Jacquie Osmond Reserve and Warwick Farm Recreation Reserve and access to the project site would be required through both these reserves. This would result in minor temporary changes to reserve access points (for approximately two weeks when components of the Cabramatta Creek bridge are being constructed), cordoning off some areas within the reserves and the reduced amenity of neighbouring areas from noise, as discussed in section 20.3.1. Three of the 12 softball diamonds would be unavailable during construction.

These activities could result in the following impacts:

- confusion and increased anxiety for pedestrians, cyclist and road users relating to access arrangement to regular transport routes and recreational facilities
- pedestrians and cyclists choosing a less active method of transport to avoid areas of construction resulting in a loss of the health benefit of active transport
- confusion and increased anxiety for sensitive receivers wanting to use public areas, relating to access arrangement and if the sites are open and available for use
- temporary loss of informal recreational areas and soft ball diamonds and reduced amenity of remaining facilities, reducing community use and related health benefits derived from an active lifestyle.

A construction traffic management plan would be prepared prior to the commencement of works as part of the CEMP. The aim of the CEMP is to maintain the safety of road users within and near to the site. This would include

providing safe movement of traffic for both the general public and construction workers through defined routes, diversions, signage, safe crossing points for pedestrians and cyclist and where needed traffic management staff.

Public consultation prior construction and the use of appropriate notifications and signage during construction would inform the public about the routes to access and the availability of areas of recreation. Consultation with key stakeholders such as Southern Districts Softball Association would be carried out to ensure the active lifestyle of members could be maintained at this location.

#### *20.3.5.2 Air quality impacts*

Construction activities are associated mainly with vehicle movements, groundworks, vegetation removal and concrete sawing, may cause emissions of dust to be dispersed into the atmosphere. The air quality impact assessment (refer to Technical Report 3) has predicted that air quality criteria are met within 30 metres from the boundary of the project site. . There are a number of residents, businesses and public facilities such as active transport routes and public reserves within 30 metres including residents along Broomfield Street and Sussex Street.

Changes to air quality have the potential to disturb and cause irritation to some residents and workers of local businesses when spending time outdoors. Users of sport and recreation facilities within 30 metres of the works (Jacquie Osmond Reserve, Warwick Farm Recreation Reserve, Lawrence Hargrave School playground) may also be exposed to dust, which has the potential to affect sports training and competition participants, and informal users of the facilities. People who may be more sensitive to dust impacts from the project include students of Lawrence Hargrave School, infants, the elderly and people with asthma.

The aim would be to prevent significant impacts on receptors through the use of effective mitigation. Standard mitigation relating to dust reduction measures and diesel emissions from plant and equipment would be included in the CEMP to minimise potential impacts. However, even with a rigorous management measures in place, it is not possible to guarantee that the dust mitigation measures would be effective all the time. As the project is linear and works would be staged, impacts would be temporary and localised according to where the construction activity work is occurring. Where appropriate mitigation measures are implemented, the potential for health impacts to occur as a result of dust generated or emissions from vehicles during construction is considered to be low.

Exposure to additional dust can be reduced at residential and business properties, and indoor community facilities, by partially or fully closing windows and spending time indoors when construction is occurring nearby. Spending less time outdoors may impact some resident's active lifestyles and the health benefits resulting from this. However, this is expected to be temporary and localised according to where the construction activity work is taking place.

#### *20.3.5.3 Noise and vibration*

Construction activities and associated vehicle movements and deliveries result in increases in noise and vibration, with the potential to affect surrounding sensitive receivers.

According to the noise and vibration impact assessment (refer to Technical Report 2), construction of the project would result in a temporary increase in noise levels for sensitive receivers within 150 metres of the project site, with some specific localised construction activities causing 'highly intrusive' noise impacts on receivers close to the project site. Residents and businesses within a 600 metres radius of construction works also have the potential to experience noise impacts during night time construction activities.

Sensitive receivers within 140 metres of the construction works have the potential to experience impacts on human comfort during construction. These impacts would be occasional and not continuous throughout the construction period.

Noise and vibration impacts may affect the amenity of nearby residential properties, businesses and community facilities. This could reduce the use of outdoor areas, and the associated health benefits from an active lifestyle.

Noise impacts can also cause sleep disturbance for residents located close to construction works during the night time, and for shift-workers during the daytime. The study area may include vulnerable communities who may be more sensitive to noise and vibration impacts, such as people with a higher need for assistance with self-care, communication or mobility services, due to illness, age or disability. However, as a linear project worst case noise

and vibration impacts would be temporary and localised according to where the construction activity work is occurring.

Users of surrounding social infrastructure who may be more sensitive to noise and vibration impacts include students of Lawrence Hargrave Special Education School (within 100 metres). It is likely students who attend the school may be more vulnerable to noise and vibration impacts. This may result in diminished comfort, concentration, daily routine and overall wellbeing of the students. Consultation with the school will be carried out prior to works commencing.

Noise impacts to a hospital could result in levels of anxiety, sleep deprivation or annoyance to patients or interfere with ability of staff to carry out their work. Liverpool Hospital is located around 600 metres from the closest part of the project site. This is at the very edge of the potential impact area for noise. However, it is located further from the more significant construction impacts (ie areas where piling for bridges or demolition of the noise wall are located) and therefore impacts are not predicted. Standard mitigation measures proposed to minimise impacts to receivers closer to the project would also benefit and minimise impacts to Liverpool Hospital.

Given that the project's main site compound is located within part of Jacquie Osmond Reserve, users of the playing fields would have the potential to experience noise and vibration impacts. This may affect participants during training sessions, weekend competitions and tournaments, causing changes to the way in which participants make use of the facility. Three softball diamonds would be affected Impacts are expected to be low with the exception of tournaments which would result in a larger number of players and greater use of facilities at one time. Public consultation would be undertaken to inform detailed construction planning and signage would establish as necessary to inform the public about access and the availability of areas of recreation. Consultation with key stakeholders such as Southern Districts Softball Association would be carried out to ensure the active lifestyle of members could be maintained at this location as much as possible.

### 20.3.6 Other health and safety risks

A number of other construction activities could result in impacts to the safety the local community if improperly managed. These include:

- items falling off vehicles during the transportation of equipment, excavated spoil and material to and from site
- transportation of hazardous goods to and from the project site
- potential for risks to pedestrian/public safety resulting from unauthorised access to construction work areas.

Safety risks during construction and transportation of materials by road or rail would be managed by the implementation of standard workplace health and safety requirements including the requirements of the Dangerous Goods Code' and ARTC's risk management framework (refer to section 20.5.1).

The potential for unauthorised access to result in safety risks is considered to be low, based on NSW workplace safety laws. This requires construction sites to have adequate site security, which includes appropriate fencing and access restrictions. The construction contractor would need to ensure that construction sites are secure at all times, construction plant and equipment could not be activated by unauthorised persons and take all possible actions to prevent entry by unauthorised persons.

### 20.3.7 Cumulative impacts

Other projects that have the potential to occur at the same time as the project are described in Appendix E.

There are no other known construction projects proposed in the immediate vicinity of the project site, and therefore no cumulative impacts relating to safety issues with other projects are predicted.

Cumulative impacts relating to transportation of hazardous goods and related safety risks during construction are predicted to be low and would managed by the implementation of standard workplace health and safety requirements including the requirements of the Dangerous Goods Code and ARTC's risk management framework.

As the air quality impacts from the construction of the project are predicted to be transitory and criteria are met within 30 metres from the boundary of the project site, the cumulative impacts would be minimal unless an additional source of dust (to this project) was generated close to receptors. There are no other known construction projects proposed for the area.

As the noise impacts from the construction of the project are predicted to be transitory and confined to an area near the boundary of the project, the cumulative impacts would be minimal unless additional sources (to this project) of noise was generated close to receptors. There are no other known construction projects proposed in the vicinity of the project site. The potential for cumulative noise and vibration impacts from development proposals in the wider area would be low due to the separation distances between the construction areas for the project and other proposals. Therefore no significant cumulative impacts with other projects are predicted.

During scheduled possession periods there may be other rail maintenance work being conducted within the Sydney Trains rail corridor next to the SSFL. This may result in noise from construction works being exacerbated during this period. Noise from these activities would be managed within standard mitigation measures and out of hours protocols to minimise impacts to sensitive receivers.

## 20.4 Assessment of operation impacts

### 20.4.1 Public safety

#### *20.4.1.1 Safety for road user, pedestrians and cyclists*

Following completion of the project, road, pedestrian and cycle facilities would be re-instated in a similar or same location, as described in section 6.2.4. Therefore, there would be no additional impacts to the safety of road users, pedestrians and cyclists from operation of the project.

The new rail bridge over Sussex Street would extend the existing road, cycle and pedestrian routes which go under the rail bridges. The landscape and visual impact assessment for the project (refer to Technical Report 10) outlines the use of Crime Prevention Through Environmental Design principles, to be included in the proposed lighting design for the connections under the bridge to achieve adequate illumination during the night time.

The repositioned retaining wall and noise wall on Broomfield Street would be designed with appropriate tolerances to wind shear and potential collapse and would meet appropriate standards. Therefore any safety issues related to collapse of structures is considered low.

#### *20.4.1.2 Safety for public recreation users and neighbouring residential areas*

Following completion of the project Warwick Farm Recreation Reserve would be returned to its pre-construction condition and public access routes to these areas. Therefore, there would be no additional impacts to public health and safety from the operation of the project.

Jacquie Osmond Reserve and its access points would be returned to its pre-construction condition. It would however, be slightly smaller by a few metres, due to the expanded rail corridor. It would also have a new retaining wall between the public area and the rail corridor for part of the length of the reserve. The structural analysis and design of the wall would meet the appropriate standards. Therefore any safety issues related to the retaining wall are considered low.

On completion of the project, the road corridor along Broomfield Street and Sussex Street would be re-instated in a similar location, as described in section 6.2.4. The rail corridor would be a few metres closer to these residents. There would be no additional impacts to the safety of residents living on these streets and any rail incidents would be managed according to ARTC existing risk management framework outlined in section 20.5.1.

### 20.4.2 Underground and aboveground utilities

Some utilities would be relocated during construction. No further changes to utilities are expected during operation of the project and therefore no impacts to sensitive receivers are anticipated.

### 20.4.3 Storage, handling and transport of dangerous goods and hazardous materials

There are no areas within the operational site that would be used for the permanent storage of chemicals.

The amount of hazardous materials and dangerous goods that would be used during maintenance activities would be much smaller than the volumes required during construction. Hazardous materials and dangerous goods required during maintenance would be similar to those listed in Table 20.1. These would be managed within the ARTC's existing risk management framework outlined in section 20.5.1 and standard operating procedures established for the existing SSFL. Any potential risks of leaks or emissions are considered to be low. Health and safety impacts to the community from exposure to these contaminants through inhalation and/or direct contact, is considered to be low.

Transport of hazardous materials and dangerous goods via rail during freight operations has the potential to cause impacts to the surrounding community and the environment through leaks and spills. The transport of hazardous materials and dangerous goods would be the responsibility of the freight operator/s and would be undertaken in accordance with relevant standards and regulatory requirements including the Dangerous Goods Code, ARTC's existing EPL (EPL #3142) and ARTC's standard operating procedures.

### 20.4.4 Emergency vehicle movements

Operation of the project would not change existing vehicle access arrangements, increase flooding of roads or lower the existing height restrictions under bridges. Therefore, there would be no additional impacts to emergency vehicle movements as a result of the project. However, flooding would occur at the same public road locations as it is currently occurring.

### 20.4.5 Health impacts

#### *20.4.5.1 Changes to access*

Following completion of the project, Warwick Farm Recreation Reserve and Jacquie Osmond Reserve would be returned to its pre-construction condition with the same public access routes to these areas. The existing 12 softball diamonds within Jacquie Osmond Reserve would returned to pre-construction condition. Health benefits associated with the full use of public areas for sport and informal recreation would be returned to the local community.

As described in Technical Report 10 - Landscape and visual impact assessment, the urban design of the project would include considering improving pedestrian and cyclist safety. Clear sightlines would be provided following the clearance of existing vegetation between Sussex Street and the pedestrian bridge over Cabramatta Creek. This would improve visibility of pedestrians and cyclists to passing vehicles and improve the ability of active transport users to see the road clearly before crossing Sussex Street. Clear sightlines would also be provided through strategies such as reduction of unnecessary clutter on paths (such as bollards and light poles) and adequate lighting especially in relation to the addition of bridge structures and new signage.

Signage and lighting would also be installed where the shared path diverts from Cabramatta Creek under the bridge at Jacquie Osmond reserve. This will improve connectivity and safety in this location.

#### *20.4.5.2 Air quality impacts during operation*

Some community members may be sensitive to dust and emissions from operational trains. Sensitive receivers would include people with asthma, elderly, infants, and students at Lawrence Hargrave School.

According to the air quality impact assessment (Technical Report 3), an increase in average annual levels of contributing pollutants (such as dust and emissions) from operation of the project are predicted to be negligible. Dust and emissions would continue to be managed in accordance with ARTC's standard operating procedures and ARTC's existing EPL. Operational impacts resulting in additional impacts to health are therefore considered to be negligible.

#### *20.4.5.3 Noise and vibration impacts during operation*

The noise and vibration impact assessment (Technical Report 2) indicates that overall operational noise and vibration impacts will be negligible; however, surrounding community members may perceive the additional noise

from trains to be a nuisance. One residential property may be impacted by the project during operation and as a result further reasonable and feasible mitigation will be explored to mitigate this impact.

There is also potential for students of Lawrence Hargrave Special Education School to be more vulnerable to the increased train noise; however, the school is already directly next to the rail corridor and the proposed operational alignment will be on the opposite side of the existing corridor to the location of the school. As such it is expected that there wouldn't be a noticeable difference to students as a result of this project.

### 20.4.6 Other safety issues and hazards

Potential impacts to the safety of the local community during operation include:

- security risks from unauthorised access or vandalism.
- security of the rail corridor would be undertaken in accordance with ARTC's standard operating procedures and risk management framework which would include continued maintenance of security features such as fencing.

### 20.4.7 Cumulative impacts

Potential health and safety impacts during operation of the project associated with other approved and proposed projects are not anticipated to increase the risks to public safety or health when combined with the operational project.

## 20.5 Management of impacts

### 20.5.1 Approach

#### *20.5.1.1 Approach to mitigation and management*

In general, potential health and safety impacts would be avoided by:

- managing construction and operation in accordance with relevant legislative policy requirements and ARTC's existing risk management framework (discussed further below)
- designing, constructing, and operating the project to minimise risks to health and safety
- implementing the management and mitigation measures provided in Table 20.2.

During construction a CEMP would be prepared minimise the risks to community safety which would include:

- actions to avoid impacts, such as compound and worksite layouts, appropriate hoarding, security features and storage requirements for hazardous and dangerous goods
- actions to minimise impacts, such as dust and noise management, appropriate management of contaminated spoil, incident management and spill response procedures.

Response to emergencies during operation would be undertaken in accordance with ARTC's existing Safety Management System and associated procedures (refer to section 20.5.1). Maintenance activities would be managed through ARTC's existing maintenance procedures.

#### *20.5.1.2 ARTC's risk management framework*

As part of ARTC's operational systems and procedures, ARTC has an existing management framework for managing risks and minimising impacts associated with operating its infrastructure. This includes avoiding, minimising and managing risks related to public safety and incident management. The project would be managed through the existing ARTC operational systems and procedures.

The existing framework includes, but is not limited to:

- ARTC Environmental Management System and its associated procedures, work instructions and tools
- ARTC's existing Safety Management System

- ARTC Strategic Risk Management Protocols RM-01
- ARTC Incident Management Procedure SP-03-08
- ARTC Incident Management Manual TA44
- ARTC Rail Safety Risk Management Procedure SP-03-00
- General Instructions, Train Marshalling, Rail Infrastructure Corporation version 4.0 (2004)
- General Instructions, Loading Restrictions, Rail Infrastructure Corporation version 3.3 (2004)
- ARTC Train Operating Conditions (TOC) Manual – Division Pages (Version 13, TS TOC.2: 2018 issue 2)
- ARTC Monitoring and Responding to Extreme Weather Events Procedure (OPE-PR-014)
- ARTC Train Operating on Catastrophic Fire Days Work Instruction (OPE-WI-009).

#### *20.5.1.3 Expected effectiveness*

ARTC and its contractors have experience managing potential air quality, noise and health and safety impacts associated with the construction and operational phases of rail development projects. Compliance with ARTC's risk management framework, Safety Management System and implementing of the mitigation measures outlined in Table 20.2 through the CEMP are expected to be effective in managing the potential risks to health and safety.

Monitoring of safety measures would occur daily as part of routine site management procedures, for movement of hazardous goods, safe workplace practices, and regular testing and monitoring of any fire and life safety systems. Audits and reporting on the effectiveness of environmental management measures is generally carried out to demonstrate compliance with management plans and other relevant approvals and would be outlined in detail in the CEMP prepared for the project.

Regular monitoring and inspections would be undertaken during construction to confirm the effectiveness of mitigation measures. Monitoring and inspections would include, but not be limited to Project Contractor's supervisory inspections on a daily basis, environmental representative weekly inspections and any monitoring relating to management of noise and air quality emissions.

### 20.5.2 List of mitigation measures

The mitigation measures that would be implemented to address potential risk, health and safety impacts are listed in Table 20.2. These measures would be in addition to the mitigation measures outlined to manage the following:

- impacts to traffic and transport, refer to section 8.5
- noise and vibration impacts, refer to section 9.6
- air quality impacts, refer to section 10.5
- impacts from contamination, refer to section 12.5
- social impacts, refer to section 18.5.

**Table 20.2 Mitigation measures**

| Stage | Impact | Measure |
|---|---|---|
| Design | Public health and safety | A hazard analysis will be undertaken during the detailed design stage to identify further risks to public safety from the project, and how these will be mitigated through safety in design and construction methodology. |
| | Public safety from collapse of structures, embankments or walls | All structures such as the retaining wall in Jacquie Osmond Reserve and the noise wall on Broomfield Street will be designed to meet appropriate standards, with sufficient tolerances to loads and wind gusts to prevent collapse. |

| Stage | Impact | Measure |
|---|---|---|
| | Safety of road, pedestrian and cycle connections under the widened Sussex Street bridge | Lighting design under the Sussex Street bridge will consider the Crime Prevention Through Environmental Design principles. |
| Construction | Public safety from, fires, explosions, flooding and inundation | The CEMP will include emergency response procedures in consultation with relevant stakeholders. It would include measures to minimise the potential for health and safety impacts on the local community and environment such as fire management procedures. |
| | Public safety from collapse of structures, embankments or walls | Construction methodology will be selected to ensure collapse of partially built structures so not occur during construction.<br>The CEMP will include emergency response procedures in consultation with relevant stakeholders. It would include measures to minimise the potential for health and safety impacts on the local community and environment should an incident occur. |
| | Rupture or damage to services and utilities | The location of utilities, services, and other infrastructure will be identified prior to construction to determine requirements for access to, diversion, protection and/or support. This will include as required, undertaking utilities investigations, including intrusive investigations, and consultation with service providers. |
| | Anxiety, confusion and safety concerns from changes to roads, footpaths and cycle routes | A construction traffic management plan will be prepared as part of the CEMP as per mitigation measure C1.1. This will detail the actions and infrastructure needed to ensure a continuous, safe and efficient movement of traffic for both the general public and construction workers. This will include defined routes, diversions, signage, safe crossing points for pedestrians and cyclists and where needed, traffic management staff. |
| | Public health and safety from falling items contact with construction sites. | An appropriate layout of compounds sites, construction methodology and hoardings to will be established to prevent any construction items exiting the site in an uncontrolled manner. This will meet all relevant requirements of NSW workplace safety laws. |
| | Reduced health benefits from changes to areas of public recreation and active transport routes | Public consultation will be carried out prior and during construction to inform the public about the routes to access and the availability of public reserves and softball area.<br>Signage will be provided to identify access points to reach areas of public recreation and active transport routes.<br>Consultation with key stakeholders such as Southern Districts Softball Association will be carried out to ensure the active lifestyle of members could be maintained at this location. |
| | Unauthorised access to the project site resulting in injury or fatalities | NSW workplace safety laws which require construction sites to have adequate site security, such as appropriate fencing will be followed. Appropriate actions or security devices will be used to prevent construction plant and equipment being activated by unauthorised people. |
| | Reduced public use of Jacquie Osmond Reserve and Warwick Farm Recreation Reserve | All public areas will be returned to their pre-construction condition and the same public access routes to these areas. The existing 12 softball diamonds within Jacquie Osmond Reserve will be reinstated to pre-construction condition in consultation with the Southern Districts Softball Association. |

| Stage | Impact | Measure |
|---|---|---|
| Operation | Unauthorised access to the rail corridor | Security of the rail corridor will be undertaken in accordance with ARTC's standard operating procedures and risk management framework which will include continued maintenance of security features such as fencing. |
| | Public health and safety from emissions/leaks of dangerous goods and hazardous materials | Operation of the project will be undertaken in accordance with ARTC's standard operating procedures and EPL 3142. |

### 20.5.3 Consideration of the interaction between measures

Mitigation measures to control impacts to health and safety of the community may replicate mitigation measures proposed for the control of impacts associated with noise, air quality, water quality, contamination, traffic and access, social impacts and waste management.

All mitigation measures for the project would be consolidated and described in the CEMP. The plan would identify measures that are common between different aspects. Common impacts and common mitigation measures would be consolidated to ensure consistency and ease of implementation.

### 20.5.4 Managing residual impacts

A residual risk analysis was undertaken following the impact assessment summarised in this chapter. The results of the residual risk analysis are provided in Appendix D and summarised below.

The mitigation and management measures outlined in section 20.5.2 have been designed to minimise the potential impacts to people and the environment.

Regardless, construction and operation of the project still involves some level of residual impact. An unplanned incident could still occur without prior notice which can degrade safety, result in emissions, or harm to the environment. There is the possibility that unplanned incidents can result in severe injury and/or death and may require the partial or full closure of the affected roadway, rail corridor or public reserve for an extended period. This risk is inherent with the operation of a complex infrastructure construction project.

With the implementation of design features and the safeguards identified in this chapter, the residual impact associated with hazards and risks associated with the project are considered low.

# 21 Climate change and greenhouse gases

*This chapter provides the climate change risk assessment for the project and considers the projects contribution to greenhouse gas emissions. It predicts the volume of greenhouse gases emissions, the potential risks that climate change could have on the project, and provides recommended adaptation controls and mitigation measures. It has been informed by the climate change assessment undertaken by GHD. A full copy of the climate change assessment report is provided as Technical Report 12 – Climate change risk assessment. The report was written to address the relevant SEARs which are outlined in Appendix A.*

## 21.1 Assessment approach

### 21.1.1 Methodology

#### *21.1.1.1 About climate change*

Climate change has the potential to alter the frequency, intensity and distribution of extreme weather related natural hazards, including more intense and frequent heat waves, droughts, floods and storm surges. The risk of climate change impacts on rail infrastructure need to be considered as part of the design process, as structures need to be designed to last for many years, and therefore need to be resilient to climate change.

Climate change adaptation planning and risk management is an evolving field. Responses to reduce the risks of climate change broadly fall into two categories: mitigation and adaptation. Using the definitions of IPCC (2007), mitigation aims to reduce human effects on the climate system by strategies to reduce greenhouse gas sources and emissions, and to enhance greenhouse gas sinks. Adaptation refers to adjustments in response to actual or anticipated climate changes or their effects, to moderate harm or to exploit beneficial opportunities. Infrastructure design and planning needs to incorporate adaptation measures, based on the assessed risk of climate change to a proposal.

Although climate projections represent the presently accepted forefront of climate change science, there is still a high level of uncertainty that exists regarding the climate changes that may actually eventuate. The inevitability of uncertainty is stated within Australian Standard 5334:2013 Climate change adaptation for settlements and infrastructure – a risk based approach, and it is recognised that decisions and adaptation planning processes should be flexible enough to cope with potential knowledge gaps.

#### *21.1.1.2 Climate change risk assessment*

The purpose of the climate change risk assessment for the project is to:

- identify the potential climatic events and hazards that could impact the project, based on its scale, location, structural components and design life
- assess climate change risk under two timeframes and emission scenarios to provide an indication of potential risks
- link infrastructure vulnerability associated with climate change to the design of the project, and potential adaptation options to improve structure resilience.

The overall approach to the assessment involved modelling two potential climate change scenarios for the study area using the Commonwealth Scientific and Industrial Research Organisation's (CSIRO) 'Australian Climate Futures' climate change modelling tool, and assessing the potential risks for the project based on these scenarios.

The assessment involved:

- reviewing climate data
- developing projections of the future climate in the study area and as per AS 5334, determining the climate projection scenarios for the assessment and the Representative Concentration Pathway (RCP)

- near term, moderate scenario using 2030 and RCP 4.5
- long term, extreme scenario using 2090 and RCP 8.5

- undertaking a detailed climate change risk assessment and determining risk ratings
- identifying potential adaptation measures and/or design strategies based on the identified risks and potential impacts.

A detailed description of the assessment methodology is provided in Chapter 3 of Technical Report 12. A summary of the results is provided in the following sections.

#### *21.1.1.3 About greenhouse gases*

A greenhouse gas is a gas that absorbs and emits radiant energy which then warms the atmosphere. A greenhouse gas assessment quantifies the total greenhouse gases produced directly and indirectly from an activity. The purpose of this assessment is to assess the volume and potential impact of emissions on the environment from the construction and operation of the project.

Global Warming Potential is a metric used to quantify and communicate the relative contributions of different gases to climate change over a given period of time. Global Warming Potential accounts for the radiative efficiencies of various gases and their lifetimes in the atmosphere, allowing for the impacts of individual gases on global climate change to be compared relative to those for the reference gas carbon dioxide.

This assessment used the Global Warming Potential levels provided Department of the Environment and Energy (2018) National Greenhouse Accounts. The greenhouse gases considered in this assessment and the corresponding Global Warming Potential for each gas are listed in Table 21.1. These are reflective of radiative forcing over a 100 year time horizon.

**Table 21.1 Greenhouse gases and 100 year global warming potentials**

| Greenhouse gas | Global Warming potential | Discussion |
|---|---|---|
| Carbon dioxide ($CO_2$) | 1 | NA |
| Methane ($CH_4$) | 25 | Methane has 25 times more warming potential than $CO_2$ |
| Nitrous oxide ($N_2O$) | 298 | Nitrous oxide has 298 times more warming potential than $CO_2$ |

Source: Department of the Environment and Energy (2018) National Greenhouse Accounts (Appendix 1).

#### *21.1.1.4 Greenhouse gas emissions methodology*

The greenhouse gas assessment involved:

- identifying relevant aspects of energy use and emissions from construction and operation and considered possible emissions sources of greenhouse gases, including ($CO_2$), nitrous oxide ($N_2O$), and methane ($CH_4$.
- determining the tonnes of carbon dioxide equivalent emissions (t $CO_2$-e) for each activity and the total greenhouse gas emissions attributable to the project
- providing a qualitative assessment of the impacts of greenhouse gas emissions, including reduction of greenhouse gas from diversion of road freight to rail
- recommending greenhouse gas mitigation and reduction opportunities.

This assessment considered only greenhouse gas emissions sources within the boundary of the project, and excludes upstream and downstream emissions. The following emission sources were considered in the assessment scope:

- fuel and electricity consumption during construction activities
- fuel used in the delivery of materials, plant and equipment
- construction personnel commuting
- fuel and electricity consumption during operations.

This assessment has not included emissions likely to be negligible such as small quantities of chemicals, hydrocarbon leaks or vegetation clearance. It also does not include Scope 3 emissions (ie embodied energy of construction materials, management of waste materials), or diesel consumption by freight trains and associated GHG emissions which are the responsibility of the freight company.

Activity data used for the GHG assessment was provided by ARTC or estimated by GHD. All Emission Factors used were as per the NGER (Measurement) Determination. The assessment was based on emission factors available at the time of the assessment and future changes in emission factors were not considered.

### 21.1.2 Risks identified

The preliminary environmental risk assessment undertaken for the project included potential risks associated with Aboriginal heritage. Potential risks were considered according to the impacts that may be generated by the construction and/or operation of the project, pre-mitigation. The purpose of the preliminary environmental risk assessment was to inform the impact assessment. Further information on the preliminary risk assessment, including the approach and methodology is provided in Appendix D.

The assessed risk level for the majority of potential climate change and greenhouse gas risks was medium. Risks with an assessed level of medium or above include:

- increased electricity and fuel use during construction
- increased demand on local and regional resources during construction
- greenhouse gas emissions from combustion of fuels during plant/vehicle operation
- increased energy consumption associated with the use of site compounds.

These potential risks and impacts were considered as part of the assessment. The assessment also considered matters identified by the SEARs and stakeholders, as described in Chapter 3 (Approval and assessment requirements) and Chapter 4 (Consultation).

### 21.1.3 How potential impacts have been avoided/minimised

As described in Chapter 6 (Project features and operation) and Chapter 7 (Construction), design development and construction planning has included a focus on avoiding and/or minimising the potential for environmental impacts during all key phases of the process.

Potential climate change and greenhouse gas impacts have been avoided/minimised where possible by the following:

- climate change risks identified were integrated and validated into the overarching Safety in Design hazard log
- wind loading, drainage and other weather phenomenon has been considered in the reference design
- drainage has been considered at reference design to minimise impacts to flood risk.
- the immunity of the rail line to flood risk has been built into the design and is greater than a 1 in 200 year event

- design life of the varying infrastructure components has been considered at reference design. The rail bridge structure and retaining wall structure are anticipated to have a 100 year design life. The road and noise wall design is anticipated to have a 25 years design life.

## 21.2 Existing environment

### 21.2.1 Climate baseline relating to the project site

A review of existing climate data and past extremes has identified the following features of the project site and surrounding area:

- the project site has been known to flood, in particular the Cycleway and Broomfield Street, both as a result of limited stormwater drainage causing over land flows and from Cabramatta Creek flooding
- some vegetation along Cabramatta Creek has been mapped in a number of vegetation classes on the bushfire prone land map
- the project site is impacted by extreme heat events. Fairfield City Council and Liverpool City Council are both part of the Western Sydney Regional Organisation of Councils (WSROC) which identifies urban heat as a major concern for western Sydney.

### 21.2.2 Climate projections

The key messages relating to the location of the project site as presented on CSIRO's Climate Change in Australia projection summary tool (CSIRO and BOM, 2015) are as follows:

- average temperatures will continue to increase in all seasons with very high confidence
- more hot days and warm spells are projected with very high confidence. Fewer frosts are projected with high confidence
- decreases in winter rainfall are projected with medium confidence. Other changes are possible but unclear
- increased intensity of extreme rainfall events is projected, with high confidence
- mean sea level will continue to rise and height of extreme sea-level events will also increase with very high confidence
- a harsher fire-weather climate in the future with high confidence
- on annual and decadal basis, natural variability in the climate system can act to either mask or enhance any long-term human induced trend, particularly in the next 20 years and for rainfall.

Detailed trends of climate data are provided in section 4.3 of Technical Report 12.

### 21.2.3 Greenhouse gases

Australia's national greenhouse gas emissions, by sector, for the year to December 2017 are presented in Table 21.2. Total annual emissions are 533.7 Mt $CO_2$-e.

The most recently published state-based emissions inventory is for 2016. NSW greenhouse gas emissions, by sector, for the 2016 year are also presented in Table 21.2. Total annual emissions are 131.6 Mt $CO_2$-e.

Table 21.2 Australian and NSW greenhouse gas emissions

| Emissions Source | 2017 Australian Emissions (Mt $CO_2$-e) [1] | 2016 NSW Emissions (Mt $CO_2$-e) [2] |
|---|---|---|
| Energy – Electricity | 184.5 | 51.8 |
| Energy – Stationary Energy excluding electricity | 96.9 | 15.3 |
| Energy – Transport | 100.0 | 27.4 |
| Energy – Fugitive Emissions | 55.4 | 15.6 |
| Industrial processes and product use | 35.8 | 13.2 |
| Agriculture | 71.2 | 17.5 |
| Waste | 12.6 | 3.2 |
| Land Use, Land Use Change and Forestry | -22.7 | -12.5 |
| Overall Total | 533.7 | 131.6 |

Source:

Department of the Environment and Energy (2018) *Quarterly Update of Australia's National Greenhouse Gas Inventory: December 2017*

Department of the Environment and Energy (2018) *State and Territory Greenhouse Gas Inventories: 2016*

## 21.3 Assessment of construction impacts

### 21.3.1 Greenhouse gases

Assumptions used in estimating greenhouse gas emissions for the construction and operation of the project are listed in Table 21.3.

Activity data used for the greenhouse gas emissions assessment was provided by ARTC or estimated by GHD. All Emission Factors used were as per the Commonwealth Department of Environment and Energy National Greenhouse and Energy Reporting (NGER) (Measurement) Determination 2008 (1 July 2018 version). The assessment was based on emission factors available at the time of the assessment and future changes in emission factors were not considered.

Table 21.3 Greenhouse gas assessment assumptions by source – construction

| Parameter | Assumption |
|---|---|
| Diesel combustion – stationary energy purposes | Diesel use has been estimated by ARTC at 6,500 L/week for the duration of the construction period for mobile and stationary plant and equipment. This equates to 676 kL over the 2 year construction period. This covers construction of the new rail track, track realignment, bridge works, road works and ancillary infrastructure. |
| Diesel combustion – transport purposes | Diesel use for employee commuting was estimated at 197 kL over the construction period, based on maximum number of employees during possession and non-possession periods.<br>Diesel use for transporting plant and equipment to site was estimated as 273 kL over the construction period, based on average heavy truck movements. |
| Electricity use | Electricity used at the three site compounds (site offices, meal rooms, first aid rooms, toilet/showers) has been estimated at 334 MWh, based on typical loads for demountable buildings. |

Construction emissions are estimated in Table 21.4 as approximately 3,400 $tCO_2$-e.

Table 21.4 Construction emissions

| Activity | Emissions (t CO2-e) |
|---|---|
| Diesel combustion – transport purposes | 1,281 |
| Diesel combustion – stationary energy purposes | 1,832 |
| Electricity use | 274 |
| Total | 3,386 |

The quantity of emissions estimated to occur during construction are estimated at approximately 3,400 $tCO_2$-e during the entire construction period. Construction emissions would be of limited duration over two years. Australia's national greenhouse gas emissions, are presented in Table 21.3 above.

Estimated emissions savings from shifting freight transport from road to rail is estimated at approximately 9,900 $tCO_2$-e/annum for the SSFL. Any emissions from construction of the project are more than offset by the potential savings in emissions from shifting some freight transportation from road to rail.

### 21.3.2 Cumulative impacts

Other projects that have the potential to occur at the same time as the project are described in Appendix E.

As the impacts from the construction of the project relating to emissions are predicted to be transitory and confined to an area 30 metres from the boundary of the project, the cumulative impacts would be minimal unless an additional source of diesel emission emissions and electricity use (to this project) was generated. There are no other known construction projects proposed in the immediate vicinity of the project.

## 21.4 Assessment of operational impacts

### 21.4.1 Climate change

This initial climate change risk assessment identified eleven climate hazards and associated risks which are applicable to the project. Current control measures were identified which describe the controls and adaptation measures incorporated within the scope of reference design, which addresses the requirement of the SEARs to incorporate climate change risk mitigation in design. Additionally, potential controls were identified which represent adaptation actions which could be implemented at detailed design, or operation, assisting in minimising residual impact.

No high or very high risks were identified, in part reflecting the effective adaptation measures already identified and implemented as part of reference design. A summary of the low and medium climate change risks identified, including the existing controls and initial assessment of consequence and likelihood, is provided in Table 21.5. Principle risks identified related to flooding and storms. These risks are discussed further below.

#### *21.4.1.1 Flooding*

Flood risk to the project could arise from flooding of Cabramatta Creek or inundation from runoff from surrounding streets if storm drainage reaches capacity. Climate change flood risks have been assessed in Technical Report 5 – Hydrology and flooding impact assessment, by increasing the modelled runoff from rainfall in the 100 year event by 10 per cent to account for increased rainfall expected in the future. This is greater than the four per cent increase to the 1 in 20 year rainfall event which is projected for 2030.

The immunity of the rail line has been built into the design and is greater than a 1 in 200 year event. Modelling of the 1 in 500 year event indicates the potential for overtopping of the rail track further south of the rail bridge around Jacquie Osmond Reserve and just north of the car yard.

The flood modelling determined that in existing circumstances there is significant flooding for Broomfield Street for the 1 in 100 year flood event with 10 per cent addition for climate change (Technical Report 5 – Hydrology and flooding impact assessment). This includes inundation to houses and unsafe velocity flows on some parts of the street. Due to existing stormwater capacity constraints the immunity for Broomfield Street is less than the 10 per cent AEP (more frequent than 1 in 10 years), and the flood immunity for the cycleway is assessed as the same (in light of the detailed modelling not covering events more frequent than this). These are indirect risks to ARTC which will not be the asset owner or operator of Broomfield Street or the Cycleway at the end of the project. The risk already exists and is experienced in the area due to the level of the asset in the landscape and the capacity of existing infrastructure. The project does not alter the risk – ARTC proposes to match the existing infrastructure capacity and not worsen the existing situation, noting that engineering controls to reduce the risk of significant flooding of Broomfield Street and the cycleway are not reasonably feasible.

#### *21.4.1.2 Storms*

Extreme wind and storms were rated as medium risks due to the safety consequences of these events. For example the risk of noise wall collapse would be rare, but walls have been known to fall and cause a fatality in exceptional circumstances. Generally, appropriate maintenance regimes would mitigate storm activity more broadly, ensuring that the potential for debris and blocked drains is kept to a minimum. ARTC currently has a policy Monitoring and Responding to Extreme Weather Events, which provides direction around inspection frequencies for various extreme weather alerts including wind and rainfall events. Adoption of this policy in the management of the project would provide mitigation to storm event impacts in line with ARTC current practices.

The most difficult climate change risks to anticipate and manage occur where multiple events coincide. For example, although flooding has been shown to be a low risk for the project, if maintenance schedules allow debris to block drainage systems then the controls cannot be relied upon, and the risk of flooding would become heightened. This has been reflected in the storm risk identified in Table 21.5, where debris and high intensity rainfall are likely to coincide.

Table 21.5 Climate risk assessment summary

| Hazards | Risk | Existing control measures | ARTC initial risk rating | | | Potential control measures including existing ARTC operational procedures | ARTC residual risk rating | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Consequence | Likelihood | Risk rating | | Consequence | Likelihood | Risk rating | |
| Extreme wind | Noise wall collapse due to extreme wind event causing fatality, environmental damage or cost | 1. Noise wall designed to Australian wind code AS1170.2 resulting in design wind gust velocity of 143 km/h (greater than maximum projected wind gust of 137.4 km/h | Extreme | Rare | MED | None identified | Extreme | Rare | MED | Applicable to 2030 scenario |
| 4% increase to 1 in 20 year rainfall | Cabramatta Creek floods rail track causing operational delay | 1. Ballasted track provides drainage for rainfall<br>2. Detailed modelling shows immunity to more than 1 in 200 year event | Minor | Rare | LOW | None identified | Minor | Rare | LOW | Applicable to 2030 scenario |
| 4% increase to 1 in 20 year rainfall | Rail track floods due to poor drainage causing operational delay | 1. Ballasted track provides drainage for rainfall<br>2. Current stormwater flows to be matched (at a minimum) | Minor | Unlikely | LOW | None identified | Minor | Unlikely | LOW | Applicable to 2030 scenario |
| 4% increase in 1 in 20 year rainfall | Broomfield Street becomes flooded due to poor drainage causing reputational damage, damage to houses, road closure or serious injury (indirect risk to ARTC) | 1. Design will match current stormwater flow rates<br>2. Flood modelling has been performed to assess flood risk for a range of scenarios including climate change | Major | Unlikely | MED | 1. ARTC to consult with asset owner, Fairfield City Council, regarding the drainage design | Major | Unlikely | MED | Applicable to 2030 scenario |

| Hazards | Risk | Existing control measures | ARTC initial risk rating | | | Potential control measures including existing ARTC operational procedures | ARTC residual risk rating | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Consequence | Likelihood | Risk rating | | Consequence | Likelihood | Risk rating | |
| 4% increase in 1 in 20 year rainfall | Cabramatta Creek floods cycleway causing serious injury to cyclists (indirect risk to ARTC) | No project controls at this stage. | Moderate | Possible | MED | 1. ARTC to consult with asset owner, Fairfield City Council, regarding the drainage design | Moderate | Possible | MED | Applicable to 2030 scenario |
| Higher extreme heat and solar radiation | Rail track buckling causing delays and increased management effort and cost | 1. Concrete sleepers in design to reduce movement<br>2. Creep heat monitoring is standard rail design practice | Minor | Unlikely | LOW | 1. Heat affects are currently managed via an operational procedure, the Area Stability Maintenance Plan, guided by ANG-210 – this includes a measure that speed restrictions are put in place in extreme heat based upon the neutral temperature of the rail. | Minor | Unlikely | LOW | Applicable to 2030 scenario |
| Higher extreme heat and solar radiation | Signalling equipment loses efficiency causing increased energy consumption, reduced design life and cost of replacement | 1. Critical signalling equipment (Point machines and interlocking) rated to operate up to 70°C | Not significant | Unlikely | LOW | 1. Re-specification of equipment at end of design life to account for climate change | Not significant | Unlikely | LOW | Applicable to 2030 scenario |

| Hazards | Risk | Existing control measures | ARTC initial risk rating | | | Potential control measures including existing ARTC operational procedures | ARTC residual risk rating | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Consequence | Likelihood | Risk rating | | Consequence | Likelihood | Risk rating | |
| Intense storms | More intense storms disrupt operations of paths, rail track or road from fallen debris blocking access or drainage | 1. Flooding analysis has been performed to consider the flood profile of the project and the surrounding environment.<br>2. Noise wall provides some protection to track infrastructure | Minor | Likely | MED | 1. Implementation of an appropriate maintenance regime to limit blocked drainage in line with ARTC's existing Major Periodic Maintenance regime | Minor | Possible | LOW | Applicable to 2030 and 2090 scenarios |
| Lightning strikes | Lightning strike causes damage to electrical and signalling assets, causing operational delay and cost | 1. Bonding of equipment to rails and cross-bonding of all current and proposed tracks reduces effects of lightning strikes | Minor | Unlikely | LOW | None identified | Minor | Unlikely | LOW | Applicable to 2030 and 2090 scenarios |
| Increased bushfire weather | More frequent bushfires impact operations of SSFL | 1. Additional loop provided by project allows adaptive SSFL management | Minor | Possible | LOW | 1. Implementation of an appropriate bushfire management plan in line with ARTC's current policies | Minor | Possible | LOW | Applicable to 2030 and 2090 scenarios |

### 21.4.2 Greenhouse gases

Assumptions used in estimating greenhouse gas emissions for the operation of the project are listed Table 21.6.

Activity data used for the greenhouse gas emissions assessment was provided by ARTC or estimated by GHD. All emission factors used were as per the National Greenhouse and Energy Reporting (Measurement) Determination 2008, which was made under subsection 10(3) of the *National Greenhouse and Energy Reporting Act 2007*.

The assessment was based on emission factors available at the time of the assessment and future changes in emission factors were not considered.

**Table 21.6 Greenhouse gas assessment assumptions by source – operation**

| Parameter | Assumption |
|---|---|
| Electricity use | Signalling controls use a small quantity of electricity during operations, estimated at approximately 14 kVA. This is equivalent to 110 MWh per annum.<br>Operations of the SSFL are controlled from ARTC's Network Control Centre South in Junee. There is no additional electricity use at this control centre from the project. |
| Freight shift | The expected additional diversion of freight from road to rail due to the project would result in fuel savings. A conservative emission factor for road freight of 59 $gCO_2$-e/tonne.km was used, compared with 30 $gCO_2$-e/tonne.km for rail freight. The estimated additional freight transported due to the project was estimated as 340,589,000 tonne.km per annum (36 wagons per train, 75 tonne capacity, 50% loading, 36 km (SSFL distance from Macarthur to Sefton) and increase in freight from 24 to 36 trains/day each way, at 80% capacity on average). It was assumed that 100% of this additional freight would have otherwise been transported by road over the same distance. This was calculated for the whole of the SSFL as this project removes the bottleneck from the SSFL. |

The only emissions from the project during operations are from minor electricity use in signalling operations. These emissions are estimated at 100 $tCO_2$-e per annum.

Australia's national greenhouse gas emissions, are presented in Table 21.3. Total annual emissions are 533.7 Mt $CO_2$-e. Total annual NSW emissions are 131.6 Mt $CO_2$-e. Annual emissions from the project during operations would account for approximately 0.00002 per cent of Australia's annual emissions and 0.0001 per cent of NSW's annual emissions, which is insignificant. Emissions during operation are negligible and therefore no mitigation measures are recommended.

Estimated emissions savings from shifting freight transport from road to rail is estimated at approximately 9,900 $tCO_2$-e/annum for the SSFL. Any emissions from operation of the project are more than offset by the potential savings in emissions from shifting some freight transportation from road to rail.

### 21.4.3 Cumulative impacts

Greenhouse gas emissions during operation of the project are predicted to be insignificant and are more than offset by the potential savings in emissions from shifting some freight transportation from road to rail. Therefore no cumulative impacts with other project is predicted.

The climate change predictions are based on projection data. This already includes global climate projections that relate to how the world may respond to the challenge of a changing climate, the need to continue to produce and use energy and resources, and the global greenhouse gas emissions that may occur. This has therefore, already accounted for cumulative impacts.

## 21.5 Recommended mitigation measures

### 21.5.1 Approach

#### *21.5.1.1 Approach to mitigation and management*

Climate change itself as a risk source is not under the control of the project. Nevertheless, controls or adaptations may be implemented to reduce the likelihood or the consequences of extreme climate events which may transpire as a result of climate change.

Potential adaptation measures have been identified in Table 21.5 to mitigate the risk identified. Typically there is a lag between climate change science and incorporation of the newly observed climate data into Australian Standards, therefore designing to standards cannot be wholly relied upon to ensure climate change risk is mitigated, without further consideration. Therefore ARTC will review the climate change risks identified in this assessment in the event of design changes during detailed design and improvements in adaptation knowledge.

#### *21.5.1.2 Expected effectiveness*

Some adaptations would need to be implemented during design, while others such as management protocols would ideally be implemented by the time the project is operational. The additional adaptation mitigation measures would ensure the risks are manageable within the project design and through the ARTC operational management system.

### 21.5.2 List of mitigation measures

The mitigation measures that would be implemented to address potential climate change impacts are listed in Table 21.7.

**Table 21.7 Mitigation measures**

| Stage | Impact | Measure |
|---|---|---|
| Design | Design development changing climate change risk | ARTC will:<br>• apply the climate change risk assessment and its existing control measures as incorporated into the reference design, in implementing the project, or<br>• in the event of design changes, during detailed design, review the climate change risks identified in this assessment in order to amend existing control measures or identify additional control measures to reduce the climate change related risks to the project with no 'very high' or 'high' residual climate related risks remaining. |
| | Risks from climate change | ARTC will implement all potential adaptation measures identified in Table 21.5 so far as is reasonably practicable to reduce climate change risk. |
| | Improvements in climate change projections | In the event of significant new scientific climate change projections becoming available during detailed design, ARTC will review the relevant climate change risks and control measures identified in this assessment in order to confirm that there are no 'very high' or 'high' residual climate related risks remaining. |
| | Reduction in greenhouse emissions | Opportunities to reduce greenhouse gas emissions will be investigated during detailed design. This will include:<br>• opportunities for low emission construction materials<br>• locally sourced materials to reduce travel related emissions<br>• use of recycled material options (eg Asphalt). |

| Stage | Impact | Measure |
|---|---|---|
| Construction | Emission of greenhouse gases | The CEMP will include the following requirements:<br>• all plant and equipment used during the construction works will be regularly maintained to ensure fuel efficiency<br>• sustainable procurement practices will be adopted where feasible<br>• plant and equipment will be switched off when not in constant use and not left idling<br>• air conditioning and lights in site compound buildings will be turned off when not in use<br>• energy efficient vehicles or equipment will be selected where available. |

### 21.5.3 Consideration of the interaction between measures

Mitigation measures to reduce climate change risk and greenhouse gas emissions may replicate mitigation measures proposed for the control of impacts associated with air quality, flooding and drainage.

All mitigation measures for the project would be consolidated and described in the CEMP. The plan would identify measures that are common between different aspects. Common impacts and common mitigation measures would be consolidated to ensure consistency and implementation.

### 21.5.4 Managing residual impacts

A residual risk analysis was undertaken following the impact assessment summarised in this chapter. The results of the residual risk analysis are provided in Appendix D and summarised below.

The mitigation and management measures outlined in section 21.5 have been designed to minimise greenhouse gas emissions and minimise climate change risks. The project will however result in some greenhouse gas emissions which will contribute to climate change.

Infrastructure is designed to function and perform within the environment that it exists, and to respond to the variable weather conditions for which it has been designed. State, national and international design standards and codes of practice exist to provide the parameters necessary to ensure the desired reliability and level of resilience of various infrastructure components to extreme conditions.

The project is however subject to climate change uncertainty, from the risks posed to a physical infrastructure by climate hazards under the influence of climate change. For any infrastructure to be resilient to the impacts of climate change, consideration must be made to the climate hazards which are applicable to the infrastructure type and broader context, including periodic review to incorporate the latest climate science. The results of a climate change risk assessment at any stage of a design promotes resilience and consideration of adaptation, either through designed adaptations or in allowance for future adaptive capacity. However, the inherent uncertainty of climate change predictions means residual impacts could be realised in either the short term or decades from today. These risks would be managed through implementation of appropriate maintenance regimes and continued management protocols to protect climate change risks.

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