

Project Assessment Report

River Torrens to Darlington Project

T2D TORRENS TO
DARLINGTON



Artist's
impression



Australian Government



Government
of South Australia

Department for Infrastructure
and Transport



Acknowledging the past and present

We respectfully acknowledge the Kurna Peoples as the Traditional Custodians of the T2D Project area and recognise their continuing connection to land and waters.

We pay our respects to the diversity of cultures, significance of contributions and to Elders past, present and emerging.

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Introduction

Welcome to the River Torrens to Darlington (T2D) Project Assessment Report (PAR).

The Department for Infrastructure and Transport (the Department) is committed to delivering sustainable infrastructure, transport and programs that carefully balance economic, environmental and social needs and outcomes. For this reason, the Department has developed this PAR for the T2D Project to understand and minimise potential impacts from construction and operational activities while maximising environmental and social outcomes to deliver lasting benefits to the community. The PAR also provides an opportunity to support community and stakeholder understanding of the project and consider your feedback for incorporation as the project progresses.

The T2D Project is the final 10.5km section required to complete the 78km North-South Corridor (NSC) and is one of the largest and most complex infrastructure projects ever undertaken in South Australia.

The PAR details the impact assessments undertaken on the revised Project Design as of December 2022; this iteration of the design included the key design developments from 2010 to 2022. Since this time, further design refinement has and will continue to occur.

In this PAR you will find:

- information outlining why the project is needed
- a description of key project elements
- an outline of the project's expected impacts and benefits
- measures that will be implemented to protect the environment and minimise disruption
- details of how and when it will be constructed.

Engagement regarding the T2D Project has been ongoing for many years and community and stakeholder feedback has led to many significant changes and enhancements to make the project what it is today.

The Department is committed to openly engage with you about the environmental and social outcomes of the project including the potential impacts, opportunities and mitigation measures.

To provide feedback on this PAR, please visit our T2D Community Information Centre, complete the online survey at [T2D.sa.gov.au](https://www.T2D.sa.gov.au) or book a one-on-one meeting with the T2D Project Team.

Please contact us via telephone on 1300 951 145 or online at www.T2D.sa.gov.au or by emailing T2D@sa.gov.au.

There is also a digital version of the PAR which can be accessed via the T2D Project website which features further detail and interactive maps. Feedback can be given electronically for those wishing to provide online feedback.

Project description

This chapter outlines the T2D Project, providing an overview of the project design, project phases, key activities and program.

This chapter also summarises the design history of the project and details changes to its design between 2021 and 2022.

Overview of the North-South Corridor

The NSC is one of South Australia's (SA) most important transport corridors. For more than two decades, the South Australian and Australian Governments have invested significantly in upgrading the NSC. To date, approximately \$4.8 billion has been invested to upgrade 67.5km of the NSC to motorway standards which enables connections locally, regionally and nationally. It provides essential transport links to local residents and businesses, as well as to key employment centres and international gateways, including Adelaide Airport and Port Adelaide.

The T2D Project is a joint investment by the South Australian and Australian Governments and will improve the state's competitiveness in a national and global market by delivering improved freight connections between Port Adelaide and SA's primary industries and businesses. The project enables residents, businesses and industries to pursue more opportunities and to enjoy more reliable, safer journeys across Adelaide.

Overview of the T2D Project

The NSC is a major route for north and south-bound traffic consisting of eight sections, seven of which have already been constructed and are operational. The T2D Project will be the final section of the NSC to be completed.

Using a combination of tunnels, lowered and surface-level motorway, as well as underpasses at key intersections, the project will complete the NSC, creating 78km of non-stop motorway between Gawler and Old Noarlunga.

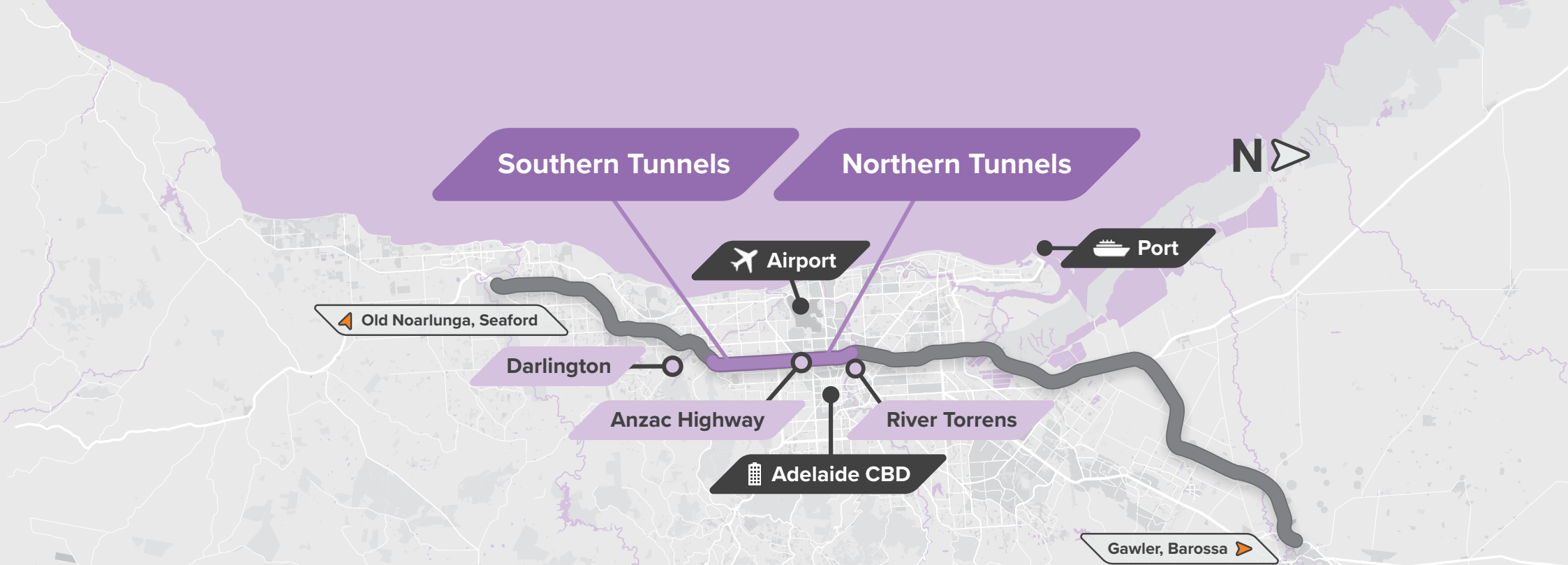
The project will complete the final 10.5km section from West Hindmarsh to Darlington, connecting the Torrens Road to River Torrens Project (T2T) in the north and the Darlington Upgrade Project in the south.

The project design has been developed to allow for uninterrupted, long-distance journeys along the NSC. The project will bypass 21 sets of traffic lights, reducing travel time by up to 30 to 40 minutes between the River Torrens / Karrawirra Parri and Darlington in weekday peak times.

The T2D Project has been designed primarily for longer journeys, with access points to and from a number of key destinations balanced against the overall efficiency and safety of the non-stop motorway.

It's estimated the project will result in around 200 fewer crashes per year between the River Torrens / Kirrawarra Parri and Darlington. Reducing the amount of stop-start traffic on this section of South Road, and the number of vehicles travelling these intersections will significantly improve safety.

T2D Southern Tunnels, southern portal



More than a motorway

The project will provide urban renewal opportunities for local businesses and residents through new and upgraded walking and cycling paths, green spaces and recreational areas.

During construction the project will be supporting approximately 5,500 jobs during the major construction works.

About 60% of the motorway will be twin three-lane tunnels with the remainder consisting of a combination of lowered and surface-level motorway.

The key benefits of the 2022 Project Design compared to the 2021 Project Design, include:

- improved connectivity providing more options for motorists travelling to key destinations via the motorway, as well as providing improved resilience of the road network
- increased open green space and community areas along the motorway
- improved safety for motorists entering the motorway from the south
- reduced visual impacts by removing some elevated ramps and structures from the design
- reduced long-term closures of the northern portion of the Darlington motorway during construction
- reduced impact on existing open green community space.



T2D Southern Tunnels, southern portal

A review of the T2D Project was undertaken in 2021 to ensure it will deliver the best possible outcome for road users and those who live and work along the corridor, representing value for money for South Australian taxpayers, creating opportunities for local businesses and realistic estimated delivery timeframes.

Design history

Over the past decade, extensive work has been undertaken to identify a preferred alignment and configuration for the T2D section of the NSC.

Options explored for the T2D alignment and configuration included a range of motorway-based and tunnelling solutions. These were assessed for connectivity, safety, whole-of-life costs during construction and operation, flexibility of construction and considered community feedback.

Ultimately, a hybrid solution consisting of both open motorway and tunnels was selected based on minimising community disruptions including property acquisitions while creating greater economic benefits, urban-redevelopment opportunities and ensuring more businesses can stay open during construction.

This early hybrid design (2021) was further developed to reduce project impact and deliver broader benefits to the community. This included review of the design in consultation with the community and stakeholders to ensure the project will deliver the best possible outcome for road users and those who live and work along the corridor.

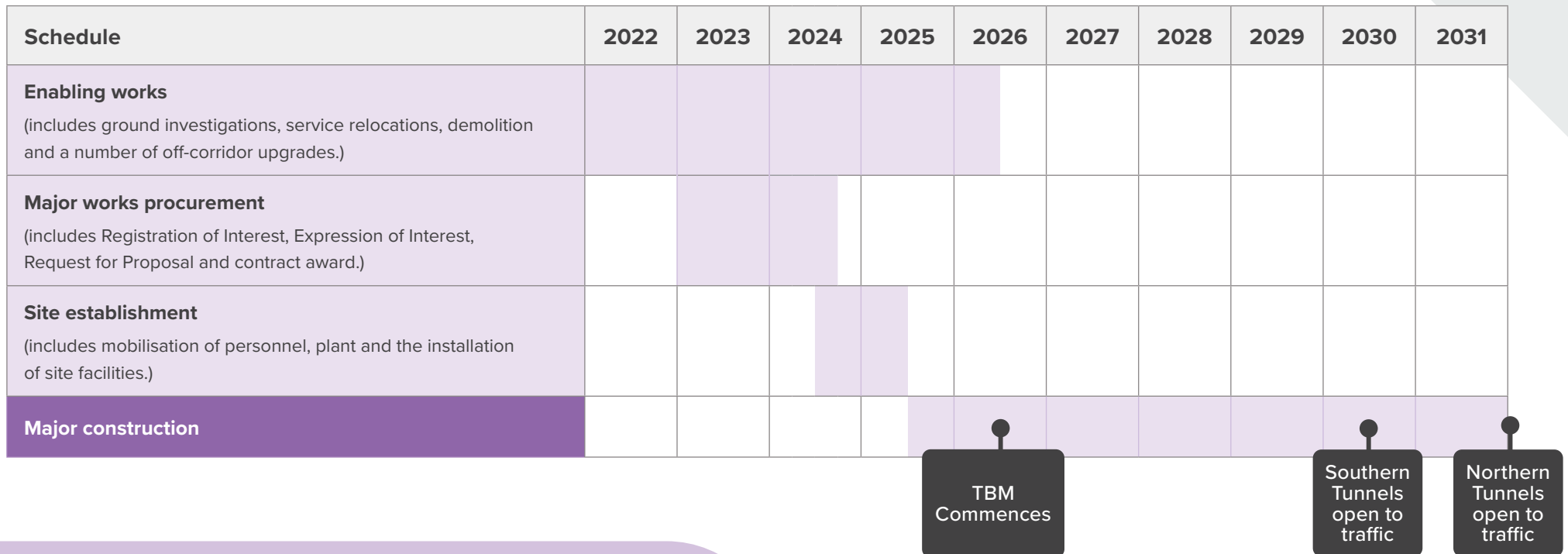
To deliver the optimal solution, the early hybrid option underwent further investigations and refinement in 2022, with an extension of the Southern Tunnels, redesign of the Northern Tunnels, northern portal and amendments to interchanges at Anzac Highway, Richmond Road and James Congdon Drive. This process was part of developing the current project design. Further design refinement and details are ongoing ahead of the appointment of a head contractor, planned for Q3 2024.

Overview of the T2D Project staging and timeline

The project timeline has four key phases:

- enabling works
- major works procurement
- site establishment
- major construction including tunnelling via tunnel boring machine (TBM).

The project timeline will be refined over time. The major works contract will be awarded in Q3 2024 and will commence with detailed design and approvals. Major construction will commence in 2025, with major tunnel works commencing in 2026. Full funding by the Australian and South Australian governments facilitates project completion in 2031.





T2D Anzac Highway



Project land and setting

The T2D Project is predominantly located within an existing road corridor adjacent to current urban land uses, such as public parks and recreation, residential, commercial and industrial land.

General land use patterns are such that commercial and light industry typically are more likely to interface directly with South Road, with residential and open space areas more likely to be further away from the corridor.

South Road also links multiple significant destinations within metropolitan Adelaide, including the Adelaide Central Business District (CBD), Adelaide Airport, large retail shopping centres, sporting ovals and stadiums, hospitals, schools and universities.

Key precincts and land use along the T2D Project alignment include:

- the River Torrens / Karrawirra Parri at the north of the project alignment
- retail/commercial hubs at Brickworks Marketplace (Torrensville) and Castle Plaza (Edwardstown)
- public transport connections at Emerson and Tonsley (train) and South Road tram overpass and high frequency bus connections south of Anzac Highway
- higher-density residential options along Anzac Highway (Urban Boulevard Zoning)
- recreation/open space at Glandore Oval, Richmond Oval (Hisense Arena), Thebarton Oval and Kings Reserve
- historic areas in Everard Park, Richmond, Mile End and Thebarton
- Local and State Heritage Sites, including the Hindmarsh Cemetery, Thebarton Theatre, Maid of Auckland Hotel and St Mary's Anglican Church
- the Tonsley Innovation District precinct at the south of the project alignment.

Urban Design Strategy

A focus on good urban design is a priority to maximise the benefits of the project and realise its broader potential. The T2D Project Urban Design Strategy (UDS) has been prepared to ensure good urban design outcomes for the project, not only for the motorway but also in neighbouring communities.

The purpose of the T2D Project UDS is to:

- analyse relevant background strategies, policies and plans
- analyse the local context of the project corridor, including its visual and landscape aspects
- analyse stakeholder values and priorities heard through engagement
- establish the urban design vision and outcomes to be achieved
- provide contextual guidance for key locations along the corridor
- provide technical guidance for a range of infrastructure and public realm elements.



T2D northern landscaping



T2D Anzac Highway

Artist's
impression

The Urban Design Strategy (UDS) is the guiding document to ensure high-quality urban design, landscape and public realm outcomes are achieved for the T2D Project.

The UDS sets out an overarching urban design vision, principles and objectives which apply project-wide to all works. These are supported by more detailed design requirements for specific locations and project elements.

The UDS has been informed by government policies and strategies, local area analysis, best practice project benchmarking and stakeholder engagement to ensure

the T2D Project works respond sensitively to their surroundings, enhance local features and complement existing character.

The UDS is a contractual document intended to provide consistent guidance to the contractors engaged to design and deliver all urban and landscape design components of the T2D Project. This will help to achieve consistency in corridor design and broader, holistic outcomes throughout different design phases of the T2D Project lifecycle.

The T2D Project UDS will be used to:

- provide consistent urban design guidance and direction throughout all stages of the T2D Project

- support various stages of stakeholder engagement, by aligning its direction with the priorities of communities, businesses, local government and Traditional Custodians
- form the basis of urban design contract requirements, together with the T2D Project specification, which will be jointly used to evaluate design responses received during the procurement process from bidding delivery teams.

The UDS will be used by contractors engaged to design and deliver all urban and landscape design components of the T2D Project to achieve consistency in corridor design and broader, holistic outcomes.

As required, the UDS will also be used to guide urban design works included in the associated broader network, amenity and active travel upgrades aimed at improving liveability, connectivity, sustainability and community outcomes along the corridor.

City shaping

City shaping initiatives embody an approach to achieve outcomes that focus on people and places. It includes the consideration of the social, cultural and economic context of communities along the project corridor, within Greater Adelaide and in SA's regions.

It is an urban renewal program that identifies specific broader benefits and opportunities to improve connections, develop places, increase greening and support communities along the corridor. These opportunities build on Adelaide's renowned and celebrated liveable-city status.

It also identifies ways to mitigate potential adverse amenity outcomes for the different components of the project. This has been applied during design development, enabling outcomes to be included early in the design process and ensuring the preferred outcomes match the size and scale of the project.

Consistent with the UDS, \$125 million is committed to specific city shaping initiatives to be delivered over the period of the project which will respond to community and stakeholder feedback.

City shaping aims to have a positive effect on local communities and businesses by connecting people, celebrating culture and place, enabling opportunities and great journeys, and creating greener, more resilient places.



Artist's impression



Artist's
impression

Land acquisition

To enable significant infrastructure such as the T2D Project to be constructed, the South Australian Government needs land on which to build.

The 2022 Project Design requires a total of 524 properties at surface level for the T2D Project, this includes full and partial acquisition. Land is required at surface level for the open and lowered motorway, tunnel portals, relocation of essential infrastructure services (beyond the road footprint) and construction purposes.

The project team has been in communication with relevant property owners subject to land acquisition at surface level.

Underground land is required for the construction of the Southern and Northern Tunnels. Underground land acquisition requirements are determined by the location of the tunnels. Land from the surface to 10m deep does not need to be acquired for the project. The underground land required includes the land occupied by the tunnel, as well as an additional tunnel exclusion area around each tunnel to protect its integrity.

Land is primarily acquired in two ways:

- **Government initiated** – for at surface level land this process occurs when contact is made with the affected parties by the Department's Property Acquisition Team and a Notice of Intention to acquire land is issued setting out the rights, processes and timeframes of acquisition. For underground land the Property Acquisition Team will directly contact the affected parties in late 2024 to share more information and start to work through the process.
- **Landowner initiated** – occurs when property is listed for sale in the open market and the government purchases the land through a non-statutory process. This occurred for a small number of properties identified as being required for the T2D Project.

Native title

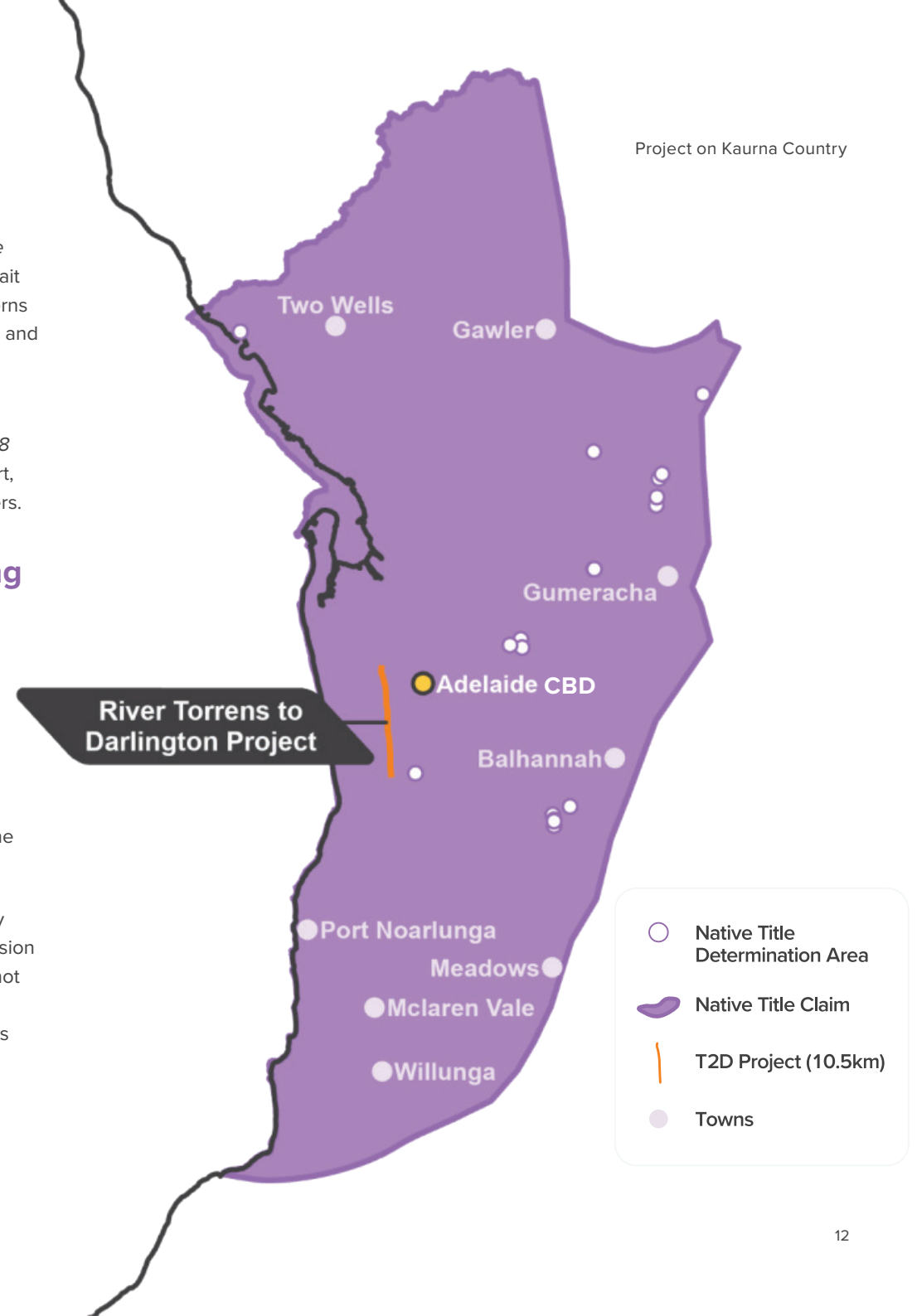
In SA, native title is predominantly administered through the Commonwealth *Native Title Act 1993* (NTA). The NTA recognises the rights and interests of Aboriginal and Torres Strait Islander people in land and waters according to their traditional laws and customs, governs the process to establish native title rights, interacts with land for which native title exists, and provides for the establishment of Indigenous Land Use Agreements (ILUAs).

The South Australian *Native Title Act 1998* is a state-based Act enacted to parallel the Commonwealth NTA prior to amendments made in the *Native Title Amendment Act 1998* (Cth). This state-based Act provides the Environment, Resources and Development Court, and the Supreme Court of South Australia, with jurisdiction to deal with native title matters.

In March 2018, the Federal Court provided a ruling on the Kurna Peoples Native Title Claim Area, which determined that native title exists (native title land) for 17 parcels of land within the Determination Area.

None of the parcels of land are within or in proximity to the project area. As a result, the project area does not encroach on any of the designated native title land and none of the land will be impacted/modified by this project.

The project area land is subject to an ILUA between the Kurna People and the Attorney General for the State of South Australia (Tribunal Number SI2018.004). The native title vision database, maintained by the National Native Title Tribunal, shows that native title does not exist over the project area land. This aligns with an initial understanding that native title is generally considered extinguished on freehold land and within a road reserve that was constructed prior to 1994.

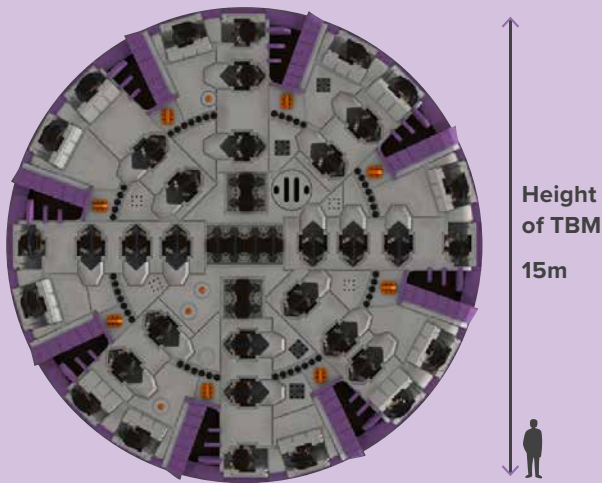


Construction

Construction of the project will occur in two stages from south to north, beginning with the Southern Tunnels before moving onto the Northern Tunnels.

Construction approach

The majority of the Southern and Northern Tunnels will be constructed using tunnel boring machines (TBMs) which will operate non-stop; progressing approximately 8-10m per day. Tunnel construction waste (known as spoil) will be collected and processed in temporary acoustic sheds to mitigate noise and dust impacts prior to being transported for re-use or disposal.



Construction environmental management

A Construction Environmental Management Plan (CEMP) will be developed and implemented to manage potential environmental and community impacts and to ensure the project complies with environmental and waste management legislation and practices.

The project is estimated to generate over four million cubic metres of spoil, including soil, rock and fill during construction. Spoil will be managed appropriately and classified prior to leaving the construction site in accordance with SA Environment Protection Authority (EPA) standards and guidelines.

It is expected the majority of spoil generated by the project will be suitable for re-use outside of the project corridor. Any material not suitable for re-use will be disposed of at an appropriately licensed facility using licensed waste transporters.

Construction and operation of the project will also generate waste streams that require management and disposal. Where possible, generation of waste will be avoided, and disposal should only occur where other waste management options are not possible.

Traffic management

Comprehensive traffic management measures will minimise impacts on surrounding roads and ensure the

safety of the public, motorists and construction personnel to the best extent possible. However, road access restrictions and diversions are likely to be required. Affected residents, communities and businesses will be informed of any potential restrictions or expected impacts in advance of any changes.

Pre-construction activities

Early works, preparatory investigations and surveys are required in advance to prepare sites for the main construction activities of major infrastructure projects and are being undertaken for the T2D Project. These works typically take place before detailed design has been finalised, and include:

- survey work and investigations, including investigative drilling
- condition surveys of buildings and infrastructure
- property acquisitions and adjustment works, including installation of property fencing
- demolition of existing structures
- contamination testing and land remediation (subject to remediation action plan recommendations where required)
- relocation, adjustment and protection of utilities and services affected by the project (ongoing during main works)
- roadwork adjustments to provide access to temporary construction support sites
- detailed heritage investigations, protections, salvage and/or conservation works.



Tunnel boring machine

Construction activities

The project construction will be delivered in two packages – the Southern Package and the Northern Package. Construction will progress from south to north, with the Southern Package of works from Darlington to north of Anzac Highway, consisting of the Southern Tunnels and sections of open motorway with connections to the surface road network at each end of the tunnels. The Northern Package, consisting of the Northern Tunnels and sections of open motorway with connections to the surface, is expected to commence about two years after the start of the Southern Package, and will complete the project by connecting the Southern Package through to the existing motorway at Grange Road.

Laydown areas will be established first for the Southern Tunnels followed by a similar area for the Northern Tunnels. These areas provide starting points for the large TBMs to commence tunnelling operations. Typical construction activities for the tunnels and open motorway sections include:

Northern and Southern Tunnels

- construction of cut and cover tunnel and dive structures
- construction of tunnels by TBMs and cross-passages
- construction of surface connections and roadworks
- civil finishing works, including safety barriers and noise walls
- urban design and landscaping
- tunnel fit out, including safety and control systems
- intelligent transportation system (ITS) infrastructure for motorway control
- tunnel ventilation facilities including vertical air extraction
- construction of operational facilities, including
 - new transport management centre
 - water treatment plants.

Open motorway

- construction of trough structures including building retaining walls on each side of the proposed road
- construction of surface connections and roadworks
- construction of drainage basins and creek/overland flow conveyance structures
- bridge works
- civil finishing works, including safety barriers and noise walls
- urban design and landscaping
- ITS infrastructure for motorway control.

Community and stakeholder engagement

The Department has undertaken extensive community and stakeholder engagement since 2020. The feedback received has already helped shape the T2D Project. Engagement has focused on increasing people's awareness of the project and creating meaningful opportunities for input to help minimise potential impacts and maximise positive outcomes for the community.

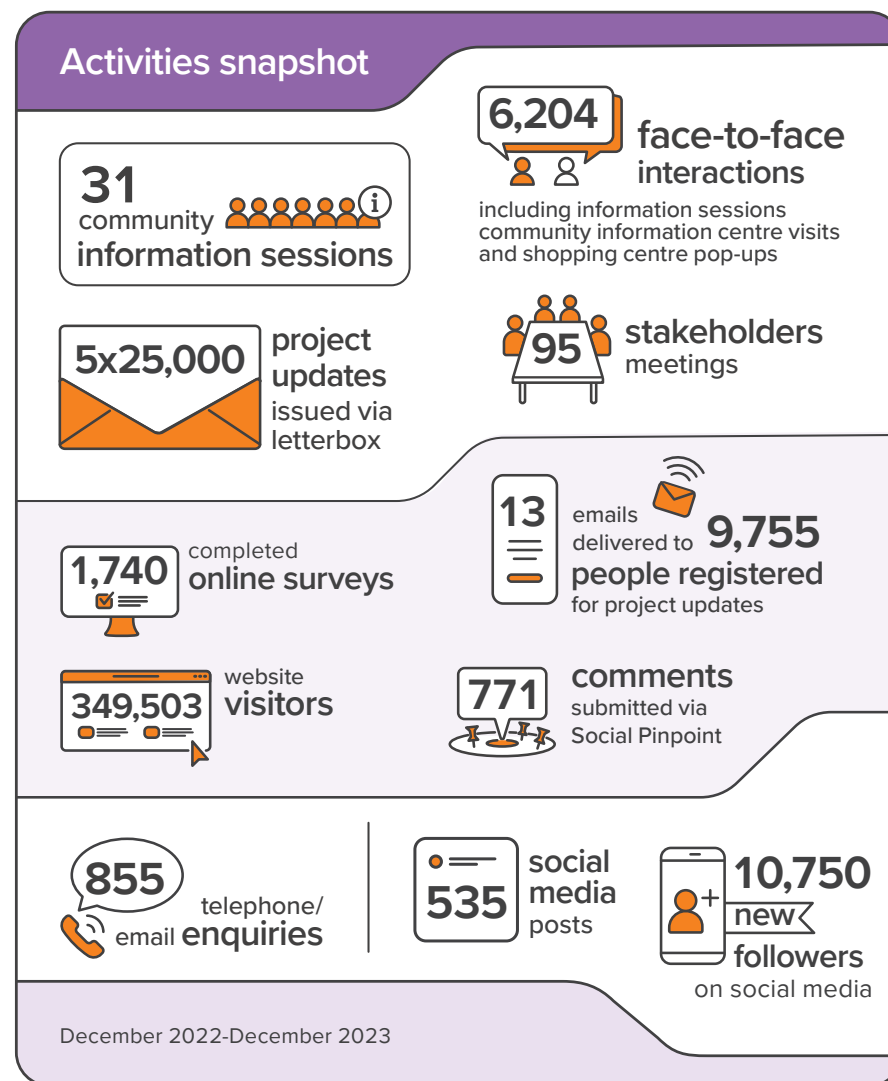
The next stage of engagement will be focused on the Project Assessment Report (PAR) which outlines the various environmental and heritage assessments which have underpinned project planning and design. A supplementary report will be developed to respond to public feedback and comments raised during the PAR consultation period.

Engagement so far

A range of tools have been used to engage with the community and stakeholders including meetings, workshops, letterbox drops, emails, a local face-to-face presence (at shopping centres, community hubs, and information sessions) and digitally (via website, social media and online surveys).

Meetings have been held with key stakeholders, including schools, businesses, people living and working near the project alignment, local councils, Kaurna Yerta Aboriginal Corporation, community action groups, Civil Contractors Federation SA, Adelaide Airport Limited, Business SA, a range of government departments and agencies including the South Australian Environment Protection Authority and independently facilitated Community Reference Groups.

Engagement phases to date have included raising awareness of the project, understanding early works, land attainment, outcomes of the design review, local area traffic management, temporary noise walls and urban design. The approach, methodology and supporting collateral for each phase has been bespoke and planned to suit the specific engagement purpose.





Community and stakeholder feedback

Stakeholder feedback has covered a range of topics so far, including the project alignment and design, traffic and transport, amenity, health impacts, ecology, urban design, business impacts, construction methods, local access and safety.

While there has generally been wide support for the project and an eagerness to see it completed quickly, the Department will continue to work with the community, particularly those who live and work close to the project footprint to understand how best to minimise impacts.

Overall, conversations with community members acknowledged traffic congestion and travel times along South Road have been an issue for a long time and improvements are needed.

The community largely indicated it was excited about the progress the completed T2D Project would bring to South Australia (SA). However, key concerns are held relating to changes to local access during construction and operation, and how that will impact their regular journeys.

How to stay engaged

Engagement with the community and stakeholders will continue across the life of the project. There is a lot more planning and detailed design work still to be completed. Opportunities to seek important insights will continue to be identified to help inform this process.

Engagement will also continue during the construction phase to ensure a 'no surprises approach' and the potential construction impacts on the local community are minimised. The Department will continue to provide information as the project evolves, listen to community and business concerns, draw upon local knowledge and incorporate community feedback into planning and design.

For more information, if you have a question, or require hard copies of the design review information or Community Consultation Report, please contact us by calling 1300 951 145.

Assessment methodology

Overview

The Department is committed to delivering sustainable transport, infrastructure and programs in a manner that balances economic, environmental and social needs.

In doing this the Department seeks to minimise the impacts of its activities, and where possible further enhance environmental and social outcomes to deliver lasting benefits to the community.

This is primarily achieved by:

- assessing environment, heritage and social risks and opportunities together with identifying mitigation measures to manage those risks
- ensuring that contractors undertaking work are aware of and abide by the environmental and heritage obligations

- continually improving and updating the standards and guidelines for environment and heritage management
- integrating environment and heritage considerations into decision making.

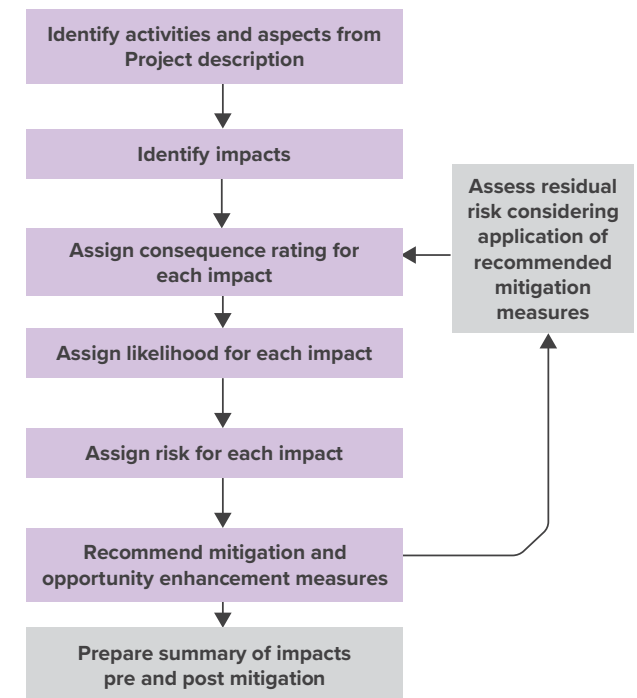
The Department's Environment and Heritage Technical Manual (EHTM) sets out guidelines and standards to assess and manage the environmental and heritage aspects of infrastructure projects.

Environment and heritage assessment

Assessments have been undertaken for the T2D Project including its alternatives and objectives and its impacts on environment, heritage and social aspects within and adjacent to the project corridor. As part of this process a range of measures to offset any potential negative impacts have been identified. Given the project's size and scale, and the wide community interest, the outcomes of the assessments are being shared publicly in the form of this Project Assessment Report (PAR).

The methodology

To provide a consistent evaluation of the diverse range of potential environment, heritage and social impacts the assessment methodology followed the steps below:



What is included in the PAR

The assessments considered both the construction and operation of the T2D Project within the project corridor. It did not extend to associated projects, such as the broader network upgrades, the spoil receiving and precast facilities. These works and infrastructure projects are subject to separate planning, design and assessment processes in accordance with the Department's assessment requirements.

Describing the T2D Project corridor

To support the assessment process the project corridor has been considered in three sections:

- N** Northern Tunnels
- O** Open motorway
- S** Southern Tunnels

All three sections can be viewed on the adjacent map.

Cumulative impact

The PAR does not assess cumulative impact. Cumulative impact considers the combination of multiple impacts that may result when the project is undertaken alongside other proposed non-Department projects in the same area.

The responsibility and management of cumulative impacts of non-Department projects are outside of direct Department control. Consideration of how cumulative impacts can be influenced by the Department indirectly includes engagement with the responsible parties to identify opportunities for aligning mitigation measures, realising beneficial opportunities and engaging with the community and stakeholders on broader cumulative impacts where they occur.



Aboriginal cultural heritage

Aboriginal cultural heritage in South Australia takes many forms and includes objects like artefacts made of wood, bone and stone, and sites like artefact scatters, culturally modified (scarred) trees, campsites, quarries, stone arrangements, shell middens, ancestral burials, rock art and historical places. The Kurna Peoples are the Traditional Custodians of the T2D Project area and the wider Adelaide region.



River Torrens / Karrawirra Parri

Aboriginal cultural heritage sites and objects may relate to Aboriginal spiritual beliefs and ceremonial activities, living patterns and burials and the use of resources such as water, flora, fauna, and stone. Sites may be obvious or subtle features in the landscape or may be completely hidden beneath the ground's surface. Some sites may have very little material evidence left but remain significant in the the oral traditions of Aboriginal communities.

Existing environment

At the time of European settlement, the Kurna People inhabited an area extending from Crystal Brook in the north to Cape Jervis in the south and inland to the western edge of the Mount Lofty Ranges. Since European settlement in the 1830s, South Road has been subject to significant development and has been highly modified. Even so, the Kurna community continue to have strong connection to Country. Any land, developed or undeveloped, may contain Aboriginal cultural heritage sites of significance to Aboriginal archaeology, anthropology, tradition and history.

A search of the Attorney-General's Department's Aboriginal Affairs and Reconciliation Division (AGD-AAR) Register of Aboriginal Sites and Objects shows there are no registered sites within the project land. Two landscape features that generally carry higher risks for the discovery of Aboriginal sites and objects, as advised by AGD-ARR, that are located within the project corridor are:

- areas within close proximity to creeks and waterways such as River Torrens / Karrawirra Parri, Keswick Creek and Brownhill Creek / Willawilla
- places bearing Aboriginal names, or place names which are English translations of Aboriginal names or indications of Aboriginal interaction with the landscape.

The project is within the Kurna Native Title Determination Area. None of the 17 parcels of land for which native title was determined are within or are in proximity to the T2D Project. As a result, the project design does not encroach on native title land where native title exists.

Potential impacts to existing environment

The project has the potential to cause both construction and operational impacts to unknown Aboriginal heritage, however, the likelihood of encountering Aboriginal sites, objects or remains in highly modified and disturbed soils is low. Even so, there are areas within the project area that may have a higher potential for encountering Aboriginal heritage including ground disturbance work within and surrounding the River Torrens / Karrawirra Parri and Keswick Creek and Brownhill Creek / Willawilla.

Any land, developed or undeveloped, may contain Aboriginal sites, objects or remains even if the AGD-AAR does not identify them. There is a risk, as for any infrastructure project of encountering unknown Aboriginal heritage sites, objects or remains.

Potential operational impacts to Aboriginal cultural heritage are not anticipated as ground disturbing works will occur during construction phase, some ground disturbing works may be required for maintenance.

Alternatives, mitigation and opportunities

The Department's Master Specification, with links to the Department's Environment and Heritage Technical Manual (EHTM) have requirements applicable to the assessment and mitigation of impacts to Aboriginal cultural heritage applicable to the project. The requirements will be applied to mitigate Aboriginal heritage impacts in the design and construction of the project.

A suitably qualified archaeologist/heritage specialist has undertaken an assessment of Aboriginal heritage sites, objects or remains that may be located within (or in proximity to) the project. Consultation and liaison with relevant Aboriginal group(s) or representatives in relation to Aboriginal heritage matters will also be undertaken.

The project will undertake an Assessment of Outcomes for Aboriginal people, including identifying opportunities to celebrate and recognise Aboriginal heritage. This potentially includes Aboriginal cultural expression in the design of the project (including murals and sculptures) and the investigation of naming of open spaces and assets (like bridges and structures). A Construction Environmental Management Plan (CEMP) will be prepared prior to work starting. It will be implemented and maintained to manage potential environmental and heritage effects and risks.



Mural art by Mike Makatron and Harley Hall, Torrens Road bridge, Ovingham Level Crossing Removal Project

The CEMP will include an unexpected finds protocol in accordance with provisions of the *Aboriginal Heritage Act 1988* to manage unidentified Aboriginal heritage sites or objects in the unlikely event they are discovered during construction.

Approvals, permits and authorisations

No legislative approvals are currently required. If an unregistered or unknown Aboriginal site, objects or remains are uncovered during construction, compliance with the *Aboriginal Heritage Act 1988* including approvals will be required to ensure compliance with the Act, the Department's EHTM Attachment – 2A Aboriginal Sites, Objects, and Ancestral Discovery Procedure will be implemented and followed.

Non-Aboriginal heritage

Non-Aboriginal heritage includes places and objects of high cultural value that contribute to a sense of history and identity for the community. These could be places or objects of aesthetic, archaeological, architectural, cultural, scientific or social significance.

Existing environment

The project corridor contains some of Adelaide's oldest suburbs and areas with high concentrations of non-Aboriginal heritage places, particularly in the Northern Tunnels section of the project.

An assessment was undertaken, which identified non-Aboriginal heritage types 100m either side of the project alignment.

The map highlights non-Aboriginal heritage places within proximity of the project corridor.

Potential impacts to existing environment

Construction of the project has the potential to directly and indirectly impact the form, fabric, setting, character and values of non-Aboriginal heritage places.

Direct impacts are those that may result from construction at the surface that directly overlays a non-Aboriginal heritage place, resulting in impacts to either whole or part of it.

Indirect impacts may occur to non-Aboriginal heritage places in proximity to the project such as vibration impacts during construction or operation and visual impacts created by changes associated with construction and new infrastructure.



The assessment of potential impacts to non-Aboriginal heritage confirmed the following sites:

Heritage place classification	Number of heritage places
World heritage site	0
National heritage place	0
State heritage area	0
State heritage place	10
Local heritage place	25
Representative buildings (formerly contributory items)	71
Roadside significant sites (RSS)	3
Historic and character area overlays	9

Alternatives, mitigation and opportunities

The Department's Master Specification, with links to the Environment and Heritage Technical Manual (EHTM) have requirements applicable to the assessment and mitigation of impacts to non-Aboriginal heritage. The requirements are expected to be sufficient to mitigate non-Aboriginal heritage impacts in the design, construction and operation of the project.

A Construction Environmental Management Plan (CEMP) will be prepared prior to work starting. It will include a Heritage Management Plan for places identified as potentially being impacted by the project. The CEMP will also include measures to manage vibration in a Construction Noise and Vibration Management Plan to be prepared in accordance with the Department's requirements. For more information in relation to these measures refer to the noise and vibration chapter.

During preparation of the CEMP the construction contractor will be required to assess and implement methods to minimise, monitor and manage the risk of vibration damage, and identify any required pre and post property condition surveys to be undertaken.

The CEMP will include an unexpected finds protocol in accordance with provisions of the *Heritage Places Act 1993* to manage any unidentified non-Aboriginal heritage sites or objects if discovered during construction.

Opportunities to reduce potential impacts to non-Aboriginal heritage places will be pursued during design. This includes identifying opportunities to enhance the setting and context of heritage places within the project area as part of the project's Urban Design Strategy.

Approvals, permits and authorisations

Approvals under the *Planning, Development and Infrastructure Act 2016* (PDI Act) are required for any activities which constitute a 'development'.

An application for development approval will be required for impacts to State Heritage. The project will need to demonstrate compliance with the Department's EHTM Attachment 7D – Guideline for the Management of Noise and Vibration: Construction and Maintenance, and EHTM Attachment 8A – Non-Aboriginal Heritage Assessment Guideline.



Thebarton Theatre (State Heritage listed building, Thebarton Council Chambers, Assembly Hall and Town Hall)

Air quality

Air quality refers to the degree to which the air is suitable or clean enough for humans or the environment.

Air quality impacts may arise from the emission of air pollutants to the atmosphere due to construction or operation of the motorway and can result in impacts to human health, amenity and the environment if not suitably controlled or eliminated.

During construction, the excavation and management of spoil and construction of civil infrastructure can result in additional emissions of pollutants from construction vehicles as well as the potential for dust particulate matter (PM) generation. During operation, fuel combustion from vehicles using the road can result in emissions of pollutants which include nitrogen dioxide (NO₂), and dust (PM₁₀ and PM_{2.5}).

For a road tunnel, during operation, emissions are generated by vehicles within the tunnel which will be discharged into the environment via a combination of ventilation facilities and managed emissions from the tunnel portals.

Emissions are also generated on the surface roads constructed as part of the project. Measures and requirements are in place to ensure acceptable air quality impacts during construction and operation.

Existing environment

Sensitive receptors

Sensitive receptors are places or areas which are vulnerable to air quality impacts such as hospitals, schools, parks, reserves or households. A mix of land uses, primarily commercial and residential, interface directly with the existing South Road corridor. Areas set back from South Road are primarily residential, however Hindmarsh, Mile End and Edwardstown contain some commercial and industrial areas. There are also several parks and reserves for passive recreation in the vicinity of the project.

Climate and meteorology

Meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. The prevailing wind conditions in the area are strong (greater than 5 m/s) from the southwest and light (less than 1 m/s) from the northeast. Higher wind speeds (>5 m/s) typically result in lower concentrations of air quality pollutants.

Ambient air quality

The current local ambient air quality surrounding the project is important to consider when assessing cumulative (project plus background) air quality impacts. This includes ambient concentrations of NO₂, PM₁₀ and PM_{2.5}. A review of the current ambient air pollutant concentrations found that concentrations of NO₂ and PM_{2.5} were satisfactory under the relevant limits outlined in the South Australian Environment Protection (Air Quality) Policy 2016 (Air Quality EPP) and National Environment Protection (Ambient Air Quality) Measure for the assessed period. Concentrations of PM₁₀, on occasions exceeded the relevant limits for the assessed period, with only occasional exceedances of the short-term limit. This is a common occurrence across the nation in similar (urban) locations with exceedances often related to windblown dust, bushfires and other significant dust generating events.

Potential impacts to existing environment

A project-wide evaluation of potential air quality impacts was undertaken for both the construction and operational phases of the project. The key air quality impacts identified through this assessment are outlined overleaf however it should be noted that with appropriate design, it is highly unlikely that impacts to air quality will cause any negative human health or amenity outcomes.



T2D Northern Tunnels, northern portal

Impact	Activity
Construction	
Deposition and gathering of larger dust particles causing aesthetic impacts at sensitive receptor locations (such as dust settling on a house or garden)	<ul style="list-style-type: none"> • site clearance and construction site establishment • earthworks
Generation of PM ₁₀ and PM _{2.5} from soil disturbance causing health impacts at sensitive receptor locations (such as small dust particles being breathed in by a person)	<ul style="list-style-type: none"> • construction of surface roads and other civil infrastructure • dive structure/portal and tunnel construction • traffic movement associated with material transport.
Operation	
Localised reduction of air quality	<ul style="list-style-type: none"> • vehicles using surface roads (crossroads and motorways) - emissions released locally at road level • vehicles using tunnels - emissions released through a combination of vertical air extraction through ventilation facilities and managed emissions from the portals.

Alternatives, mitigation and opportunities

The project alignment has been developed during the planning and reference design phase to minimise negative air quality impacts so far as reasonably practicable.

During the construction phase appropriate dust management measures will be in place such as ongoing monitoring, managing stockpiles and ensuring adequate water supply

for dust suppression. With management measures in place it is unlikely that construction activities will result in exceedances of the air quality criteria.

During the operation phase, design measures will be implemented to eliminate or reduce the risk of poor air quality.

Elements will include:

- tunnel ventilation system providing adequate dilution and dispersion of pollutants
- monitoring of air quality levels to provide appropriate control of ventilation systems
- intelligent transport system infrastructure and tunnel traffic monitoring resulting in traffic conditions that minimise vehicle pollution generation
- optimising of barriers such as noise wall heights, numbers and locations, to protect sensitive receptors
- integrated design of the portal geometry to enhance emission dispersion.

Approvals, permits and authorisations

The project must demonstrate that all reasonable and practical measures will be undertaken to eliminate or minimise air quality impacts during construction and operation of the project by demonstrating compliance with the Air Quality EPP which establishes maximum pollutant ground level concentrations to protect the health and amenity of sensitive receptors.

During operation, the project must demonstrate compliance with the Environment and Heritage Technical Manual Attachment 3A – Air Quality Assessment Guideline, which applies to new or major redeveloped road and rail infrastructure projects.

Business

In 2020, the Department engaged consultants to assess the positive and negative impact on businesses within the project area.

Existing environment

The existing South Road corridor is highly modified and located within an urbanised area of metropolitan Adelaide, with land use along the corridor varying considerably between commercial, industrial and residential. Businesses along the project corridor are diverse and each will experience a different type, scale and duration of impact.

The Business Impact Assessment (BIA) assessed the characteristics of existing local businesses operating within 200m of South Road or that are within 250m of South Road and are highly reliant on passing traffic.

Potential impacts to existing environment

There is a range of potential impacts to businesses during construction including short-term changes to access, effects from noise and vibration and interruption to essential utilities.

The BIA found approximately 950 currently operating businesses will experience changes to their environment due to construction and eventual operation of the T2D Project. The potential negative and positive effects of the project on these businesses and surrounding areas has been assessed and considered. All identified businesses were classified as either acquired under the T2D Project or not acquired and therefore potentially facing long-term impacts caused by construction activity and operation of the motorway following completion.

Of the 950 businesses operating in the project area, 184 (19%) have or are expected to be acquired. Many businesses will relocate rather than close. The Department is working closely with these businesses to support them through this process. The BIA also identified:

- approximately one third have been estimated to not be financially impacted by the project (either by acquisition or by the T2D Project's construction)
- approximately 20% of businesses were operating on commercially or industrially zoned land that is to be acquired for the project
- about half of the businesses have been estimated to be impacted due to reduced traffic volumes during and post construction
- the project will contribute about \$9 billion into the wider South Australia (SA) economy and save about the same amount in congestion costs

- it will support about 5,500 full-time equivalent jobs on average during the main construction period.

Managing impacts

The T2D Project requires an effective approach to supporting impacted business owners and tenants, and proactively managing impacts during construction and operation.

Engagement with businesses will determine which measures will be most effective at mitigating impacts associated with construction and operation of the project. Businesses will have different needs at different points in time depending on the construction timetable.

The key project phases and their support requirements are:

- **Pre-construction:** businesses will require support that enables effective planning and decision making and/or assistance relocating
- **Construction:** businesses will require support that mitigates the operational and financial impacts of construction activity
- **Post-construction:** businesses may require support (e.g. communicating changes to customers) following the construction phase.

The project is being guided by the Department's business and stakeholder engagement policies, Small Business Framework and recommendations set out in the Small Business Commissioner's guidelines (Open to Business - Making Roadworks Work).

Alternatives, mitigation, and opportunities

A series of surveys, one-on-one meetings and consultation events will help inform the T2D Project about businesses, their requirements and the needs of their customers. Engagement is underway and will continue through the detailed design and construction phases of the project.

The information will also be considered when planning the timing and location of major works to minimise impacts to local business as much as practically possible.

There will be significant processes and plans established to minimise impacts of construction activities such as traffic diversions and access changes, and noise and dust generation. These may include support such as advertising or signage to assist customers with changed access to businesses.

There will also be extensive engagement with businesses along the corridor to ensure that businesses are aware of activities that may lead to impacts to their operations.

Extra support for businesses can be accessed through:

- the Office of the Small Business Commissioner which provides a range of services and support to SA small businesses
- the Office of Small and Family Business which is a one-stop location for information, tools and templates to support and assist small business through various aspects of starting and running their business in SA. This includes information on marketing, business planning and advice, risk and financial management, and legal essentials
- the business.sa.gov.au website provides information, grants, services and support from across government to help businesses succeed.

Approvals, permits, and authorisations

While there are no internal Department approvals required for the project in relation to business, the project must demonstrate compliance with the Department's Master Specification Project Controls – Small Business Support (MS PC-CS2 Small Business Support).

The project's outcomes align strongly with key South Australian and Australian Government priorities including those listed in the following plans, reports, strategies and audits:

- 30-year Plan for Greater Adelaide: 2017 update
- 20-year State Infrastructure Strategy (2020)
- Australian Infrastructure Audit (2019)
- 2022 Regional Strengths and Infrastructure Gaps
- National Road Safety Strategy 2021-2030
- South Australia's Road Safety Strategy to 2031
- National Freight and Supply Chain Strategy 2019
- 2021 Australian Infrastructure Plan.





Grey-headed Flying-fox (*Pteropus Poliocephalus*)

Potential impacts to existing environment

Expert ecological surveys confirmed there are no threatened ecological communities or nationally threatened flora occurring within the project area.

Any potential state threatened flora, such as remnant Pink Gum and Flinders Ranges Wattle have also been considered but neither were recorded during site surveys so no impacts are expected.

The nationally threatened White-throated Needletail and the Grey-headed Flying-fox have the potential to be present, as do the state threatened Spotless Crake and Common Brushtail Possum.

Regarding the Claret Ash trees, the project is looking to minimise impacts to ensure as many trees are retained as possible. However, there is potential that some trees may still be impacted, primarily on the northern side of Anzac Highway between Selby Street and South Road.

If there is removal of ecological or amenity values, the project would seek to offset impacts with trees and plants planted on project land and sites in proximity to the project.

Ecology

Ecology includes both flora (plants and vegetation) and fauna (animals) and relates to how they interact with their surrounding environment.

Some negative impacts cannot be avoided, however the T2D Project has sought to maximise opportunities and minimise impacts to ecology throughout each phase.

Comprehensive ecological surveys have already been completed to inform early works and design in minimising impact on the natural environment.

Existing environment

While there are few ecological features remaining along the highly modified existing South Road corridor, there remain some scattered patches of high value vegetation, including significant, regulated and amenity trees, other amenity landscape plantings and native vegetation in isolated pockets.

For instance, the section of the River Torrens / Karrawirra Parri that is within the project area contains flora in good condition providing high amenity value for the community and a habitat corridor for fauna. In particular, flora along the edge of the river and the overstorey is substantially intact.

The avenue of Claret Ash trees planted along Anzac Highway in the 1930s is classified as a Roadside Significant Site. This avenue of trees has both environmental and cultural significance.

There are no substantially intact remnant habitats evident in the road corridor.

Alternatives, mitigation and opportunities

To ensure there is minimal impact to the existing ecology of the project area, the planning and design process has been guided by the following principles in order of preference:

- **Avoidance:** to avoid clearance of vegetation wherever possible
- **Minimisation:** if clearance cannot be avoided, measures should be taken to minimise the duration, intensity and extent of impacts
- **Rehabilitation or restoration:** measures should be taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems impacted by clearance
- **Offset:** any adverse impact on vegetation or ecology that cannot be avoided or further minimised is to be offset in accordance with the Department's Vegetation Impact Assessment Guideline.

Avoidance is the most effective method to minimise ecological impacts and retain existing native vegetation, regulated and significant trees, and high-value flora. This is the main method being achieved for this project through the use of tunnels for the majority of the proposed alignment.

The plan to elevate the road structure to span the River Torrens / Karrawirra Parri will also minimise the effects of construction to the high-value vegetation area within the River Torrens / Karrawirra Parri corridor.

When clearance cannot be avoided, it will be minimised during design. The ecological assessments provided data for the design phase (using geographic information systems) and identified opportunities to avoid ecological impacts.

Further, where trees and vegetation need to be cleared to facilitate the project, a strategy will be developed demonstrating how and where they will be replaced. To enhance biodiversity and climate resilience the project has also committed to a minimum 20% increase in tree canopy cover.

This strategy will be implemented immediately following the completion of construction to restore the landscape amenity and maximise ecological benefit.

Rehabilitation or restoration of existing high-value flora areas, public spaces, gardens and reserves within and adjacent to the project area, will ensure the best opportunity to improve biodiversity.

Planting fauna specific native tree and shrub species as offsets will provide preferred habitat, minimising the ecological effects of the project.

Approvals, permits and authorisations

Required:

- the Department's Environment and Heritage Technical Manual Attachment 4B Vegetation Impact Assessment Guideline approval requirements.

Potentially required:

- *Native Vegetation Act 1991.* Only for flora within the River Torrens / Karrawirra Parri corridor.
- *Planning, Development and Infrastructure Act 2016.* Only for regulated and significant trees beyond land under the care, control and management of the Commissioner of Highways.

Geology and groundwater

Considering the majority of the T2D Project is located in tunnels, it is important to understand the geological and groundwater conditions that the project will be built in to ensure structural integrity and environmental protections are adequate.

Extensive field investigations including bore holes, soil and rock sampling, soil testing and groundwater monitoring have been undertaken to determine the types of soil, rock and groundwater conditions that exist in and around the project area. These assessments have been used to inform and underpin project planning and design.

Existing environment

The T2D Project area is relatively flat, with a gradual rise in elevation towards the foothills in the south. Loamy surface soils, coarse-grained sands, gravels and clay at depth dominate the areas where the entrance and exits to the tunnels and lowered motorway sections will be located.

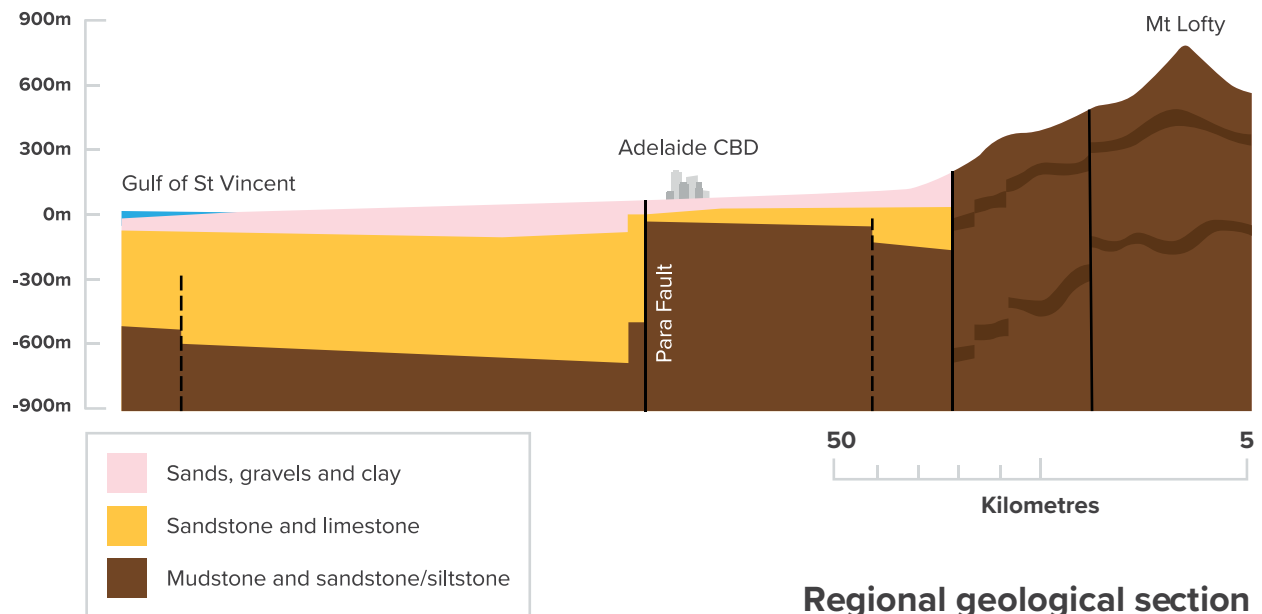
Deeper soil and rock that the tunnels will be built through are made up of layers of sandy materials interspersed within clay layers. These softer sediments rest on top of deeper limestone and sandstone.

The Southern Tunnels extend downwards from the portals through the clay layers and variably into limestone and sandstone.

The Northern Tunnels are mostly located in the clay layers with the exception of the southern portion which encounters sandstone that has been pushed up along an ancient, non-active fault zone.

Along the project corridor, surface water and groundwater largely flow from the east towards Gulf St Vincent in the west. Investigations have shown the groundwater below the project area flows through fill, shallow gravel aquifers and very permeable sand located in former ancient river channels which are separated by layers of water-resistant clay.

Two deep aquifers located in the underlying sandstone extend along the length of the alignment. These and other groundwater factors have been incorporated into project planning and design to minimise negative environmental impacts while maintaining structural integrity.



Regional geological section

Potential impacts to existing environment

The potential impacts to soil, deeper geological structures and groundwater conditions have been assessed for both the construction and operational phases of the T2D Project.

The sections of tunnel built using tunnel boring machines (TBMs) will comprise about 60% of the length of the T2D Project at a depth mostly below the water table. Dewatering (the removal of underground water by pumping) of the ground surrounding the tunnel will not be required during the tunnel boring process. Minor ground settlement is possible due to the tunnelling operations (unrelated to groundwater) and this will be monitored and managed accordingly.

Dewatering will be required in some areas to enable construction of open motorway and sections of cut and cover tunnels. This water will be treated where required (refer to the site contamination chapter for further details).

Measures will be put in place to ensure impacts from ground settlement or movement due to excavations and dewatering are minimised. During excavation of the tunnel or lowered motorway sections there may be some limited risk of settlement impact in areas immediately adjacent to the works. Any potential impact to properties or other existing assets will be closely monitored and addressed.

Dewatering of aquifers during construction may temporarily reduce water supply in the small number of existing wells surrounding the project area.

Alternatives, mitigation and opportunities

The project design has incorporated the results from thousands of samples, tests and a large number of studies, to understand and minimise geotechnical, groundwater and ground settlement risk and to determine appropriate mitigation measures.

For example, specialised retaining wall construction techniques, such as diaphragm walling, will reduce water ingress and mitigate impacts from any soil movements while base slabs will be reinforced and anchored to prevent uplift. Tunnels are progressively lined by the TBM as excavations advance to prevent groundwater ingress and minimise surface settlement. The project will draw on interstate and international tunnelling expertise to minimise risks related to settlement.

The Department's Master Specification has specific requirements applicable to the mitigation of impacts while the Environment Protection Authority (EPA) and SAFEWork SA practices and guidelines will also be strictly followed. These and many others mandated will be complied with throughout the project and are anticipated to sufficiently mitigate the identified impacts.

Approvals, permits and authorisations

The project is designed to comply with the *Environment Protection Act 1993*, the Environmental Protection (Water Quality) Policy and internal Department requirements as well as the Contractor's Environmental Management Plan.



Ground Investigations

Health

Construction and operation activities associated with an infrastructure project like the T2D Project have the potential to impact health if not properly identified and mitigated.

Health as defined by the Australian Environmental Health Standing Committee is 'a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity'.

Potential impacts to health could be caused by changes in traffic safety, air quality, construction noise and vibration, site contamination or social amenity changes. These impacts can particularly affect vulnerable people who are potentially more susceptible to health impacts such as children, the elderly, Aboriginal and Torres Strait Islander people, or people with existing adverse health conditions or a disability within the project area.

A health impact assessment (HIA) focuses on those determinants of health that can be modified. The figure to the right shows the different types of modifiable elements.



Existing environment

It is estimated that more than 84,200 people live within the project area.

The project area includes several sensitive receptor sites or places where concentrated numbers of individuals who may be more susceptible to impacts would gather which may include:

- schools and childcare centers
- hospitals and other health services
- community facilities.

Potential impacts to existing environment

The HIA draws together impacts from aspects covered in this Project Assessment Report (PAR) including traffic and transport, air quality, noise and vibration, site contamination and social amenity. Specific information on those impacts and their mitigation measures are provided in these sections of the PAR. The HIA provides an evaluation of how the project may potentially impact health in a positive or negative way and what processes are in place to mitigate negative impacts and realise any further beneficial opportunities.

Examples of health impacts that could arise from the project include:

- air quality impacts such as dust generation in construction and benefits in operation from lower emissions exposure
- noise and vibration effects from construction activities and operation
- changes to pedestrian and cyclist routes during construction
- benefits during operation from improved safety, connectivity, access to health, education and leisure facilities, new open spaces and increased tree canopy.

Alternatives, mitigation and opportunities

The Department's design process is directed to realise health opportunities, maximising these benefits during early-stage design development, informed by community feedback.

Further to this, the Department will continue to undertake community and stakeholder engagement throughout the design and construction stages of the project.

The Department has health impact management measures in place that closely align with those recommended by the national HIA guidelines.

Some of the mitigation methods and plans include:

- environmental management systems that monitor, audit and report the levels of air quality, noise and vibration, and contaminated land management
- establishment of an emergency response plan to rectify situations should a construction event exceed expected conditions
- a dedicated acquisition team to assist impacted residents, businesses and communities

- a Maintenance and Incidence Response Alliance Agreement for the operational phase (maintenance) of the project which puts in place how major incidents would be responded to
- objectives which must improve safety, enhance connectivity for active travel and increase community open space
- the Department's Master Specification integrates environmental and heritage impact assessments, including health through each phase of the project
- a separate social impact assessment for the project that considers the vulnerable communities at risk from the project and proposes mitigation measures to alleviate impacts.



Landscape and visual amenity

Landscape and visual amenity is the assessment of impacts and changes to the current scenery and settings that will be altered as construction and eventual operation of the project takes place.

T2D James Congdon Drive

Existing environment

The T2D Project will predominantly be constructed either underground via tunnels or within a corridor that is highly modified and urbanised.

The existing environment features a mix of urban land uses including residential, commercial, retail and industrial areas as well as public parks and recreational areas.

The landscape is generally tightly bound by the built environment, with few natural features remaining – these being River Torrens / Karrawirra Parri and Brownhill Creek / Willawilla.

There are few ecological features remaining within the T2D Project area and a general absence of mature trees located along South Road. Existing vegetation generally comprises planted trees, shrubs and grasses located mainly in median strips, private property, side streets or major arterial roads intersecting South Road.

There is an absence of larger amenity trees located within the South Road corridor, particularly south of Anzac Highway where trees are primarily in private properties adjacent to the road. North of Anzac Highway there are also trees in private properties, supplemented with amenity plantings of London Plane trees (*Platanus acerifolia*) kerbside in several sections north of Sir Donald Bradman Drive up to the River Torrens / Karrawirra Parri.

Potential impacts to existing environment

The use of tunnels for the majority of the T2D Project will significantly minimise above-ground visual impacts and will mitigate potential adverse effects to existing landscape character.

The visual impact of tunnel works will be limited to portal locations. While the temporary visual impact would be high, the works and resulting impact would be confined to small areas.

Key temporary and permanent changes associated with construction and operation of the project are outlined below.

Construction impacts

- **Temporary noise walls:** location, appearance and height resulting in temporary change to scenic quality and visual character
- **General earthworks:** topsoil removal, clearing, grubbing vegetation removal resulting in temporary change to scenic quality and visual character
- **Tunnel construction:** tunnel laydown areas and facilities including acoustic sheds are expected to result in temporary change to scenic quality and visual character

- **Construction traffic:** increased heavy vehicles due to construction traffic may temporarily change scenic quality and visual character
- **Demolition:** Removal of commercial, industrial and residential buildings may result in temporary changes to scenic quality and visual character.

Operational impacts

- **New project infrastructure:** installation of new roadways and structures resulting in permanent change to scenic quality and visual character
- **Maintenance of new infrastructure:** routine maintenance works may have temporary low visual impact.

Landscape and visual amenity (continued)

Key above-ground project elements

Tunnel portals: the T2D Project will provide a calming transition to and from the tunnels with elegant tunnel portal structures and passive shading devices that provide an unobtrusive and uncluttered visual experience and reduce any strobing effect for motorway users.

Ventilation facilities: wherever possible, ventilation facilities are planned to be located underground to reduce their visual impact on the surrounding streetscape and landscape. Ventilation facilities, where required above-ground, will be designed with an appropriate scale to appear as buildings or sculptural features. Use of a curved, sculptural form will soften their appearance, and materials and finishes are intended to match the surrounding environment.

Bridges and overpasses: while bridges and overpass structures are significant in size, the design seeks to reduce their impact by featuring slow transitions in

grade change and form as well as light and perforated supporting materials. Transparent materials will be used for noise barriers on top of bridges and overpass structures to maximise visual permeability.

Noise barriers: materials and finishes for noise barriers are intended to match the surrounding environment and also take inspiration from the history of Kaurua Country on which the T2D Project occurs, including indigenous plants, flowers, patterns and colours.

Alternatives, mitigation and opportunities

The T2D Project design seeks to minimise visual and landscape impacts as far as possible. The iterative design process has responded to feedback from community and stakeholder engagement and has identified key areas where visual and landscape impact is a priority. Approximately 60% of the 10.5km T2D Project is in underground tunnels, which significantly reduces permanent visual impacts.

The intention of the project design is not to screen all elements and recede the motorway as a secondary element within the urban landscape, but rather to integrate these elements, highlighting certain elements and screening others.

An Urban Design Strategy (UDS) has been developed for the T2D Project to guide good urban design, landscape and public realm outcomes. The UDS sets principles, objectives and requirements for the T2D Project to achieve high visual amenity through design that helps to mitigate any landscape or visual impacts.



Inside T2D tunnel

Approvals, permits and authorisations

The project is being undertaken under the powers of the Commissioner of Highways under the *Highways Act 1926*, which seeks to 'make further and better provision for the construction and maintenance of roads and works'.

While the *Planning, Development and Infrastructure Act 2016* (PDI Act) is relevant to the project as it regulates the development of land in South Australia, it does not apply where land is owned by or acquired under Section 20(5) of the *Highways Act 1926*. The only exception to this is

where the development materially affects the value of a State Heritage place. Therefore, the PDI Act will have limited application for this project.

To further ensure impacts to land use are minimised wherever possible and to ensure consistency, the project design has incorporated the existing planning controls and general development policies set out by the Planning and Design Code.

The T2D Engagement Campaign (2021) found that **80% of participants felt visual appearance and amenity was important. As such, minimising these impacts has been a priority throughout design, and approximately 60% of the 10.5km project will be in underground tunnels.**

Land use, planning and zoning

Land use planning is the process of assessing and determining how land will be used to meet the needs of an area. This process is bound by policy and planning controls, such as zones, subzones and overlays to ensure that development in South Australia (SA) is appropriately located, designed, and considered.

Land use and planning controls seek to balance the orderly development of land with good social, environmental and economic outcomes by providing direction about where certain forms of development should be undertaken and where types of land uses should be located. Planning controls, together with general development policies, provide rules and guidelines that apply to all parcels of land in SA and are set out by the Planning and Design Code under the *Planning, Development and Infrastructure Act 2016* (PDI Act).

Existing environment

The existing South Road corridor is located within an urbanised area varying considerably in land use. South Road also provides access to multiple significant destinations within metropolitan Adelaide, including the Adelaide Central Business District (CBD), Adelaide

Airport, large retail shopping centres, sports ovals and stadiums, hospitals, schools and universities.

Key land uses and precincts along the T2D corridor include:

- the River Torrens / Karrawirra Parri
- retail and commercial hubs at Castle Plaza, Henley Beach Road main street and the Brickworks Marketplace
- strategic employment precincts including Edwardstown, Melrose Park, Mile End, Thebarton and Hindmarsh
- higher density residential areas (e.g. along Anzac Highway)
- recreation and open space areas, such as Glandore Oval, Richmond Oval and Kings Reserve
- historic areas and character areas in Black Forest, Everard Park, Richmond, Mile End and Thebarton
- Local and State Heritage-listed items such as the Hindmarsh Cemetery, Thebarton Theatre, Brickworks Hoffman kiln, World War Two Civil Defence Sub Control Station, St Mary's Anglican Church, former Roxy Cinema and Maid of Auckland Hotel
- economic activity destinations including Tonsley Innovation District, and the Flinders health and education precinct.

The project area will interact with a number of different land use zones as identified within the Planning and Design Code.

Generally, these zones will include; Employment Zones (encourage commercial and industrial development), and Neighbourhood Zones (low-to-medium density housing and small-scale complementary uses).

Potential impacts to existing environment

The potential land use, planning and zoning impacts of the project have been assessed by applying the project's assessment methodology for both the construction and operational phases of the project. The key land use planning impacts identified through this assessment include:

- property acquisition including surface land, underground land and air space acquisition
- construction works affecting the existing use of land
- operation of the North-South Corridor affecting the future use of land, such as new traffic patterns, air quality and noise impacts
- severance and amenity issues resulting from the project
- new planning policy through a Code Amendment.



The project will also create positive impacts including additional community open space, new active transport infrastructure along the alignment and opportunities for residual construction laydown land to be redeveloped or repurposed at the end of the project. Despite avoiding and minimising many potentially adverse effects through the design process, the scale and complexity of the T2D Project means there will be unavoidable impacts on some land uses, built form and access in the surrounding areas.

Alternatives, mitigation and opportunities

The planning and design stage for the T2D Project has avoided major land use impacts for large portions of the project area. The incorporation of two tunnels in the project design, comprising approximately 60% of the length of the T2D corridor, will minimise the impacts to many heritage places and particularly places of importance to the community.

Important commercial areas will be preserved including the Castle Plaza Shopping Centre, Brickworks Marketplace, and the strategic employment areas of Edwardstown, Melrose Park, Mile End and Hindmarsh. The alignment also protects Black Forest Primary School and Richmond Primary School and retains open space at Thebarton Oval and Glandore Oval.

Opportunities to further mitigate potential impacts will be considered during the detailed design phase and will be guided by the project's Urban Design Strategy to achieve good visual, landscape and functional outcomes. A range of complementary initiatives to support greater housing diversity, improved open spaces and renewed retail and commercial hubs are also being considered through the project. Planning and delivery of the project will involve consultation with the community and key stakeholders to ensure that these initiatives are integrated with existing land use and strategic planning for the area.

To ensure the physical protection of the tunnels from inappropriate development, a new Tunnel Protection Overlay has been introduced through a proposed amendment to the Planning and Design Code. This Code Amendment means there may be an additional process that will occur as part of the usual approvals required for future renovations or building construction that is immediately above or adjacent to the alignment of the new tunnels. The intent of the changes is not to stop developments, but to ensure they do not impact on the tunnels. In most instances, the Code Amendment is not expected to impact any work a property owner may want to do in the future.

Approvals, permits and authorisations

The PDI Act regulates the development of land in SA, however it does not apply where land is owned by or acquired under Section 20(5) of the *Highways Act 1926*. The exception is where development materially affects the heritage value of a State Heritage place or results in tree-damaging activity in relation to a Significant or Regulated tree not located on Commissioner of Highways land.

Accordingly, the T2D Project is being undertaken under the powers of the Commissioner of Highways under the *Highways Act 1926*, which seeks to make further and better provision for the construction and maintenance of roads and works.

To further ensure impacts to land use are minimised wherever possible and ensure whole-of-project consistency, the project design has incorporated the existing planning controls and general development policies set out by the Planning and Design Code.

Noise and vibration

Environmental noise and vibration are disruptive effects typically generated by human activity. Expected environmental noise and vibration sources from the T2D Project include road traffic, surface construction works and tunnelling. Different types of noise and vibration sources are regulated differently. Baseline assessments and modelling help inform the level of risk and potential impact from a project or activity, and are used to determine reasonable and practical mitigation measures.

Noise and vibration impacts are assessed at sensitive receptors, which are typically residential dwellings, schools, hospitals and places of worship. Vibration sensitive receptors typically include occupied buildings, heritage listed places and sensitive infrastructure and equipment.

Existing environment

The existing South Road corridor travels through an urbanised area of mainly commercial and residential

properties. Areas not immediately adjacent to South Road are primarily residential, whilst Hindmarsh, Mile End and Edwardstown are predominantly commercial and industrial suburbs. There are also parks and reserves in the vicinity of the project.

Several heritage listed places and items sensitive to vibration are located along the existing South Road corridor, including Hindmarsh Cemetery, Brickworks Hoffman kiln, Thebarton Theatre and St Mary's Anglican Church. Other non-heritage vibration sensitive items include the SA Power Networks (SAPN) substation at St Marys, the Telstra Exchange in Edwardstown and the Tennyson Medical Centre in Kurralta Park.

Baseline vibration monitoring has been undertaken at 25 potential vibration sensitive locations, including 15 heritage listed places. The monitoring helps the project team understand the existing vibration exposure levels at these locations and informs appropriate vibration limits for project activities. The existing vibration levels in the environment are generally low and mainly influenced by road traffic. Other sources of vibration are localised sources such as industrial activity which typically have minimal impact at sensitive receptors located far away.

The existing noise environment in the vicinity of South Road is generally influenced by road traffic noise. In some areas, commercial or industrial activity also contributes to the noise environment. In residential areas set back further from South Road, the noise

environment is influenced by local traffic, domestic activity and background sounds from the natural environment (birds/wind).

Baseline noise monitoring has been undertaken at 25 locations in the vicinity of the project to help quantify the existing day and night traffic noise levels from South Road. The noise monitoring data has been used to validate road traffic noise modelling and supports the establishment of appropriate construction noise targets.

Potential impacts to existing environment

Potential noise and vibration impacts from the project have been assessed by applying the T2D Project's assessment methodology for both the construction and operational phases of the project. The key noise and vibration impacts that must be minimised include:

- noise and vibration from construction and tunnelling activities
- potential damage to buildings/structures from construction vibration
- road traffic noise from the T2D Project alignment, particularly after demolition of existing buildings and structures to accommodate the project design
- noise emissions from supporting infrastructure.

Alternatives, mitigation and opportunities

Minimising road traffic noise impacts continues to be a central focus through the planning and development phases of the project. The use of tunnels for the majority of the road alignment is expected to provide significant reductions in traffic noise on the surface roads above. Additionally, tunnel boring machines minimise noise and vibration impacts during construction in comparison to typical cut and cover tunnelling or other open motorway construction.

Construction noise and vibration impacts, will be managed through a Construction Noise and Vibration Management Plan (CNVMP). This CNVMP will assess all construction activities and outline the management and mitigation strategies necessary to address impacts. Key management and mitigation strategies include:

- using low noise/vibration construction methods and equipment where possible
- scheduling noisy work during daytime hours to minimise night works and reduce sleep disturbance where practicable and safe to do so
- monitoring noise and vibration levels during construction and amending work activities and times where possible
- undertaking property condition assessments and monitoring vibration levels during construction
- community consultation and stakeholder engagement to inform and engage the public
- constructing acoustic fences or enclosures to reduce the impact of construction noise.

Noise mitigation will be incorporated where modelled road traffic noise from the project design exceeds established criteria. This could include a combination of roadside noise barriers, property fencing upgrades and architectural property treatments. The location and configuration of noise barriers and property fencing will be developed with consideration of other factors such as access, visual amenity and community preference.

Noise impact of supporting infrastructure such as tunnel ventilation facilities will be assessed and where required, incorporate noise mitigation such as attenuators, acoustic louvres and low noise units.

Approvals, permits and authorisations

The project will need to demonstrate that all reasonable and practical measures will be undertaken to minimise noise and vibration impacts during construction and operation.

The project must demonstrate compliance with the Department's Environment and Heritage Technical Manual (EHTM) Attachment 7D – Guideline for the Management of Noise and Vibration: Construction and Maintenance Activities which provides guidance as to the assessment and mitigation approach for noise and vibration impacts during construction. Approval must be sought for CNVMPs and any Night Work Management Plans.

The project must demonstrate compliance with the EHTM Attachment 7A – Road Traffic Noise Guidelines which provide guidance in assessing road traffic noise and vibration. The Road Traffic Noise Guidelines set out the general process to be followed and criteria to be applied when assessing the operational road traffic noise and vibration impacts of infrastructure projects involving new roads and/or major redevelopment of existing roads/road corridors. Compliance with EHTM Attachment 7C – Noise Treatment Implementation Guideline will also be required, regarding the implementation of noise mitigation treatment.



Artist's
impression

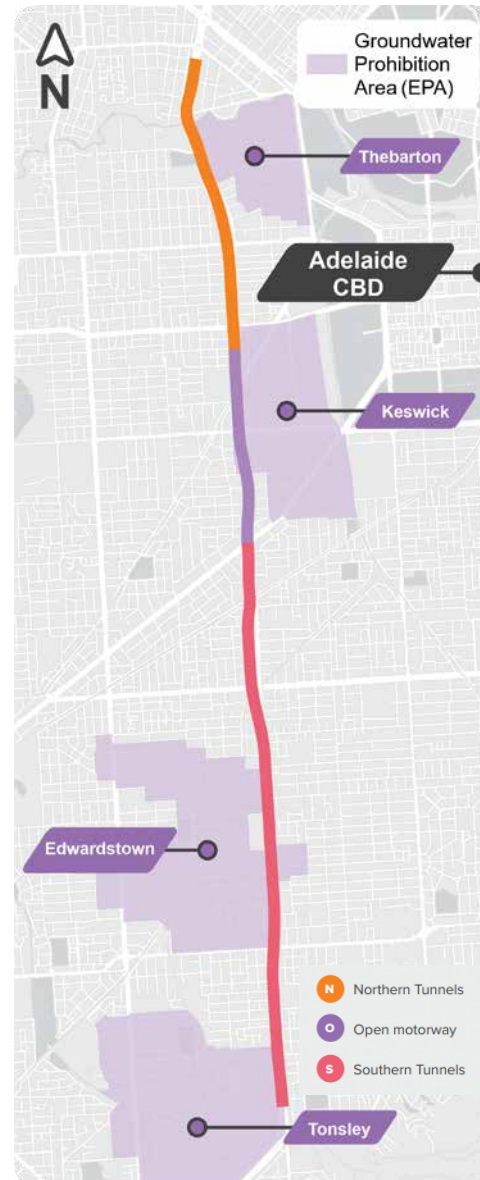
Site contamination

During construction the project is expected to encounter some areas impacted as a result of contamination from the release of chemicals from historical activities undertaken at various commercial and industrial properties along South Road.

Examples of these historical activities include fuel leaks from service stations, spillage of chemicals at industrial facilities or the burial of industrial waste in pits or landfills. The chemicals released from these activities have the potential to affect soil, groundwater, surface water bodies (creeks/ivers) and/or air (vapour).

All identified contaminated areas will be managed to minimise risks to human health and the environment.

It is possible that new areas of site contamination will be discovered during the project construction. Routinely used standard procedures will be put in place to minimise potential exposure of workers and the community to contaminated soils or water during both construction and operation.



Contamination found in locations along the corridor would be a risk to human health if a person had direct contact with soil groundwater or vapours for many years. As the contamination is generally at depth and away from the general public they currently pose no significant risk to human health.

The *Environment Protection Act 1993* (EP Act) provides provisions and regulatory instruments that enables the Environment Protection Authority (EPA) to regulate those responsible for site contamination. The project will comply with the EP Act, regulations and applicable guidance.

Existing environment

A desktop review of the project corridor in 2020 identified more than 350 sites where site contamination is known to, or may, exist. The likelihood of intersecting with many of these sites has been reduced by incorporating tunnels into the project design. As such, approximately 150 of these identified sites will be encountered by the project.

Many of these areas have already been investigated to determine the level of contamination present, but additional work will be required at other sites prior to construction to determine whether site contamination is present and whether remediation works will be required.

The project corridor is also located within or adjacent to four groundwater prohibition areas (GPA). This is where site contamination impacting groundwater has previously been found and reported to the EPA and therefore extraction of groundwater for drinking or irrigation is not allowed.

Potential impacts to existing environment

The site contamination impacts of the project have been assessed for both the construction and operational phases of the T2D Project.

The key potential site contamination impacts found through this assessment process include:

- worker exposure to soil, groundwater and vapour during the construction phase of the project
- potential movement of chemicals into deeper groundwater
- potentially contaminated surface water run-off into adjacent surface water bodies such as River Torrens / Karrawarri Parri, Keswick Creek and Brownhill Creek / Williwilla during construction and operation
- general public exposure to soils and vapour during the excavation of lowered motorways which is highly unlikely
- maintenance worker exposure to soil and groundwater post construction.

The potential impacts identified above are common to large scale construction projects in areas where commercial/industrial properties are located.

Best practice management measures will be put in place to manage these risks. It is expected that the removal of contaminated soil and groundwater during the construction process will also have an overall positive impact on the environment adjacent to the project corridor.

Processes will also be put in place to ensure that site contamination will not occur as a result of the project itself.

Alternatives, mitigation and opportunities

The proposed project alignment will go beneath or will avoid many of the sites where contamination is known to, or may, exist. The depth of the Southern Tunnels in particular has been lowered and moved westwards so that it has limited interaction with the adjacent GPA, as well as some sites where contamination is known to exist.

Where contaminated soils are encountered these will be removed and disposed of at a suitably licenced landfill site away from the project alignment.

Contaminated groundwater, including from the four GPAs, will be extracted to allow for the construction of the tunnels. This water is planned to be treated where required to appropriate standards prior to reuse or release into existing surface water bodies.

The industry has developed many procedures that will be applied to limit potential exposure to human health and the environment during construction. Routine monitoring will be conducted to ensure these procedures are effective.

Approvals, permits and authorisations

All works will comply with the EP Act and its supporting regulations and guidelines (including the National Environment Protection (Assessment of Site Contamination)). Regular interaction with the EPA will ensure the project complies with the EP Act as well as being consistent with current industry best practice.

Social

The social impact assessment for the T2D Project focuses on the community, their relationships and the sense of place for residents and businesses close to the project corridor. The impacts from the project can be positive or negative to the amenity and character of the built environment, connectivity, its local sense of community and the wellbeing of the local community.

The assessment considered the existing community near the project and identified potential vulnerable members or groups that may be impacted. It also identified those places the community value highly and which may be more sensitive to impact from the project.

The T2D Project prioritises faster journeys for more efficient travel times and improved road safety whilst enhancing local character, and supporting community values and cohesion along the corridor. The project design strives to avoid or minimise as far as possible any social impacts during construction and operation of the infrastructure.

Existing environment

The social impact assessment area was taken to extend 1.6km either side of the project corridor

(approximately a 20-minute walk). According to the 2021 Australian Bureau of Statistics Census (ABS) this assessment area has a total population of 84,240 with a large proportion of high-density housing and renters in the area.

Noting South Australia's current unemployment rate of 3.8%, at the time of the 2021 ABS Census unemployment rates were commonly about 4% to 7%. These rates were comparable to the surrounding local government areas, while average income were similar to that of wider metropolitan Adelaide.

The assessment identified more than 170 community facilities in the project area which include recreational, community services, health and disability organisations, places of worship/faith-communities, childcare and schools, hospitals and emergency services.

Potential impacts to existing environment

Potential construction impacts to community wellbeing requiring specific mitigation measures are anticipated to include:

- relocation of residents and businesses near the tunnel portals and along the extent of the open motorway
- temporary construction noise, vibration and air quality impacts to adjacent residents and businesses

- temporary increase in heavy and light vehicle movements during construction affecting existing traffic, amenity and safety
- 'construction fatigue' for adjacent residents, businesses and the community near the tunnel portals and for the extent of the open motorway
- temporary disruption to road access, including street parking, pedestrian and cyclist networks, public transport and access to social infrastructure.

Operational impacts identified a majority of beneficial impacts while some potential negative impacts to community wellbeing remained. These impacts will be subject to further mitigation measures and design. The operational impacts both positive and negative include:

- improved overall road connections and network efficiency for commuter and freight traffic throughout and across the project corridor
- reduced traffic above the tunnels improving local amenity and pedestrian and cycling safety
- connected road and pedestrian networks improving accessibility to businesses, services and community facilities
- certainty over the future construction and land acquisition requirements for this final section of the North-South Corridor
- adverse amenity and access outcomes due to elevated surface elements of the motorway including noise walls at some locations
- noise and vibration, air pollution, traffic and amenity impact in some areas once operation commences if not mitigated during design.



Alternatives, mitigation and opportunities

The Department's Master Specification requires the project to assess and document outcomes that minimise social impacts during construction that include compliance with:

- Community Engagement and Media Management Plan
- Wayfinding Strategies (for both construction and operation)
- Work Health Management Plans
- Safe Work Method Statements for construction
- Construction Traffic Management Plans
- Contractor Environment Management Plans.

These measures are in addition to mitigation measures required for air quality, noise and vibration, landscape and visual amenity and traffic and transport as documented in the relevant Project Assessment Report (PAR) chapters.

The operational phase of the project delivers a range of social impact benefits to the community as described in the project description and summarised above. With these benefits comes a further opportunity to consider placemaking activities to add to local character, social activation and community identity as part of the Urban Design Strategy, including a project specific Crime Prevention through Environmental Design strategy.

Approvals, permits and authorisations

Approvals relevant to social impacts from the T2D Project are typical of the overarching planning and transport approval requirements for the project.

Specifically, the project will comply with the:

- South Australian Government's 10-step acquisition process and requirements of the *Land Acquisition Act 1969*
- *Highways Act 1926* allows the Commissioner of Highways to acquire land required for purpose of road construction. The *Highways Act 1926* grants powers to carry out roadworks and tree damaging activity
- *Planning, Development and Infrastructure Act 2016* (PDI Act). This act does not apply where land is owned by or acquired under Section 20(5) of the *Highways Act 1926*, except in relation to a State Heritage Place therefore the PDI Act will have limited application for this project
- *Heritage Places Act 1993*. This Act guides the protection of identified heritage places that may be impacted by the T2D Project.

Surface water

Surface water is defined as water that flows over or is stored on the surface of the earth either permanently or for short time frames, such as seasonally.

The quantity and quality of surface water is important to the health and sustainability of Adelaide's urban freshwater rivers, creeks and ultimately the marine environment of Gulf St Vincent. There are multiple locations where the T2D Project intersects watercourses within water catchments, and obstruction of existing flow paths in these areas has the potential to alter the existing flood risk. If not considered and incorporated into the design, this could pose additional flood risk to the community, surrounding properties and infrastructure within and adjacent to the project corridor.

The T2D Project corridor crosses three major watercourses: the River Torrens / Karrawirra Parri, the Keswick Creek and Brownhill Creek / Willawilla.



Existing environment

The current hydrological catchments (a boundary where all surface water runoff drains to a specific watercourse or water body), flooding risks and surface water quality were assessed as part of the project planning.

The project corridor is mainly within the Patawalonga Basin and River Torrens / Karrawirra Parri catchments which are historically highly modified to a point where drainage is provided by a system of underground pits, pipes and culverts. These transfer water runoff from the surrounding areas to one of the major watercourses that flow out to the Gulf St Vincent.

The project's potential impact on each watercourse regarding potential flooding impacts has been investigated with mitigation measures identified and confirmed for incorporation into the design. These assessments also considered future climate change scenarios and related potential extreme events.

While the existing surface water quality within and adjacent to the project corridor does not always meet the water quality guideline values set by the Environment Protection Authority (EPA), the design of the project will minimise further degradation of water quality during both construction and operation.

Potential impacts to the existing environment

The key surface water construction impacts identified that will need suitable mitigation measures include the following:

- dewatering, spills and leaks, release of hazardous materials or litter into the receiving watercourses that would worsen water quality through the catchment area
- extreme stormwater discharge has the potential to change the direction and flow of surface water, subsequently increasing flood risk frequency and severity in low lying areas
- construction activities causing riverbed or riverbank erosion or construction dewatering which could cause temporary impacts to water quality and the management of flows within the local drainage network.

Operational impacts to receiving water courses needing to be mitigated include:

- project infrastructure causing changes in surface water flow paths potentially increasing flood risk that could affect residents or built assets within the floodplain

- increased amount of sealed roadways from the project increases runoff resulting in contaminants being released into watercourses particularly from traffic
- increased water flows to receiving waters causing bed or bank erosion, worsening water quality
- an extreme flood event during the operation of the tunnel which could negatively impact on road user and public safety.

Alternatives, mitigation and opportunities

Surface water mitigation measures will include the requirement to manage and treat construction dewatering and construction site surface water flows to meet with EPA water quality requirements when site re-use is not possible and discharging water off site is required.

Water Sensitive Urban Design (WSUD) elements, including swales and detention basins will be incorporated to manage pollutants generated from the operation and maintenance of the infrastructure.

A Soil Erosion and Drainage Management Plan will be prepared as part of the Construction Environmental Management Plan (CEMP).

The Department's Master Specification has specific requirements applicable to the mitigation of impacts to surface water including environmental design, planning, drainage and protecting waterways.

The contractor delivering the project must follow Master Specification requirements for environmental management and protection including sustainability in construction measures. Operation and maintenance of the T2D Project will also follow Master Specification requirements for environmental management and protection including preparation and implementation of a flood mitigation strategy.

These and many other criteria included in the design are expected to be sufficient to mitigate the negative impacts identified in the surface water assessment.

Approvals, permits and authorisations

The following approvals are required in relation to surface water: wastewater treatment licence in

accordance with Schedule 1, Section 3(4)(b) of the *Environment Protection Act 1993* refers to license for the operation of a wastewater treatment plant. This would apply to the operation of water treatment facilities and discharge of treated water.

Section 4(6) describes earthworks drainage and is a separate license type under the act.

Section 4(4) describes a dredging license for excavation works in watercourse and is a separate license type under the act.

Under Sections 104 (3) and (4) of the *Landscape South Australia Act 2019*, a permit is required for water affecting activities unless the works are approved under another act, such as the *Planning Development and Infrastructure Act 2016*, the *Environment Protection Act 1993* or the *Native Vegetation Act 1991*.

Water Affecting Activity Permits will be required for each of the three watercourses (River Torrens / Karrawirra Parri, Keswick Creek and Brownhill Creek / Willawilla) that pass through the project corridor. Under the *Water Industry Act 2012*, the project's final stormwater solution will require EPA approval.

Sustainability

Sustainable infrastructure is infrastructure that is designed, constructed and operated to optimise environmental and climate resilience and social and economic outcomes over the entirety of its life cycle.

Sustainability commitment

A project-specific sustainability commitment and associated sustainability requirements have been developed for the T2D Project that respond to the impact and opportunity areas identified during the project's planning phase. This will inform contract and procurement documentation by:

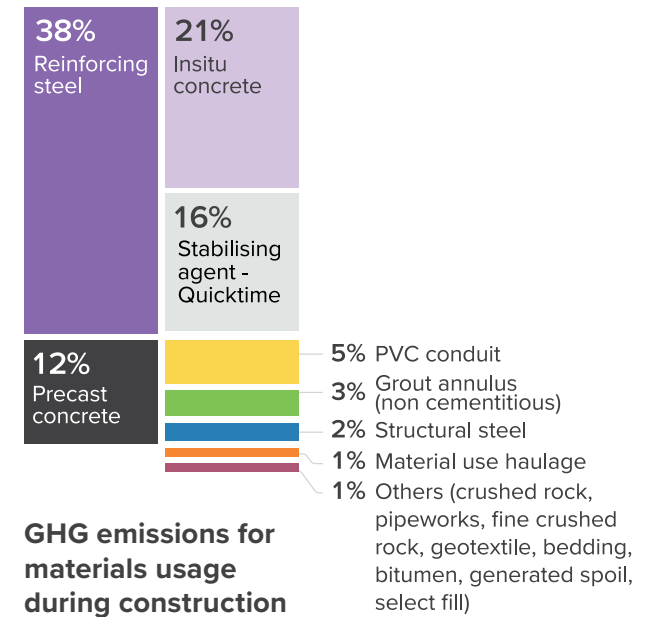
- fostering future-ready and resilient infrastructure and communities
- protecting and enhancing the local environment and communities
- integrating and embedding sustainability through developing measurable targets and consideration in project decision making and the supply chain.

Potential impacts to existing environment

There are many factors that contribute to positive and negative sustainability impacts and opportunities for this project, including its complexity and scale, the extended construction time period, the long-term operational activity and the demand on resources.

It is anticipated the project will create long-term opportunities for the community, environment and the economy, however it may also have some adverse sustainability impacts. Initial sustainability assessments have been completed based on the project design, seeking to identify sustainability impacts and opportunities anticipated to be most significant for the project including:

- whole-of-life greenhouse gas emissions and reduction opportunities
- circular economy
- climate change resilience
- greening and Water Sensitive Urban Design (WSUD)
- reducing potable water use
- social
- urban renewal.



GHG emissions for materials usage during construction

Alternatives, mitigation and opportunities

Early design intervention is essential in ensuring sustainability success for the project and to mitigate construction and operation impacts. To support this, initiatives that address the key sustainability impact and opportunity areas, which depend on early intervention (i.e. implementation in the project design), have already been identified as follows:

Key impact area	Design element	Sustainability opportunities
Greenhouse gas emissions	Tunnel ventilation system and lighting	Design for tunnel ventilation system to prioritise energy efficiency. Optimise lighting design for energy efficiency.
	Tunnel design	Optimise horizontal and vertical alignment to minimise distance travelled and optimise tunnel cross-section (length and shape) to minimise construction requirements (energy and materials).
	Construction materials usage	Reduce Portland cement content in concrete, steel quantities and whole-of-life embodied emissions in pavement uses.
	Construction/haulage vehicles	Use of low emission vehicles in place of diesel-fuelled vehicles.
Circular economy	Project-wide materials	Maximise diversion of waste from landfill and use of recycled materials.
Efficient water use	Tunnel boring machines (TBM)	Minimise potable water use, including substitution of potable water.
	Landscape irrigation	Efficient use of water, including substitution of potable water.
Climate change resilience	Whole-of-project assets	Incorporate climate change and natural hazard adaptation measures.
Green infrastructure	Greening and water sensitive urban design	Increase green canopy cover by 20% and improve WSUD outcomes.
Social	Social infrastructure and community facilities, local businesses	Providing local employment opportunities, and minimising community disruptions and impacts.
Urban Renewal	Urban design and city shaping	Including improved connectivity, land use uplift and enhanced public amenity.

Mitigation of construction phase impacts will require a combination of early design intervention, design optimisation, identification of alternative resources (including non-potable water sources, use and generation of renewable energy, and materials with reduced embodied greenhouse gas emissions) and early engagement with suppliers and key stakeholders.

Mitigation of operational phase sustainability impacts will require a similar combination of mitigation measures as those required for construction, however with particular focus to whole-of-life impacts to be managed through maintenance activities, and any handover of assets which will take place.

Approvals, permits and authorisations

Depending on the final sustainability initiatives adopted for implementation as part of the project, approvals, permits or authorisations may be required. For example, if the use of recycled water during construction is implemented, relevant approvals from local councils, SA Water and SA Health may be required.



Greening opportunities, T2D Anzac Highway

Traffic and transport

Transport systems should support the efficient movement of goods and people from one place to another in a safe and efficient manner. This can support trade and commerce, connect communities and provide safe and easy access to education, healthcare, employment opportunities, and other essential services.

As a key link in Adelaide's major north-south road spine, South Road between the River Torrens and Darlington, attracts high passenger and freight vehicle volumes, putting this non-motorway sections of the corridor under increasing pressure, hindering its ability to effectively support the economic productivity and efficiency of the State.

Traffic and transport assessments have been undertaken across several years to understand the potential impacts and benefits of the T2D Project to deliver the best outcomes for South Australia.

These assessments include understanding the existing features of the current traffic and transport network, the potential impacts and benefits of the planned

upgrades and necessary mitigation measures, as well as considering opportunities to enhance social and environmental outcomes where possible.

The assessments show that the project is expected to have significant traffic and transport benefits for road users and the community both along the corridor and across the broader network.

Existing traffic and transport environment

The North-South Corridor (NSC) is a critical part of Adelaide's transport network and is its primary economic corridor. It's role as a strategic commuter and freight route is recognised with the NSC forming part of the National Land Transport Network— a designated network of nationally important road and rail infrastructure links.

The section between the River Torrens / Karrawirra Parri and Darlington carries up to 61,000 vehicles per day and is the most complex section of NSC due to proximity to the Central Business District (CBD), connectivity requirements to the arterial network and key destinations, and dense inner suburbs. There are 21 sets of traffic lights to pass through with road users facing daily congestion, excess delays, safety risks and high crash rates.

In addition to north-south movements, accessibility is impacted on east-west movements (180,000 vehicles on an average day) with excess delays, which reduces the

attraction of sustainable transport choices such as public transport or cycling or walking.

The performance of Adelaide's east-west arterial roads is important for the efficiency of bus movements servicing communities in western suburbs. There are around 15 communities and business districts serviced by a high-frequency '15-minute Go-Zone' bus service on the western and south-western side of the CBD. In addition, South Road is a major bus corridor primarily serving the southern suburbs, including express and limited-stops services. It is also a key link for city-bound bus routes from the west. There are approximately 30 bus stop pairs on South Road within the project area.

The Glenelg tram line crosses over South Road, grade separated on an overpass with Tram Stop 6 located on the overpass. Currently, pedestrians access Stop 6 via stairs, or lifts on either side of the tram line.

The Seaford Rail line also intersects South Road at Cross Road intersection. However, South Road is grade separated with an overpass over Cross Road intersection, therefore no impacts are anticipated to the existing rail operation, pedestrian and public transport interface during construction or operation of the project.

Pedestrians and cyclists currently have four designated options to cross South Road's four lanes of traffic such as signalised crossings at intersections, pedestrian activated crossings and median refuges.

Potential impacts to existing environment

Traffic and transport modelling has been undertaken to assess the expected future traffic performance during the construction and operation phases of the project.

The key construction traffic and transport impacts identified are:

- road closures and network congestion
- increased heavy vehicle movements
- potential bus service disruption
- improve cycling and walking connections.

The key operational traffic and transport impacts are beneficial and include:

- improved north-south travel times by reducing congestion
- improved public transport travel times
- changes to some local road access
- enhanced liveability and opportunities for urban development
- opportunities to enhance active travel
- enhanced visual amenity around the project corridor
- enhancing overall road safety.

Alternatives, mitigation and opportunities

Construction works are expected to increase travel times and delays along the South Road corridor in the short term however, there are plans and processes to mitigate and minimise issues as much as possible. These include:

- contractor to develop a detailed Traffic Management Plan that minimises traffic impacts and retains accessibility
- programming works, and timing of the works to minimise impacts on the community, residents and businesses
- use of effective diversions and alternate routes and bus stop relocations
- clear and latest communication of closures or changes to accessibility
- ongoing stakeholder and community engagement.

The T2D Project has identified several opportunities for further design efficiency to increase functionality and connectivity along the corridor including:

- broader network upgrades required to ensure the network functions effectively during construction, and on completion of the T2D Project these upgrades continue to be reviewed and prioritised for positive transport outcomes on the arterial road network, cycling and pedestrian networks

- modified and improved South Road Tram Overpass to enhance the T2D Project design
- multiple new east-west active transport crossing locations:
 - along the corridor at Thebarton (near River Torrens / Karrawirra Parri)
 - at James Congdon Drive near Tennyson Street north of Anzac Highway
 - near Pleasant Avenue south of Glenelg tram line
 - near Byron Avenue/ Walsh Avenue north of Tonsley Boulevard
- other T2D Project initiatives include supporting active travel, planning for local area traffic management and enhancing South Road through improved urban realm.

The T2D Project will be further refined through the procurement phase informed by consultation with community and stakeholders.

Approvals, permits and authorisations

The traffic and transport design components of the T2D Project shall be undertaken in accordance with the Department's Master Specification.

Glossary

Abbreviation	Term
ABS	Australian Bureau of Statistics
AGD-AAR	Attorney-General's Department's Aboriginal Affairs and Reconciliation Division
Air Quality EPP	Environment Protection (Air Quality) Policy 2016
BIA	Business Impact Assessment
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CNVMP	Construction Noise and Vibration Management Plan
EHTM	Environment and Heritage Technical Manual
EP Act	<i>Environment Protection Act 1993</i>
EPA	Environment Protection Authority
GPA	Groundwater prohibition area
HIA	Health impact assessment
ILUA	Indigenous Land Use Agreement
ITS	Intelligent transport system
km	Kilometres

Abbreviation	Term
m	Metres
m/s	Metres per second
NO ₂	Nitrogen dioxide
NSC	North-South Corridor
NTA	<i>Native Title Act 1993</i>
PAR	Project Assessment Report
PDI Act	<i>Planning, Development and Infrastructure Act 2016</i>
PM	Particulate matter
RSS	Roadside significant sites
SA	South Australia
SAPN	South Australia Power Network
T2D Project	River Torrens to Darlington Project
T2T Project	Torrens Road to River Torrens Project
TBM	Tunnel boring machine
UDS	Urban Design Strategy
WSUD	Water Sensitive Urban Design



T2D Southern Tunnels, southern portal

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Published February 2024

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