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.

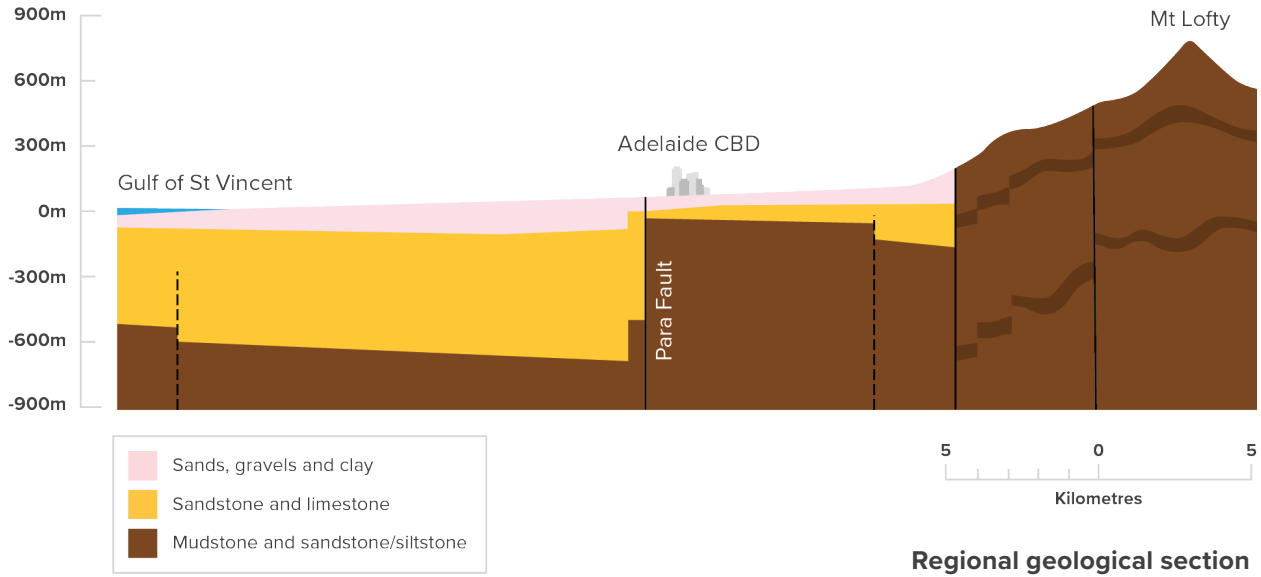
Deeper soil and rock that the tunnels will be built through are made up of layers of sandy materials interspersed within clay layers. These softer sediments rest on top of deeper limestone and sandstone.

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

Scan the QR code to view the suite of assessments included in the PAR or visit **T2D.sa.gov.au/PAR**.