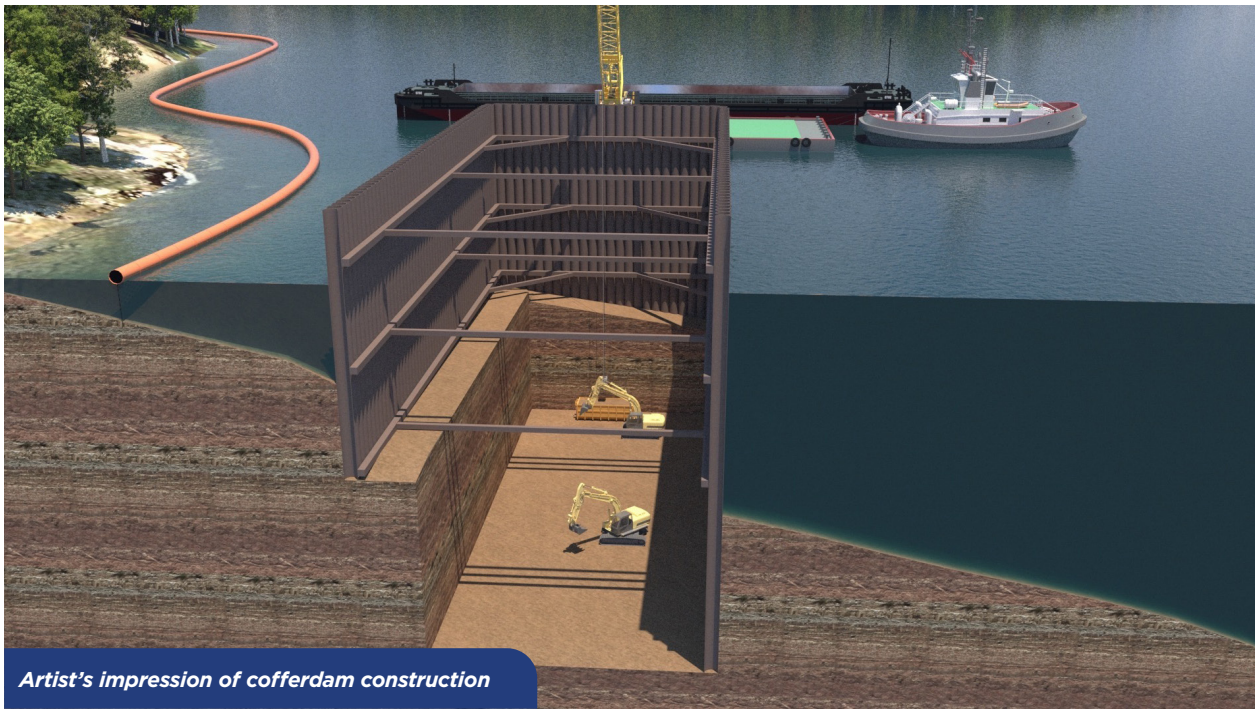
Transport for NSW

Beaches Link and Gore Hill Freeway Connection



Artist's impression of cofferdam construction

Building across the harbour

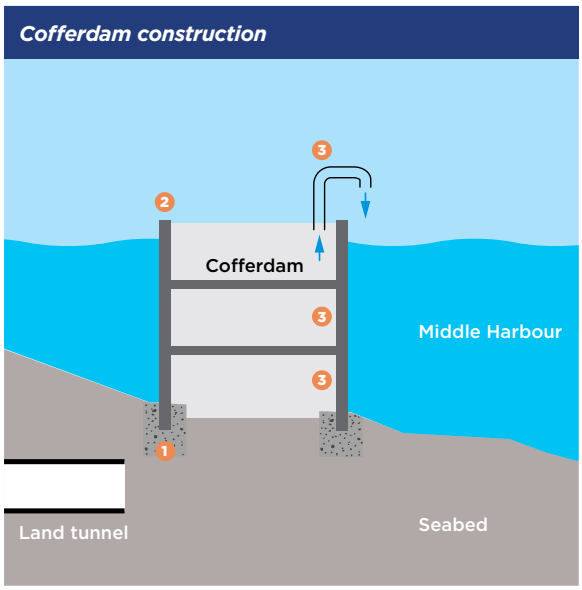
Cofferdams

We will be building a temporary cofferdam at each end of the harbour crossing, one off the shoreline of Northbridge and the other off the shoreline of Seaforth. These temporary cofferdams are required so we can build the connection between the land tunnel and the immersed tube tunnels. These cofferdams will each be about the size of an Olympic sized pool. They are temporary and we will remove them once the work is finished.

Cofferdams are made up of interlocking piles (like round hollow metal pipes) to form an enclosed watertight wall. Each pile will be vibrated down through the sediment and then driven into the sandstone below the seabed until it is secure and cannot move. Piling will take place from a barge using a crane fitted with a hydraulic vibrating hammer, offshore pile driving hammer and/or a similar piece of construction equipment.

Once each cofferdam is in place, we will pump the water out of the cofferdam and install the structural steel framework to make the cofferdam structurally sound and safe to work inside.

Building the cofferdams



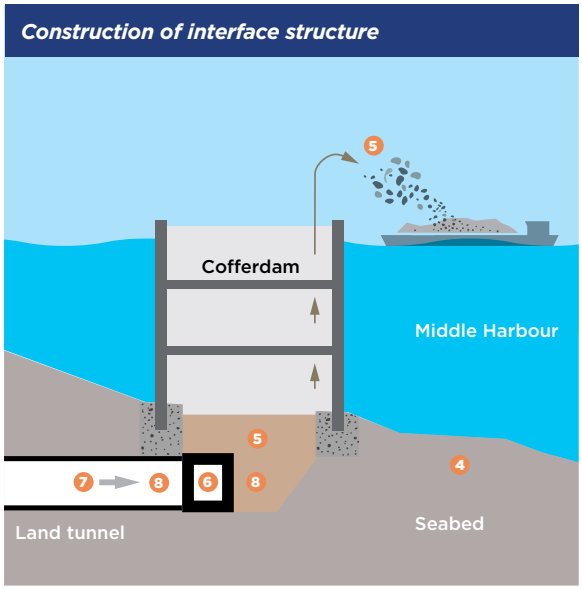
1. Ground treatment to improve the strength of the seabed
2. Installation of piles to create the outer structure of the cofferdam
3. Dewatering and installation of structural support

Building within the cofferdams

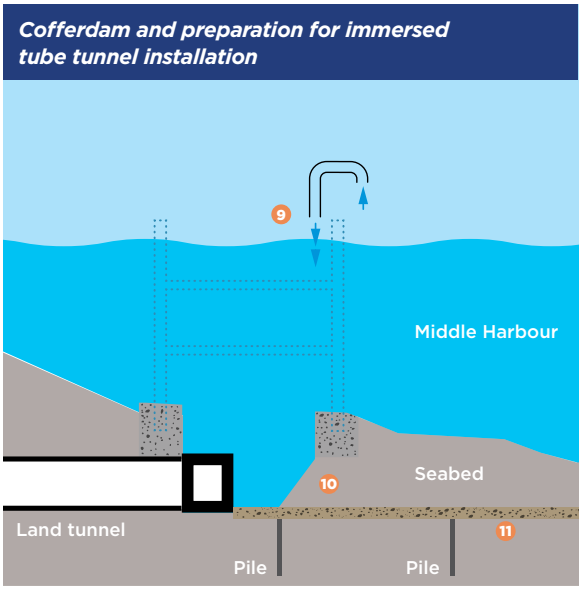
Once the cofferdams are in place and drained of water, we will remove the sediments and sandstone within each cofferdam using excavators with rockhammers to form a flat base at the tunnel level. We will then build a concrete structure (known as an interface structure) in each of the cofferdams. This will connect the tunnel under the water to the tunnel under the land.

Removing the cofferdams

Once we have finished building the interface stuctures, the cofferdams will be removed. This process involves filling them with water to the same level as the water level outside and removing the structural steel framework and piles. The marine environment will be rehabilitated as needed.



4. Commence dredging of the seabed, where required, to create a trench for the immersed tube tunnel
5. Excavation of sediment and rock within the cofferdam to final design level of the tunnel
6. In-situ construction of the tunnel interface structure
7. Breakthrough of mainline tunnel into interface structure using roadheaders
8. Installation of bulkhead structures at tunnel interface structure to provide a waterproof seal



9. Filling of cofferdam with water and removal of structure support
10. Finalise dredging adjacent to the cofferdam
11. Installation of a gravel bed and supporting piles within the trench in preparation for immersed tube tunnel installation

Seabed dredging

To get ready to place the immersed tube tunnel units we will need to prepare the seabed. This will involve creating a partial trench for the immersed tube tunnel to lie in. Most of the middle section of the immersed tube tunnels crossing Middle Harbour will be located on the existing seabed. This means we will not require a trench for the middle portion, reducing the amount of dredging required for the Middle Harbour crossing.

The dredging method we use will depend on what type of material we are removing, for example we use different equipment to remove rock than we do for sediment.

In planning our work and selecting our equipment, we have carried out marine ecology surveys, sediment testing and modelled water movements to confirm we have a strong understanding of the marine environment. We will be using a number of safeguards to manage the potential impacts to ecologically sensitive areas.

1. Backhoe dredge with closed environmental clamshell bucket

To remove some of the softer material from the seabed a closed environmental clamshell bucket will be used. This is a closed bucket attached to a large backhoe dredger. This is used to minimise the spread of material into the water as it is being removed and to allow for materials to be loaded directly onto barges.

Type of material

There will be two different types of material being removed by this method:

- soft sediments which are not suitable for reuse or offshore disposal. They will be tested and treated before being disposed of at a licenced facility on land.
- clean soft sediments suitable for offshore disposal. They will be transported by barge to be disposed of at the offshore disposal site.

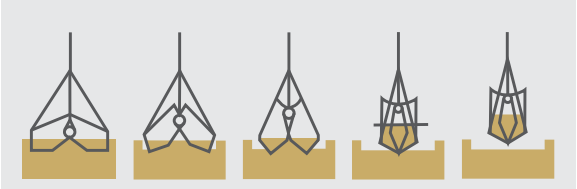


Illustration of closed environmental clamshell bucket

2. Backhoe dredge with rotating cutter head

A rotating cutter head will be used to cut and fragment rock underwater. After the material is cut using the cutter head, a backhoe will lift the materials from the water and load it into a barge. This material will be transported by barge to the approved offshore disposal site for disposal.

Type of material

- rock suitable for offshore disposal.

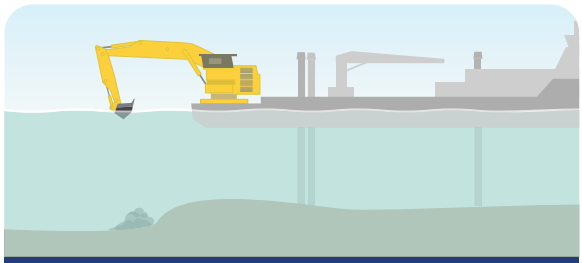


Illustration of backhoe dredger

Installing support piles

Due to very soft marine sediments in Middle Harbour, the immersed tube tunnel units will need to be supported on piles near the middle of the crossing. Installation of these piles will be carried out using similar equipment used to build the cofferdams.

Steel casings (round hollow metal pipes) will be vibrated through the sediments and then driven into the rock below the seabed and filled with reinforced concrete. The piles will be cut to the required level and a concrete headstock will be placed on top of the piles and locked in place. A headstock is a precast horizontal concrete piece which sits on top of the piles to support the weight of the tunnel. This forms the foundation for the middle section of the tunnels.

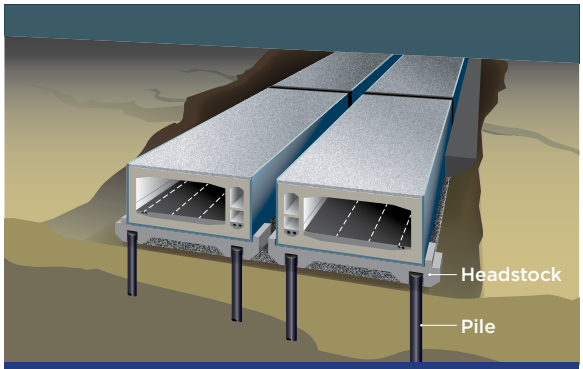


Illustration of support piles in Middle Harbour

Immersing the tunnel units

We will be positioning the immersed tube units using pontoons, tugboats and a navigational guidance system. Each unit is immersed by remotely pumping water into tanks within the units – similar to a submarine. The units have large seals on each end to create a watertight joint with the adjacent unit.

After each unit is immersed, concrete pavement is cast inside the unit to ensure it can no longer float. Locking fill is placed around the unit to lock it into place.

We will be placing units one at a time. It will take around 24 to 48 hours to install each unit. There will be some localised temporary harbour closures in the area when this is happening.

Managing spoil and waste when building in the water

Before we start building, a detailed Construction Environment Management Plan (CEMP) will be developed to detail how the project will preserve, protect and manage any potential impacts to the local environment. The CEMP will need to be approved by DPIE before we can start any major construction work.

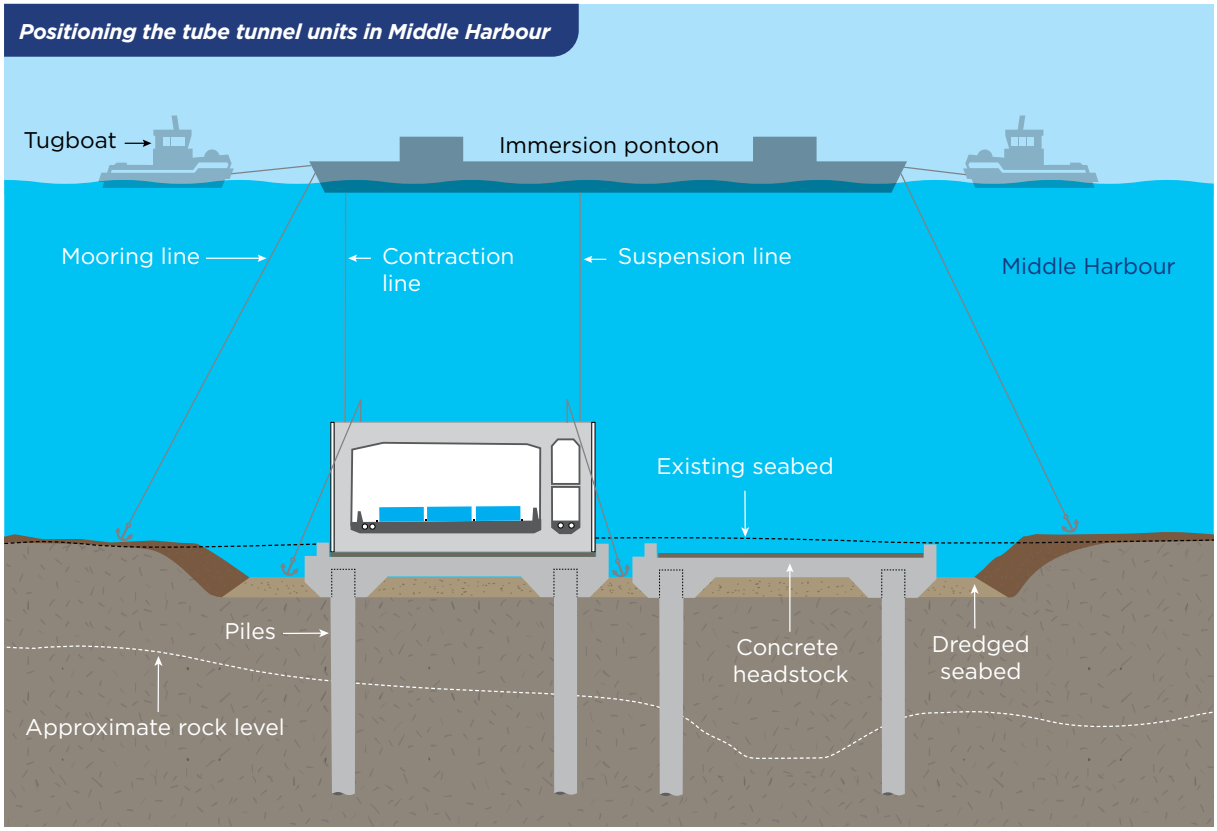
The CEMP will be a working document, subject to ongoing changes and updated as necessary, to respond to specific requirements or issues. Any handling of contaminated sediments will be carried out in accordance with the CEMP and an Environment Protection Licence issued by the NSW Environment Protection Authority.

We will continue to have a dedicated team of environmental specialists who oversee this process.

We will be removing materials from the seabed and immersed tube tunnel construction by using barges. Some dredged material associated with the construction of the crossing of Middle Harbour will be suitable for offshore disposal. We have submitted an application to the Commonwealth Department of Agriculture, Water and the Environment for offshore disposal of suitable dredged material. We will transport suitable dredged material to the offshore disposal site using barges.

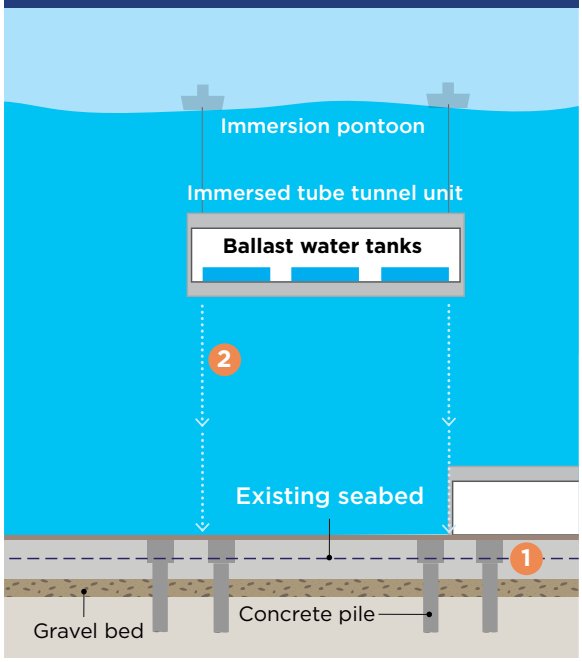
We will transport any dredged material not suitable for offshore disposal to a facility outside Middle Harbour where it will be made spadable (a consistency which allows the material to be spaded or shovelled) and then loaded onto trucks for disposal at a land-based, licensed facility.

Positioning the tube tunnel units in Middle Harbour



Tunnel unit immersion

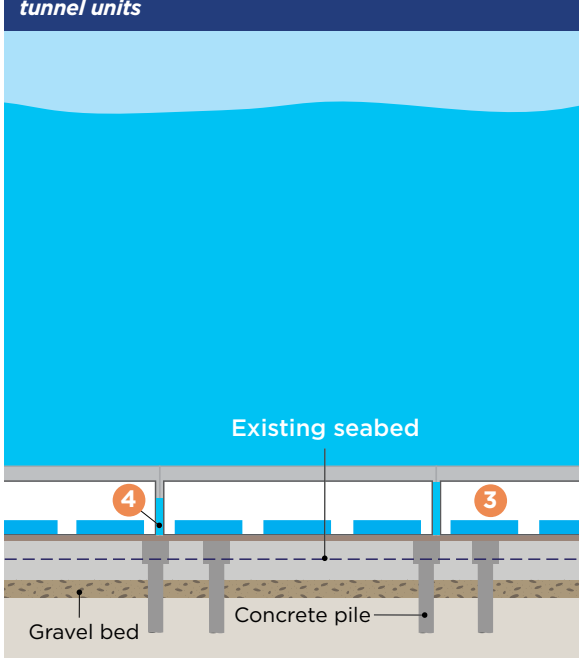
Installation of immersed tube tunnel units



1. Installation of gravel bed and/or supporting piles
2. Immersion of immersed tube tunnel unit against previous unit

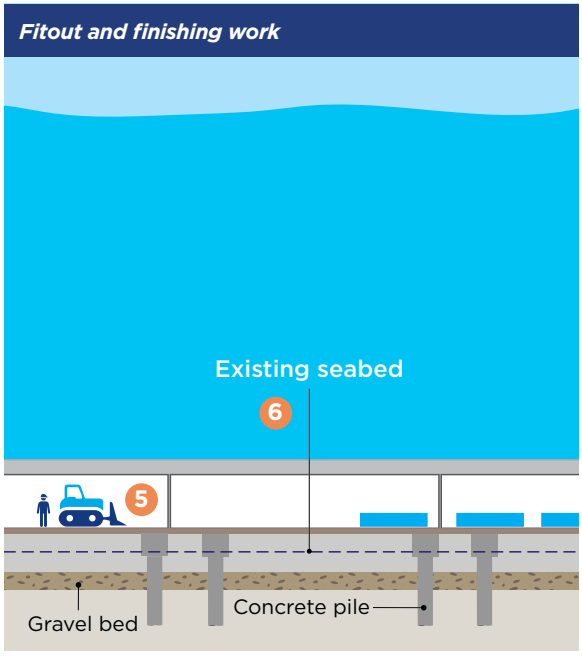
Water ballast

Connection and dewatering of immersed tube tunnel units



3. Connection of immersed tube tunnel unit with interface structure or adjacent immersed tube tunnel unit and installation of waterproof joint between units/structures
4. Dewatering of immersion joint

Fitout and finishing work



5. Casting the closure joint
6. Removal of water ballast tanks, casting of pavement and fitting out

Building the immersed tube tunnel units

The twin immersed tube tunnels will be around 340 metres long and have three individual pieces (called units) for each carriageway, with six units in total. The outer steel shell of the units will be made offsite, towed via tugboats to the Spit West Reserve temporary construction support site, where they will be fitted out with steel reinforcement and concrete. An additional concrete layer will be provided to protect the top of the completed tunnel units from damage during operation, such as potential damage from falling or dragging anchors.

Once completed, each unit will be floated to a temporary mooring site east of Clive Park in Middle Harbour for temporary storage.

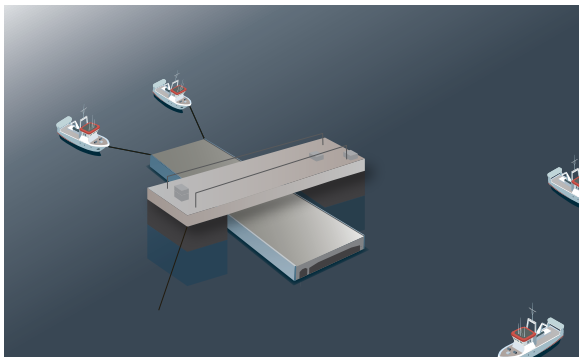
The temporary mooring location will allow us to store the first four immersed tube tunnel units before they are installed. The final two units will be towed directly to the immersion site.

Once we have built the interface structures and completed the seabed dredging and support piling, we will move the units via tugboats one at a time to the immersion site.

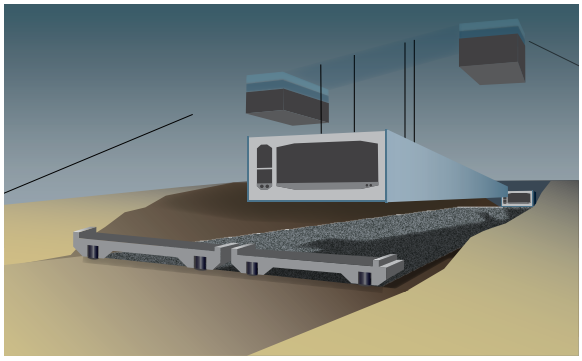
1. Transport of steel shell unit through Spit Bridge.

2. Steel shell unit arrives at construction site casting facility.

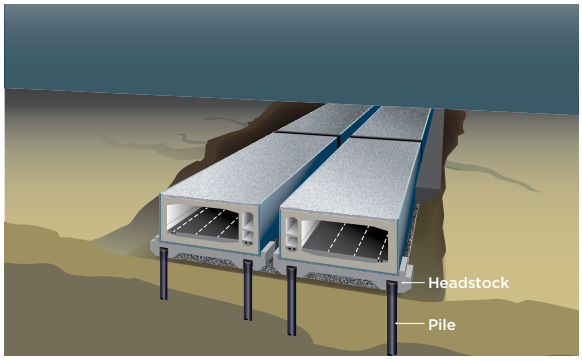
3. Floating steel shell unit arriving at casting facility for concrete construction.



4. Transport of completed unit to immersion site.



5. Immersion of a completed tunnel units.



6. Completed units partially within trench with locking fill.

Contact us

nswroads.work/blportal

1800 931 189

whtbl@transport.nsw.gov.au

Customer feedback
Transport for NSW, Locked Bag 928
North Sydney NSW 2059

Visit our interactive web portal
Read the EIS, find out more or ask our team a question.

nswroads.work/blportal

Our phone line is monitored 24 hours when work is taking place.

Translating and Interpreting Service

If you need an interpreter, please call the Translating and Interpreting Service (TIS National) on **131 450** and ask them to telephone Transport for NSW on **1800 931 189**.

Chinese (simplified)
若您需要口译员，请拨打 **131 450** 致电翻译与口译服务处(TIS National)，并要求他们转拨 **1800 931 189**致电 Transport for NSW。

Italian
Se avete bisogno di un interprete, chiamate il servizio traduttori e interpreti (TIS National) al numero **131 450** e chiedete di telefonare a Transport for NSW al numero **1800 931 189.**

Portuguese
Se necessitar de um(a) Intérprete, por favor, ligue para o Serviço de Tradução e Interpretação (TIS National), através de **131 450** e peça o telefone do Transport for NSW, através de **1800 931 189**.

Privacy Transport for NSW is collecting your personal information in connection with Beaches Link and Gore Hill Freeway Connection ("the Project"). In addition to collecting your name and contact details we may collect other information such as your submissions and other communications with us. We will retain and use this information for consultation purposes, including communications and analysis in connection with the Project. We will not disclose your personal information to third parties unless authorised by law and if we include your submissions in any public report we will not identify you. Providing your personal information is voluntary but if you do not provide it we may not include you on our stakeholder database and you might miss further consultation opportunities. Your personal information will be held by us and you can contact us to access or correct it. Please write to us at either whtbl@transport.nsw.gov.au or Transport for NSW, Locked Bag 928, North Sydney NSW 2059.