DTSS2 TODAY

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PHOTO: TBM TEBAN BREAKTHROUGH AT SHAFT N3 (INTERNATIONAL BUSINESS PARK)

PROJECT PROGRESS

The Deep Tunnel Sewerage System Phase 2 (DTSS2) project has achieved an overall progress of 51% as of May 2021.

Tunnelling works for the DTSS2 project has crossed the halfway mark. Of a total of 19 tunnel boring machines (TBMs), four have already completed their drives, and the total distance tunnelled for the project stands at 26 kilometres.

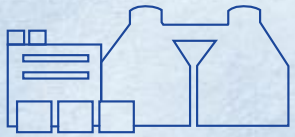
The contract for Mechanical, Electrical, Instrumentation, Control and Automation (MEICA) works for the odour control and air jumper facilities has also been awarded and works commenced in May.

Foundation works continue across Tuas WRP for the various facilities. Q2 2021 also marked the start of excavation of the coarse screen shafts and concreting works for the first digester structure.

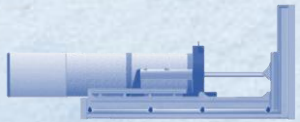
51%
Overall Progress

31.8 million
Total Man-hours (Overall)

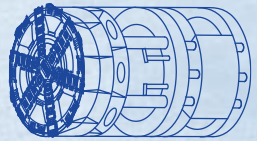
*as at 31 May 2021



Domestic Used Water
650,000m3/d
Industrial Used Water
150,000m3/d



Link Sewer
Internal Diameter
0.3 to 3m



Tunnel
Internal Diameter
3 to 6 m

CONVEYANCE

Link Sewer

31% Construction Progress

2 km Length Jacked

Tunnel

26 km Length Tunnelled

13/19 TBMs in Operation

4/19 TBM Breakthroughs

50 Active Sites

54.2% Construction Progress

26.4 million Man-hours worked

Photo: Lowering of pipe jacking machine at Schedule II Contract 2 MH08 (Jurong Townhall Road)

* as at 31 May 2021

Singapore's largest TBM breakthrough, DTSS2's first tunnel drive completed for South Tunnel

Despite the disruption caused by the COVID-19 pandemic for most of 2020, PUB's Deep Tunnel Sewerage System Phase 2 (DTSS2) project pushed on, with tunnelling works progressing steadily. A significant milestone was achieved on 30 April 2021 with the breakthrough of TBM Teban (Contract T-09), which also marked the completion of the first tunnel drive at the South Tunnel.

TBM Teban, with an outer diameter of 7.56m, is the largest TBM (tunnel boring machine) in Singapore to date. Launched on 17 July 2020, it took nine-and-a half months to tunnel through 1.64 kilometres.

(Left) The PUB and Leighton Asia management with TBM Teban following the breakthrough; (Right) TBM Teban, Singapore's largest TBM, completed its drive on 30 April 2021

PUB's Chief Executive, Mr Ng Joo Hee (right), on site at Shaft N witnessing TBM Teban's breakthrough

To witness the momentous occasion, PUB's Chief Executive, Mr Ng Joo Hee was present on site at Shaft N3, along with other DTSS2 officers.

This is the third TBM to complete its drive after TBM Buroh (Contract T-08, 1.3km) in December 2020 and TBM Sentosa (Contract T-11, 1.6km) in April 2021.

DTSS2 hosts site visit by Minister for Sustainability and the Environment and Second Minister for Finance

On 19 April, the DTSS2 project welcomed Ms Grace Fu, Minister for Sustainability and the Environment, and Ms Indranee Rajah, Second Minister for Finance, for a site visit at Shaft O1 worksite in Penjuru Road.

Both ministers were briefed on the DTSS2 project and its construction progress, before visiting the actual tunnel. During the visit, Ms Indranee shared that the DTSS is an example of a key infrastructure that will benefit multiple generations of Singaporeans.

Ms Indranee Rajah (left) and Ms Grace Fu being briefed on how a tunnel boring machine works by Ms Woo Lai Lynn, PUB's Chief Engineer for DTSS2. Looking on is Mr Yong Wei Hin, PUB's Director for DTSS2.

(Photos courtesy of Ministry of Sustainability and the Environment)

Safety first: A quick briefing before entering the tunnel

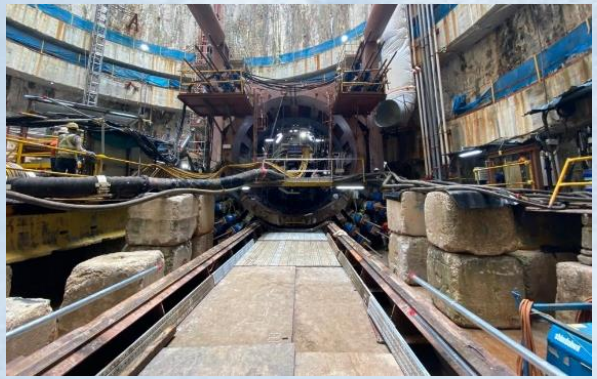
Making good progress: A site walk along a newly constructed section of the 6m-diameter tunnel

DTSS2 pioneers TBM flying launch method in Asia

DTSS2 has chalked up another first in Asia with the use of the Hochtief ‘Flying Launch’ method. This is the first time it is being used outside of Europe. Used at a depth of 50m, it is also the deepest flying launch.

The first TBM launched using this innovative method – pioneered by German construction firm Hochtief – was TBM Yuan Ching in November 2019. Since then, Leighton Contractors (Asia) Limited (Singapore Branch), which manages Contract T-09, has used the same method for all its TBMs – TBM Teban and TBM Clementi in July and December 2020 respectively.

While the first launch was with Hochtief’s on-site supervision, the two subsequent launches were supervised remotely due to COVID-19 travel restrictions. Being a first, additional CCTV cameras had to be installed to provide better visibility of the launch site. High precision cameras, controlled by Hochtief’s engineers, combined with data link and launch parameters provided in real-time further ensured better surveillance and communication throughout the entire launch sequence.



Wider and safer working space with the flying launch method

TBM Clementi in the starting position prior to the flying launch

Hochtief’s patented flying launch method was developed to eliminate some of the major disadvantages of a conventional TBM launch such as space constraints and the time taken to fabricate and install temporary blind rings. Instead, a pressure ring installation with tension bars is used to pull the TBM towards the portal eye using hydraulics. This is a safer and more time-efficient launching method, as the erection and removal of the concrete blind rings are not required.

In comparison to conventional launch methods which require about 6-8 days for the launch sequence and dismantling of temporary rings and supporting steel structures, the flying launch of TBM Clementi was completed in a single day.

TUAS WRP

Contract 3A

Industrial Liquids Modules – Civil and Structural Works

Contract awarded to China State Construction Engineering Corporation Limited Singapore Branch in Dec 2020. Piling works are ongoing.

Contract 3D1

Domestic Liquids Modules 1 – MEICA and NEWater

Contract awarded to UES Holdings Pte. Ltd. in Mar 2021. Site establishment and engineering works are ongoing.

Contract 2B

Product Water Pumping Facilities

Contract awarded to China Harbour (Singapore) Engineering Company Pte. Ltd. in Apr 2021. Site establishment works and mobilisation of machinery are underway.

Piling works are ongoing throughout the site. In parallel, Mechanical, Electrical, Instrumentation, Control and Automation (MEICA) detailed design works is underway.

5.2 million
Man-hours worked

8/18
Contracts awarded

8.95%
Construction progress

A closer look at Tuas WRP's near-shore outfall pipe

A stretch of the outfall pipe being installed

Tuas WRP will incorporate a 1.8-km pipe that channels the plant's treated effluent to a near-shore outfall for discharge to the sea in an environmentally responsible manner.

How big is the outfall pipe?
It's diameter starts at 1.2m – and goes all the way up to 3m in diameter at its largest section. This is almost twice an average man's height!

Eugene Koh , Engineer from PUB's DTSS2 Department standing inside a section of the outfall pipe

Raising safety standards at Tuas WRP worksite

Electronic Permit-To-Work System (ePTW)

For the Tuas Water Reclamation Plant project, it was projected to involve 5,000 workers (at peak) and expend 50 million manhours. Given the scale of the project, how do we raise safety standards?

We needed a solution that helps us to work smarter and more efficiently, through digitising our worksite and leveraging on technology.

What is of utmost importance on the TWRP project?

Mark Wong: In PUB, the safety of our people has always been of paramount importance and concern to us. At Tuas WRP, we wanted to raise the bar for safety, especially with over 5,000 workers within a compact worksite and with multiple work fronts. We wanted a smarter permit-to-work system that could enable us to do so.

Mark Wong, Chief Engineer (Tuas WRP), PUB

Did the ePTW technology help the project? Could you see a difference before and after using this system?

Matt Warburton: The overall process is much more streamlined, with a significant reduction in the manhours required to undertake the PTW process. We particularly like the geofencing ability in the system that ensures our contractors are physically present to survey the work conditions as part of the e-PTW process. This provides rigour and assurance to the procedure.

Matt Warburton, Project Director (Tuas WRP), Jacobs Engineering

How has digitising the PTW system benefited the project?

Matt: By using an electronic system, our productivity is steadily increasing, and our site team can focus on the real tasks in hand, as opposed to being tied up in paperwork. This is really enhancing the efficiency of our team, which is a critical gain in a project such as Tuas WRP.

Mark: Other than saving time and money, our workforce is now working more efficiently and effectively. The system has made the Tuas WRP worksite a safer place to work.

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A JOINT VENTURE DELIVERING THE DTSS2 PROJECT

Jacobs

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Link Sewers

- Aik Leong Plumbing Construction Pte Ltd
- Ed. Züblin AG, Singapore Branch
- Guan Joo Construction Pte Ltd
- Eng Lee Engineering Pte Ltd
- Samwoh Corporation Pte Ltd
- Eng Lam Contractors Co (Pte) Ltd
- Ohin Construction Co Pte Ltd
- Megastone Holdings Pte Ltd

Tunnels

- Ed. Züblin AG, Singapore Branch
- Penta-Ocean and Koh Brothers Joint Venture
- Leighton Contractor (Asia) Limited (Singapore Branch)
- Nishimatsu Construction Co., Ltd.
- Shanghai Tunnel Engineering Co (Singapore) Pte Ltd

Tuas WRP

- McConnell Dowell South East Asia Pte Ltd
- Koh Brothers-China Harbour Joint Venture
- CES_SDC Pte. Ltd.
- Sinohydro Corporation Limited
- ABB Pte. Ltd.
- China Harbour (Singapore) Engineering Company Pte. Ltd.
- China State Construction Engineering Corporation Ltd.
- UES Holdings Pte. Ltd.