The Tuas Water Reclamation Plant Industry Briefing was held on 30 November 2017. The intent of the presentation was to provide a brief overview of the key features of the Tuas Water Reclamation Plant project, including the contract packaging and overall timeline of its execution. The briefing was delivered by:

• Mr Yong Wei Hin, Director, DTSS 2 Department, PUB,
• Mr Scott Trusler, Project Director, CH2M Hill - PUB’s Detailed Design Consultant
This slide outlines the agenda of the briefing session.
This slide highlights to the audience the emergency exits at the briefing venue.
This section of the briefing was presented by Mr Yong Wei Hin, Director of DTSS 2 Department, PUB.
This slide outlines the key topics that were covered by Director Yong Wei Hin.
This section covers the safety commitment of the DTSS Phase 2 team.
This slide shows the safety mission of the DTSS Phase 2 project team. Mr Yong shared that zero harm may sound impossible, but it is in fact possible. He cited the London Olympic Stadium as an example where over 5 years of construction, there had been zero fatality.
This section provides an overview of the Deep Tunnel Sewerage System.
This slide presents an overview of how PUB manages the entire water loop in Singapore; the collection, production, supply and reclamation of water.

The Deep Tunnel Sewerage System (DTSS) uses deep tunnel sewers to convey used water entirely by gravity to centralised water reclamation plants to be reclaimed, closing the water loop.
This slide presents an overall view of the Deep Tunnel Sewerage System (DTSS). The DTSS comprises of link sewers and tunnels connecting the 3 Water Reclamation Plants (WRP) at Changi, Kranji and Tuas.

Phase 1 (in the East) of the DTSS was completed in 2008. DTSS Phase 2 (in the West) is an extension of DTSS phase 1.
This slide presents the benefits of the DTSS.

The DTSS, as the backbone of NEWater production, ensures water security through the reclamation of used water. To ensure that every drop of used water is treated, advanced technologies are needed to efficiently reclaim used water amidst land and resource constraints. The DTSS frees up land through the elimination of pumping stations and the centralising of reclamation plants. Furthermore, the conveyance of used water through gravity, enhances the robustness and reliability of the used water collection system.
This slide shows the 2 major components of the DTSS Phase 2 project:

(1) Deep tunnels & Link Sewers for the collection and conveyance of used water and
(2) The Tuas Water Reclamation Plant (TWRP) where the collected used water will be treated, with a percentage of it being further purified into NEWater. TWRP will be co-located with NEA’s Integrated Waste Management Facility (IWMF) to allow both installations to benefit from the synergies afforded by their co-location.
The DTSS Phase 2 project will be completed by 2025 at a total project cost of S$6.5 billion.

The tunnel contract has been awarded and the groundbreaking ceremony was conducted on 20 November 2017.

Tuas WRP has been conceived as a compact and energy self-sufficient installation that will be operated with a lean manpower. TWRP will have an initial used water treatment capacity of 800 MLD (650 MLD for domestic used water & 150 MLD for industrial used water) and initial NEWater treatment capacity of 114 MLD.
This slide shows the site layout of Tuas WRP. The location of the buildings and process units have been almost finalised. The layout has been determined in view of interfacing requirements. For instance, the Influent Pumping Stations have been identified to be located close to where the tunnels enter the site.

The Integrated Waste Management Facility (IWMF) will be co-located with Tuas WRP.
The co-location of TWRP and IWMF was conceptualised to allow the installations to leverage on the water-energy-waster nexus. For example, IWMF’s food waste will be sent to TWRP to be co-digested in its digesters. The biogas produced at TWRP will then be conveyed to IWMF where it will be used to produce electricity. This electricity will then be supplied to TWRP to meet its electrical needs, leading to energy self-sufficiency.
This slide depicts the rough timelines of the 3 components that make up DTSS Phase 2.

As can be seen, there will be some overlap between the detailed design phase and the construction phase of Tuas WRP as the construction of the plant will be carried through multiple staggered contract packages.
This slide shows the Programme Structure for DTSS Phase 2.

The project is led by PUB’s Director Yong Wei Hin and Deputy Director Herman Ching who oversee the construction of the Tuas WRP, the link sewers and the tunnel. The Programme Manager for the project is a joint venture between Black & Veatch and AECOM with Mr Yogalingam as the Project Director.

The development of Tuas WRP will be carried out jointly by PUB and CH2M Hill who has been appointed as the detailed design consultant. PUB’s Chief Engineer Koh Siong Teck and CH2M Hill’s Project Director Scott Trusler will be leading the team.
The DTSS Phase 2 Technical Video depicts the key elements of the DTSS Phase 2 project.
This section is presented by Scott Trusler, Project Director of Tuas WRP, from CH2M.
This slide outlines the key topics presented on the Implementation of TWRP by Scott Trusler.
Tuas WRP Safety Mission

- To fully implement PUB’s DTSS 2 Safety Mission
- To team with the Contractors to create a collaborative safety culture committed to PUB’s Mission of ZERO HARM
- We will not compromise on safety for any reason
- We will recognise and reward safe performance
- We will continuously learn and improve our approach to the safety and health of everyone involved in the delivery of TWRP

This slide highlights the safety mission the Tuas WRP team drives towards to.
This section covers the objectives to be achieved in the construction of Tuas WRP.
This slide talks about the need to produce NEWater and industrial water by treating the domestic and industrial used water from the two incoming tunnels. Future expansions will be required to treat a higher capacity of domestic and industrial used water.
This slide depicts the critical milestones to be met during the construction of Tuas WRP. The whole of Tuas WRP (Phase 1) is expected to be completed and commissioned by December 2025.
This slide summarises the synergies that are achieved when both plants are co-located together.
This slide emphasises the key productivity and innovations for the Tuas WRP project. PUB is looking forward to the industry to help achieve the goal of delivering the Tuas WRP project in a more productive and innovative way.
This slide reiterates the emphasis on workplace safety and health. Contractors onboard are required to fully comply with all statutory regulations and implement PUB’s safety requirements and life-saving rules. This also includes raising the bar for the minimum Personal Protection Equipment (PPE) and the abolition of the ‘Don’t Know, Don’t Care’ behavior within the delivery team.
This section covers the location, site layout and staging areas of the Tuas WRP project.
This slide presents a map of the Tuas WRP site including the area allocated for IWMF. The entire area is made up of 68ha of reclaimed and undeveloped land. There are currently some ongoing preparation works that aim to improve and stabilize the ground for the construction of Tuas WRP. The site is bounded by sea water intake canal and Tuas Power Generation.
This slide highlights the key components of Tuas WRP, starting with the Influent Pumping Station (IPS), Liquids Treatment, Biosolids Treatment, Site-Wide Development Works, Future Expansion as well as the IWMF. The construction of 2 new bridges are underway via Route 2 and 3 to provide the necessary road access into the site during the construction of the plant.
This slide presents the two available off-site staging areas that are currently available to Tuas WRP.
This section covers the principal work elements and scope identified for the Tuas WRP project.
This slide presents an overview on how the Tuas WRP process flows through the key design features in the Domestic Used Water Treatment, Industrial Used Water Treatment and Biosolids Treatment.
This slide presents the site development works and support ranging from permanent works to temporary works and support designed for the Tuas WRP.
This site diagram illustrates the locations of the influent pumping station (IPS) and two incoming tunnels. This slide also broadly discusses the scope of works: the construction of 5 shafts and installation of various pumps as well as 6 rising mains beyond ground level. The scope also involves the construction of a centralised Odour Control Facility.
This site diagram depicts the locations of the Industrial Liquid Modules and Domestic Liquid Modules. The scope includes Membrane Bioreactors (MBR) and Reverse Osmosis (RO) treatment.
This slide identifies the location of the Biosolids Treatment Facility where the scope involves building the facility with space for future equipment, the use of Thermal Hydrolysis Pre-Digestion (THP) and various silo digesters. Majority of these equipment are expected to interface actively with the IWMF.
This slide presents the location of the Wet Weather Treatment Facility which holds a treatment capacity of 487.5 MLD. This facility only treats excess domestic used water and will be a design and built contract.
This slide highlights the locations of the two control rooms which include a SCADA/PLC-based system. This work element will be built out progressively to meet the Tuas WRP’s key project milestones.
The administration building for PUB and NEA offices will be located outside the secured zone while the operations building for TWRP operators will be located within the secured zone.
These two 66kV substations will be built with 100% redundancy to power the entire Tuas WRP. Solar panels are expected to be installed on facility roofs to supplement that plant’s electrical needs. Odour Control Facilities (OCFs) will be located at the IPS and Liquids Treatment Modules.
This section introduces the 11 contract packages of the Tuas WRP project.
This slide provides an overview of the 11 Tuas WRP contract packages i.e. Contract No., Name and Description of contract packages.
This slide presents the implementation considerations for the Tuas WRP project.
This section covers the implementation timeline of the 11 contract packages for the Tuas WRP project.
This slide presents the overall timeline planned for the 11 contract packages of the Tuas WRP project. Tenders will be called for Contract 1A and 2A from Q2 2018 and Q3 2018 respectively. The remaining 9 contracts will be called subsequently. Completion of the majority of the contracts are expected to be between 2023 and 2025.
This section introduces the ongoing preparation works in advance of awarding the main construction contracts for Tuas WRP.
Ground improvement works are on-going to compact the entire site which is undeveloped and made from reclaimed materials. The ground improvement works utilises two techniques to compact the site; vibro-compaction for the majority of the site and perforated vertical drains with surcharge loading for specific areas not appropriate for vibro-compaction. The ground improvement works is planned to be completed ahead of all construction contracts. The slide also shows that the typical final elevation of the site will be brought back to elevation 5.
Soil investigation works will be completed by October 2018. Approximately 172 boreholes will be done over the entire TWRP.
This slide shows the ongoing construction of the two access bridges to the TWRP site at Routes 2 and 3.
The pictures on this slide demonstrate the collaboration between CH2M and PUB in the current detailed design stage for the Tuas WRP project.
This section covers the key project requirements for the Tuas WRP project.
This slide introduces 6 key requirements for all the contracts: BCA Registration, Primavera P6 for programmes, 6D BIM, Smart Innovations, Workplace Health and Safety, and Document Control.
This slide summarises the expected BCA requirements for tenderers based upon the expected size and scope of the 11 TWRP contracts. Firms not registered with the Building and Construction Authority (BCA) can obtain registration information from BCA [www.bca.gov.sg](http://www.bca.gov.sg).
The SO will utilise an integrated programme tool, Primavera P6 for all programming. Contractors will be required to utilise P6 for their programming and reporting to the SO.
This slide highlights the structure and importance of BIM to the delivery and operation of the TWRP. The design will be delivered to Contractors in a 3D Model and the Contractors will be required to update it during construction and provide an as-built model with COBie data for all managed assets.
The SO will utilise a common document control system, Aconex, for all communications with the Contractors. Contractors are free to select their own system provided that they communicate with the SO through Aconex. It is planned to provide each Contractor with a license to Aconex to facilitate their communications with the SO.
PUB is encouraging the application of smart innovations in the design, construction and operation of the TWRP. This slide shows three examples of innovations being considered; autonomous vehicles, electronic personnel tracking and internet of things.
The TWRP delivery will encourage the use of best practices in Workplace Safety and Health; including full Personal Protective Equipment and contract Incentive & Disincentive schemes.
This section covers an overview of the key project challenges likely to be faced during the delivery of the Tuas WRP project.
This slide summarises several of the key challenges in the construction of TWRP. PUB and its consultants are developing measures to address these and will need the industry’s full support to successfully mitigate these and other challenges during the construction.
This section brings us to a summary of key takeaways emerged from the briefing presented to all attending industry partners.
The slide concludes the key takeaways of the Tuas WRP construction project.

Key Takeaways

- Safety is a MUST
- Timely completion of project
- Value for Money
- Industry’s collaboration needed to succeed
- Productivity and Innovations
This section presents the upcoming events and/or ways to keep industry partners updated with important insights of the Tuas WRP project.
This slide presents the upcoming events and/or initiatives that keep industry partners stay connected to the Tuas WRP team and related insights. One of which is the bi-annual Singapore International Water Week (SIWW), happening in July 2018, where PUB and NEA will showcase Tuas WRP and IWMF in an exhibition at Marina Bay Sands. To get in touch with the Tuas WRP team, one way is to go through the sending of emails to the TWRP mailbox. This presentation deck will be posted onto PUB DTSS 2 website and on the same webpage, there are also other DTSS 2 related resources available.
Q&As