

The Stage 2A Sewage Conveyance System

WHAT IS “HATS STAGE 2A SEWAGE CONVEYANCE SYSTEM” ?

The sewage conveyance system (SCS) comprises a network of interconnected sewage tunnels and vertical shafts. The vertical shafts collect sewage from the preliminary treatment works in North Point, Wan Chai East, Central, Sandy Bay, Cyberport, Wah Fu, Aberdeen and Ap Lei Chau. These preliminary treatment works handle the sewage collected from the catchment areas as shown on the plan below, which comes from around 70% of the population of Hong Kong Island. The collected sewage is conveyed to the Stonecutters Island Sewage Treatment Works via a total of 21km of deep tunnels with depths in general varying from 70m to 160m below sea level. The system essentially operates as siphon to minimize pumping at its downstream end.

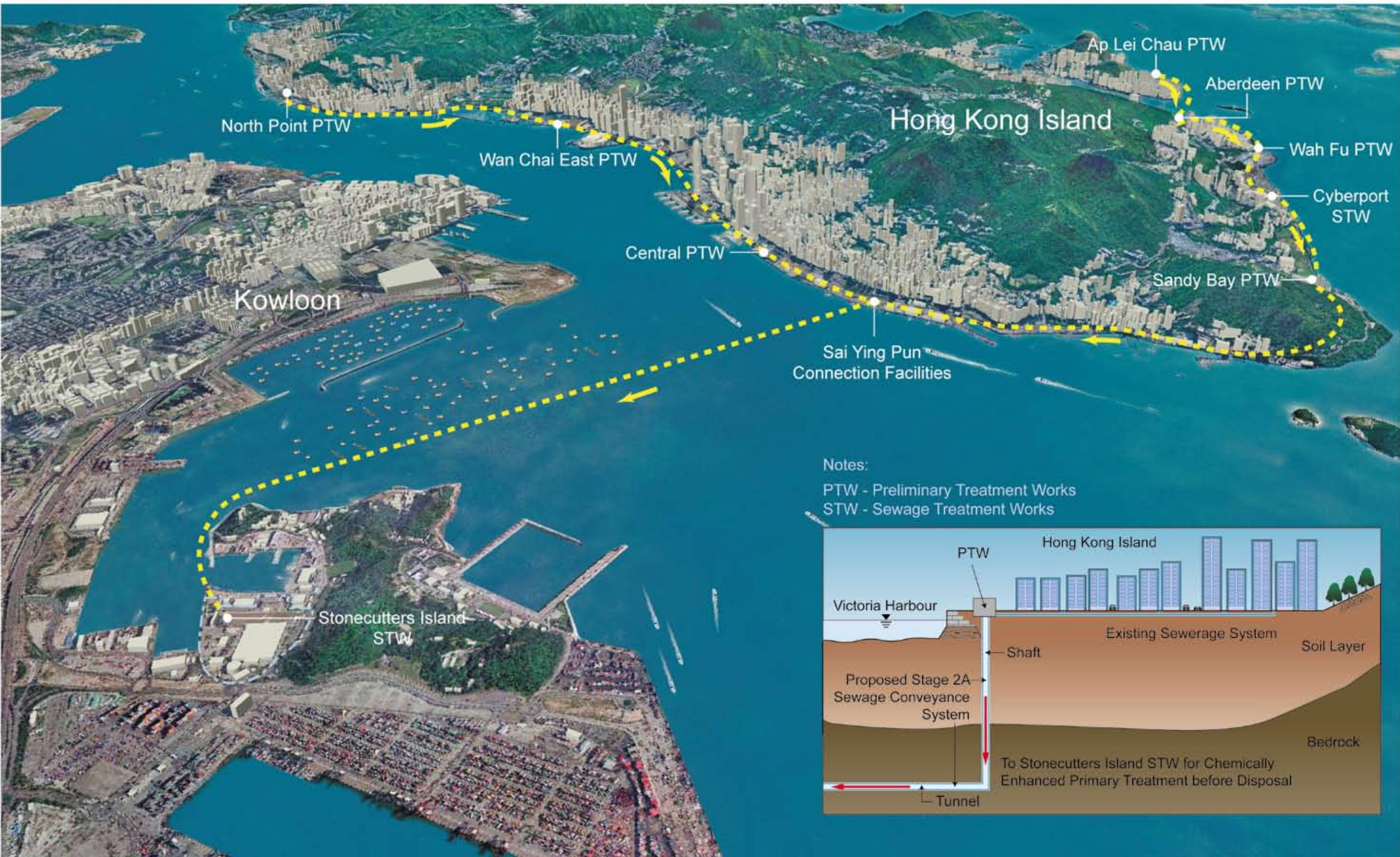
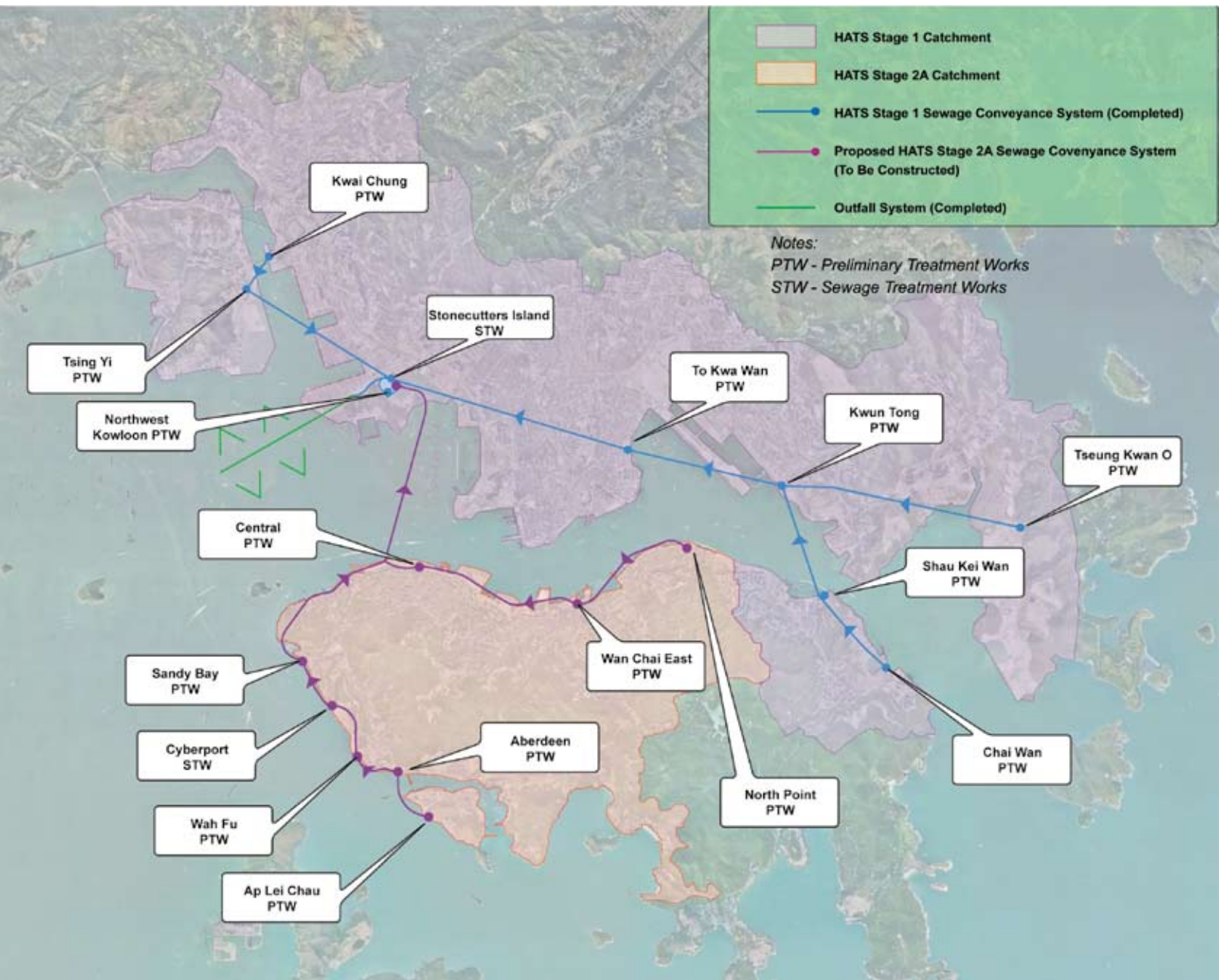
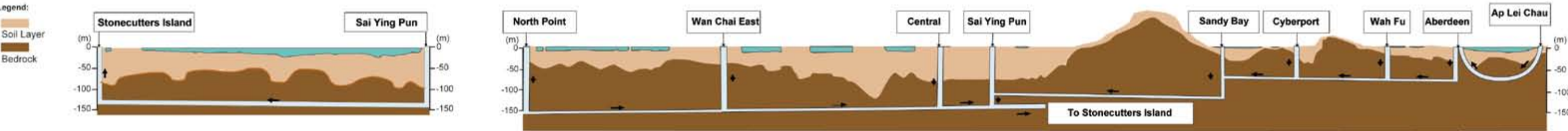
WHY ARE THE TUNNELS SO DEEP ?

Because of the large quantity of sewage to be conveyed, the SCS comprises large conduits with sizes ranging from 900mm to 3,000mm equivalent diameter. The conduits have to go through major residential and commercial districts. Constructing these conduits using open trench method would greatly disturb road traffic and cause inconvenience to the public. Therefore, tunnel is a better option. Also to allow for future land development on top of the tunnel, they are in general deep underground with at least 30m of bedrock cover.

WHY DO THE TUNNELS RUN IN CURVES ?

The alignments of the Stage 2A tunnels are designed to reduce the impacts of difficult geological conditions and to avoid going under private lands as far as possible.

Alignment of the Stage 2A Sewage Conveyance System



Construction Methods

HOW ARE THE TUNNELS BUILT ?

Construction of a deep tunnel starts with the excavation of the production shaft. A production shaft is a deep well through which the workers enter into for carrying out tunnel construction. It is excavated from the ground surface down to the tunnel level. The tunnel is then excavated from the bottom of the shaft. Through the production shaft all excavated materials are removed, and construction equipment and materials are brought in. As ground level activities are confined to the production shaft sites, disturbance to public is reduced to a minimum. The production shafts are surrounded with noise enclosures where necessary and the site areas with hoarding to minimize impacts on the surrounding. For the entire Stage 2A SCS, nine production shafts are planned with seven situated near the treatment works at North Point, Wan Chai East, Sandy Bay, Cyberport, Aberdeen and Stonecutters Island and two at Sai Ying Pun.

Large diameter tunnels are usually excavated either using tunnel boring machine or drill-and-blast method. Drill-and-blast method is chosen for HATS Stage 2A SCS because in addition to providing more working space for temporary support installation; yielding a more controllable programme; and resulting in higher valued excavated rocks for re-use, it is more versatile in controlling groundwater during construction, especially for the section of deep tunnel under the Victoria Harbour. The smaller diameter tunnel from Ap Lei Chau to Aberdeen is constructed using horizontal directional drilling method, in which the tunnel drilling equipment has a remote control on directional steering to govern its horizontal and vertical alignments.



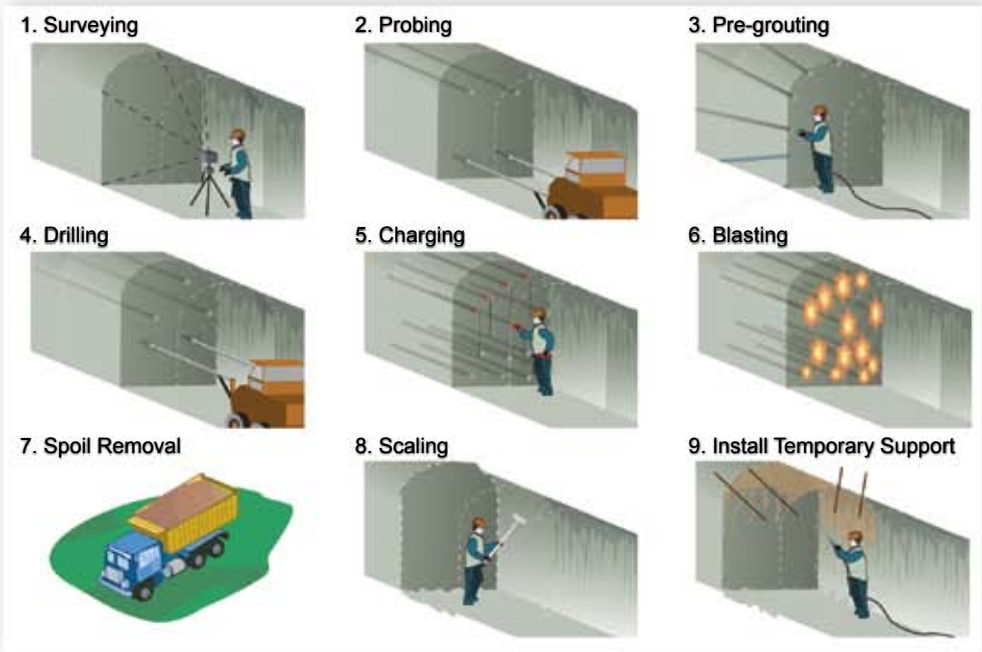
WHAT ARE THE TUNNELLING PROCEDURES ?

During excavation, probe holes are drilled ahead of the tunnel excavation face to investigate the ground condition. If ground water is detected, the ground ahead of the tunnel face is grouted to seal up the joints in the rock. This forms a solid core to stop ingress of ground water before tunnel excavation advances to that region.

Before and during construction, ground water and ground movements around the tunnel areas are closely monitored to ensure that tunnel excavation will not cause adverse effects on the surrounding ground.

After excavation, the tunnel is lined with durable concrete to provide a smooth running surface for sewage flow.

The investigation, grouting, excavation and lining have to be done step by step carefully. All these activities need careful design and close supervision by specialists. This is why it takes a long time to complete the tunnel construction.



Looking Forward and Further Information

LOOKING FORWARD.....

It is expected that after the completion of HATS Stage 2A, the water quality in the harbour will be further improved to the extent that will enhance the growth of aquatic life and possibly facilitate the re-holding of the long suspended cross harbour swimming event.

BACKGROUND INFORMATION

The HATS project was initiated in late 1980s. Stage 1 of the Works, comprising the Stonecutters Island Sewage Treatment Works and 23.6km of deep tunnels, were commissioned in 2001. The approach for implementing the subsequent stages were reviewed in 2000 by an International Review Panel and investigated under a study entitled Environmental and Engineering Feasibility Studies in Relation to the Way Forward. After an extensive consultation in 2004, the Government adopted the centralized treatment option and proposed to implement the remaining stages of HATS in two phases, Stage 2A and Stage 2B. Stage 2A consists of an advance disinfection arrangement, a SCS as well as upgrading and expansion of existing treatment facilities along the route of the SCS. Stage 2B consists of upgrading the treatment level at Stonecutters Island Sewage Treatment Works to biological treatment.

INFORMATION OF STAGE 2A SCS

Total length	About 21km
Range of depth below sea level	Between 70m to 160m
Range of size of completed sewer	From 0.9m to 3m equivalent diameter
Population served on commissioning	About 1 million
Maximum conveying capacity	7m ³ per second
Total area of catchment	44km ²
Quantity of material to be excavated	About 900,000m ³
Number of Preliminary Treatment Works along the SCS	8
Estimated construction costs	About HK\$6200 million

The above information may be subject to change

IMPLEMENTATION PROGRAMME

Ground investigation commencement date	:	2006
Ground investigation completion date	:	2008
Construction commencement date	:	2009
Construction completion date	:	2014

PROJECT MANAGEMENT

Management Division	:	Harbour Area Treatment Scheme Division, Drainage Services Department, The Government of the Hong Kong Special Administrative Region
DSD's Website	:	www.dsd.gov.hk
Drainage Hotline	:	2300 1110
Consultants	:	Metcalf & Eddy – Maunsell Joint Venture
Project Enquiry Hotline	:	2159 3419



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Our VISION is to provide world-class wastewater and stormwater drainage services enabling the sustainable development of Hong Kong

HARBOUR AREA TREATMENT SCHEME STAGE 2A
SEWAGE CONVEYANCE SYSTEM



WHAT IS “HATS” ?

“HATS” stands for the Harbour Area Treatment Scheme. Prior to the operation of this scheme, sewage collected from Kowloon and Hong Kong Island was discharged via submarine outfalls to the Victoria Harbour after screening and de-gritting in preliminary treatment works in different districts along the coast. Under HATS, sewage is collected through a network of deep tunnels to the Stonecutters Island Sewage Treatment Works for chemically enhanced primary treatment before discharging to the harbour. The HATS represents the Government’s commitment to clean up the Victoria Harbour.

The HATS is implemented in two stages. Stage 1 collects and treats sewage from urban Kowloon, Kwai Chung, Tsing Yi, Tseung Kwan O, Chai Wan and Shau Kei Wan. It was commissioned in 2001. Since then the water quality in Victoria Harbour has improved significantly. Stage 2 is further divided into two phases. Stage 2A will collect sewage from the remaining catchments in the northern and south-western Hong Kong Island to Stonecutters Island Sewage Treatment Works for treatment and disinfection before discharging into the harbour. Stage 2B will add biological treatment at the treatment works to all HATS flows.