# 3 除污淨流

## Let's Clean up Our Water

妥善處理污水
保護海洋生態環境

*於二〇〇一年，經渠務署處理的污水達八億八千五百萬立方米，容量足以填滿四十四萬個標準泳池。*
*885 million cubic metres of sewage had been treated by the Drainage Services Department in 2001. The total volume equalled to the total capacity of 440,000 standard swimming pools.*

## 整體策略及計劃

經過過去幾十年的迅速發展，香港已成為一個著名的金融和通訊中心，而且是世界上人口最密集的其中一個城市。經濟活動和人口的顯著增加，為香港帶來了每日超過二百四十萬立方米的污水。

為保護海洋生態環境，污水須經公共污水系統設施妥善收集和處理，然後才排放入海。透過我們在公共污水系統基礎設施的不斷努力，已為所有市區和許多已發展的新界地區提供了公共污水系統，覆蓋九成五的住宅和收集超過九成八的污水。

為了應付發展的需求及生活水平的提升，我們需要不斷擴展和提升污水系統基建設施。在一九八九年，我們完成了「污水策略研究」，並制定了有關污水收集、處理和排放的長遠策略，以達致規定的水質指標。

## Overall Strategy and Programme

The rapid growth in the last few decades has transformed Hong Kong into an eminent financial and communication centre and one of the most densely populated cities in the world. The dramatic increases in economic activities and population have produced large quantities of foul water or sewage - over 2.4 million cubic metres every day.

To protect the marine environment, the sewage must be properly collected and treated, through the public sewage facilities, before its disposal to the sea. With our continuous investment in the public sewerage infrastructure, all urban areas of Hong Kong and much of the developed New Territories are now provided with a public sewerage system, covering about 95% of the households and over 98% of the sewage produced.

To cope with the increasing development and the rise in the standard of living, we need to continuously expand and upgrade the sewerage infrastructure. The Sewage Strategy Study completed in 1989 established the long term strategy for collecting, treating and disposing of the wastewater generated by the community to meet the water quality objectives.

*昂船洲污水處理廠每日處理超過全港一半的污水*
*Stonecutters Island Sewage Treatment Works treats over half of the sewage produced in Hong Kong every day*

該項研究建議為全港公共污水系統設施進行整體改善，整項策略包括兩個主要計劃，分別是「淨化海港計劃」和「污水收集整體計劃」工程。「淨化海港計劃」是為處理來自維多利亞港兩岸，佔全港七成以上的污水。透過「淨化海港計劃」第一階段，污水經收集後，會經深層隧道輸往昂船洲的中央污水處理廠，接受化學輔助一級處理，然後才排放入維多利亞海港西部水域。

在「污水收集整體計劃」下，我們將全港分為十六區，逐一擴展及改善各集水區內的現有污水收集網絡，並擴建現有污水處理廠或加建新設施，以確保污水設施能應付目前的污水量和日後的需要。

The study recommended substantial improvements to the public sewerage facilities for the whole territory and the whole strategy has two main components, the Harbour Area Treatment Scheme (HATS) and the Sewerage Master Plans (SMPs). The HATS caters for the urban centres around Victoria Harbour, which generate more than 70% of sewage in the territory. Under the stage I of HATS, sewage is collected and transferred to a centralized sewage treatment plant at Stonecutters Island by deep tunnels where it will receive chemically enhanced primary treatment (CEPT) before discharge to the western harbour.

Under the SMPs, improvements to the sewerage system in the territory are being carried out on a catchment-by-catchment basis in which the territory is divided into 16 SMP areas. In each of these areas, the existing sewerage network is extended and improved, and existing sewage treatment works (STWs) are upgraded or new facilities are constructed so as to ensure sufficient capacity for conveying and treating sewage generated today and from future developments.

*污水收集整體計劃地區*
*Sewerage Master Plan Areas*

## 新工程

渠務署負責污水系統改善工程的設計、建造和運作。為應付香港的迅速發展，我們需要提供先進和足夠的污水系統基礎設施，而新設施是需要很多的資源和時間去建設，故此項任務實在是極龐大和艱巨的。

「淨化海港計劃」第一階段於二〇〇一年十二月竣工，這不僅是香港污水處理一個重要的里程碑，亦標誌著我們在工程方面達到國際水平的卓越成就。現在，此計劃每日把超過一百三十萬立方米的污水，從九龍及港島東北部輸送到昂船洲處理及排放，使維多利亞港的水質得到大大改善。政府現正進行一系列的試驗和研究，以釐訂「淨化海港計劃」餘下各階段的路向。

「污水收集整體計劃」的工程自從在一九八九年動工以來，進展良好，柴灣至筲箕灣以及香港島南部的兩項工程已分別於一九九七年和二〇〇〇年竣工。在新蒲崗、九龍灣及觀塘興建十七公里長污水渠和修正工業區內不妥善接駁的東九龍渠務工程，亦已在二〇〇一年大致完成。而西北九龍的工程和香港仔、鴨脷洲及薄扶林的工程亦進展順利，現已分別完成了九成和八成。改善港島北部污水網絡的中區、西區及灣仔西的工程和灣仔東及北角的工程，第二階段工程亦已展開。其餘「污水收集整體計劃」的工程亦正處於不同的設計或建造階段，預計可在二〇一三年或之前分期完成。

## New Works

DSD is responsible for the design, construction and commissioning of the sewerage improvement works. This is a huge and hard undertaking because the provision of new and adequate sewerage infrastructure to cope with the rapid development of Hong Kong requires vast resources and the new facilities take time to build.

In December 2001, the successful completion of the HATS Stage 1 marks an important milestone in sewage treatment in Hong Kong, as well as a remarkable engineering achievement by international standards. The scheme is now treating over 1.3 million cubic metres of sewage collected from Kowloon and the northeastern part of Hong Kong Island each day, bringing substantial improvement to the water quality of Victoria Harbour. A programme of trials and studies is also being implemented by Government with a view to formulating the way forward for the further stages of HATS.

SMP works, which started in 1989, are progressing well. Two SMPs, namely the Chai Wan & Shau Kei Wan SMP and the HK Island South SMP were completed in 1997 and 2000 respectively. The East Kowloon SMP, which involves the construction of about 17 km of sewers and the rectification of expedient connections in the industrial areas in San Po Kong, Kowloon Bay and Kwun Tong, was substantially completed in 2001. The North West Kowloon SMP and Aberdeen, Ap Lei Chau and Pokfulam SMP are making good progress and are now 90% and 80% completed respectively. For Central, Western & Wan Chai West SMP and Wan Chai East & North Point SMP, which serve northern Hong Kong Island, construction for the stage 2 works has commenced. The other SMPs are under various stages of design or construction, and are scheduled for completion in phases by 2013.

*在「污水收集整體計劃」下的污水渠改善工程*
*Sewer improvement works under SMP*

*於柴灣進行套筒工程*
*Relining of sewer at Chai Wan*

*淨化海港計劃第一階段工程*
*Harbour Area Treatment Scheme, Stage I project*

為配合各區的發展，並達致最新的水質指標，我們繼續在各個主要的污水處理廠進行改善工程。石湖墟污水處理廠的改善工程已在二〇〇一年八月大致完成。今年度我們亦開展了三個主要污水處理廠的工程，包括沙田污水處理廠的第三期擴建工程、興建新的深井污水處理廠和小蠔灣污水處理廠的改善工程。而其他污水處理廠的改善工程，包括大埔污水處理廠第五期工程、新圍污水處理廠、望后石污水處理廠和西貢污水處理廠第二期工程正進行策劃和設計。不過，因應人口及房屋需求增加，污水設施及服務亦要提升。環境保護署現正檢討各「污水收集整體計劃」。

主要污水系統改善工程的工程簡介載於附錄D。

渠務署從一九八九年成立至今，實施的污水工程項目總值大約有三百一十八億元，其中「淨化海港計劃」第一階段佔八十二億元、「污水收集整體計劃」佔一百七十二億元及其他配套工程佔六十四億元。截至目前為止，已完成的工程的總開支是一百九十億元。預計在未來五年進行的工程，將耗資約六十億元。在二〇〇一至〇二年度，我們的污水收集工程共耗資十八億元。

Upgrading of major STWs will continue so as to keep pace with increased development and to suit the latest water quality objectives. The upgrading works at Shek Wu Hui STW was substantially completed in August 2001. This financial year we also started the construction works for three major STWs, which include Shatin STW stage 3 extension, Sham Tseng STW and the upgrading of Siu Ho Wan STW. The planning and design for the upgrading of other STWs such as Tai Po STW Stage V, San Wai STW, Pillar Point STW and Sai Kung STW phase 2 is well underway. However, in view of the latest population growth and housing demands, more sewerage facilities and services would be required and reviews of the SMPs are being undertaken by the Environmental Protection Department (EPD).

Brief descriptions of major sewerage projects are attached in Appendix D.

From the establishment of DSD in 1989 to now, we have been implementing sewerage projects with a total cost of about $31.8 billion, comprising $8.2 billion for HATS Stage I, $17.2 billion for SMP works and $6.4 billion for other associated works. So far, we have completed works amounting to $19 billion under the programme, another $6 billion of works is being planned for the next five years. In 2001/02, the expenditure on sewerage projects was $1.8 billion.

## 污水收集系統的運作和保養

現時本港約有九成半人口住所的排水管已接駁至公共污水收集系統，超過九成八的污水得到收集和處理。整個系統的網絡長度超過1 400公里。渠務署採取預防性的保養計劃，定期檢查及清理污水渠，以保養這個龐大的污水系統和確保其運作妥當。在二〇〇一年，我們檢查的污水渠共長876公里，並清理其中697公里，清除淤泥5 200立方米，總開支約為五千七百萬元。

為加強排水及污水設備的管理，並改善對市民的服務，渠務署在一九九六年完成渠務記錄數碼化，使更能有效地處理有關渠務記錄的查詢。我們正提高有關系統的效能，以協助規劃保養工作，及提供各種設備的統計報告，使能更有效地管理資源。

在一九九七年，我們設立「渠務投訴資訊系統」，代替人手記錄渠務投訴個案。將所有接到的投訴，直接輸入資料庫，使跟進工作的進展一目了然。這個系統亦能協助確定問題地點，方便策劃及檢討預防性保養計劃。

## Operations and Maintenance of the Sewerage System

About 95% of the population is at present served by the public sewerage system with over 98% of the sewage produced being collected and treated. This system includes a sewerage network of about 1,400 km in length. To maintain this extensive and comprehensive network of sewers and to ensure their proper functioning at all times, DSD has implemented a preventive maintenance programme for carrying out regular inspection and cleansing of sewers. In 2001, we have inspected 876 km of sewers, of which 697 km were cleansed, and removed 5,200 $m^3$ of silt, costing a total of about $57 million.

To enhance the management of drainage and sewerage assets and the services to the public, DSD completed digitization of all drainage records in 1996. This has enabled us to handle requests for drainage records efficiently. The system is being further enhanced so as to assist the planning of maintenance works and generate statistical reports on assets for better management of resources.

In 1997, we installed a Drainage Complaints Information System (DCIS) to replace the manual procedures for recording drainage complaints. All complaints received are directly input into the

*利用「個人數位助理」協助拍攝工地相片*
*Personal Digital Assistant (PDA) can take site photos*

*同事將工作資料透過「個人數位助理」傳送回「渠務投訴資訊系統」中*
*Colleague inputs work result to the PDA and send back to DCIS*

為進一步加強處理渠務投訴的效率，我們最近為直屬員工隊添置了「通渠隊流動電腦系統」，配合「渠務投訴資訊系統」，員工可利用個人數碼助理以接收工作指示、記錄工作結果、及拍攝工地相片和即場繪製草圖。當工作人員回到中心時，可簡易地把所收集的資料上載到「渠務投訴資訊系統」，從而大大改善了處理渠務投訴的效率和協助監察工作進展。由二〇〇一年八月開始測試至今，效果令人滿意，所以此系統已在二〇〇二年五月逐漸全面推行，令我們處理渠務投訴更有效率。

過去各年接到的污水渠淤塞投訴和已處理的個案數字，載於附錄 E。

作為專責渠務的政府機構，渠務署負責審查公共及私人發展項目對污水收集系統的影響，並按需要提供有關接駁至公共污水收集系統的意見。在二〇〇一年，我們共處理超過 29 000 份和污水收集有關的文件，並為新發展項目發出 154 項污水渠接駁工程的繳費通知書。

database so that progress on the follow-up actions can be monitored effectively. This system also serves to identify black spots for planning and reviewing of the preventive maintenance programme.

With a view to enhancing the operational efficiency in handling drainage complaints, a Direct Labour Force Mobile Computing Application (DLFMCA) has recently been developed. With the integration of the DLFMCA and the DCIS, the workforce can make use of a Personal Digital Assistant (PDA) to receive work orders, capture work results, take site photos and make sketches on-the-spot. All captured data can be uploaded to the DCIS by a simple operation when the staff return to the depot thus greatly improving the efficiency in processing drainage complaints and facilitating the monitoring of work progress. Following the successful pilot implementation launched in August 2001, the application was migrated to full production in May 2002 to bring full benefits to the operation in handling drainage complaints.

Numbers of complaints on blockage of sewers received and dealt with in past years are shown in Appendix E.

As the Drainage authority, DSD is responsible for vetting public and private developments with respect to their impacts on the sewerage system. We also provide advice, as necessary, on their connections to the public sewerage system. In 2001, we have processed over 29,000 sets of sewerage-related submissions and issued 154 demand notes for connections for new developments.

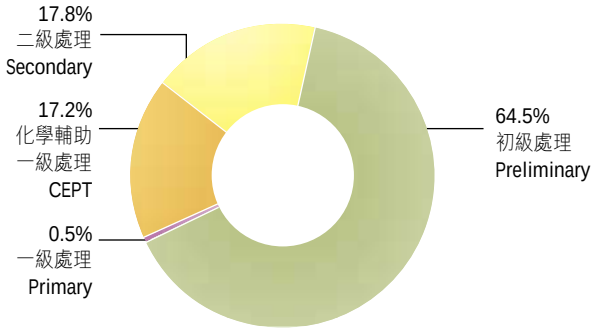


*圖 3.1　不同污水處理級別的分布*
*Figure 3.1 Percentage of treatment at different levels*

## 污水處理設施的運作和保養

渠務署目前負責大約 200 項污水處理設施的運作，其中包括污水處理廠約 60 間，分佈全港，透過各種處理方法，清除污水中的污染物，以達到牌照規定的排放標準。

主要污水處理廠位置載於附錄 F 。

就污水處理的程度來說，初級處理或稱隔濾處理，基本上是清除污水內直徑6毫米或以上的雜物及比0.2毫米大的沙礫。一級處理則包括透過沉澱作用，進一步清除污染物。在昂船洲的化學輔助一級處理廠，處理過程使用化學添加物加速沉澱，比普通一級處理廠更有效地清除污染物。二級處理是對污水的生物處理，利用細菌把有機物變成穩定的物質並加以去除。

在二〇〇一年，我們共處理污水八億八千五百萬立方米，其中 64.5% 接受初級處理、0.5%接受一級處理、17.2%接受化學輔助一級處理、 17.8% 接受二級處理。

## Operations and Maintenance of Sewage Treatment Facilities

DSD is currently operating about 200 sewage handling facilities including about 60 STWs scattered over HK in which pollutants in sewage are removed by various treatment processes so as to achieve the discharge requirements as specified in the discharge licences.

Location of major STWs is shown in Appendix F.

In terms of levels of treatment, preliminary treatment or screening basically removes large particles of 6 mm in diameter and above and grit of over 0.2 mm in size from the sewage. In primary treatment, further removal of pollutants is carried out by sedimentation. The Chemically-enhanced primary treatment (CEPT) plant at Stonecutters Island makes use of chemical additives to speed up and enhance the sedimentation process and, hence, achieves higher and faster removal of pollutants than the normal primary treatment plants. Secondary treatment plants provide biological treatment to sewage in which organic matters are converted to stable substances by bacterial activities.

In 2001, we have treated a total of 885 million $m^3$ of sewage. 64.5%, 0.5%, 17.2% and 17.8% of the sewage received preliminary treatment, primary treatment, CEPT treatment and secondary treatment respectively.

| 設施 Facility | 香港島 Hong Kong Island | 九龍 Kowloon | 新界 New Territories | 離島 Outlying Islands | 總數 Total |
|---|---|---|---|---|---|
| 污水泵房 / 旱流截流器 Sewage pumping stations/Low flow interceptors | 30 | 29 | 68 | 14 | 141 |
| 初級處理廠 Preliminary treatment plants | 11 | 6 | 6 | 1 | 24 |
| 一級處理廠 Primary treatment plants | – | – | – | 2 | 2 |
| 化學輔助一級處理廠 Chemically-enhanced primary treatment plants | – | 1 | – | – | 1 |
| 二級處理廠 Secondary treatment plants | 2 | – | 21 | 8 | 31 |
| 總數 Total : 199 | | | | | |

*表 3.1　污水泵房和各級污水處理廠的地理分布*
*Table 3.1　The geographic distribution of sewage pumping stations and treatment plants of different treatment levels*

*最後沉澱池把污水中的絮凝物於排放前移除*
*Final sedimentation tank helps remove floc before effluent discharge*

在污水處理過程中所產生的污泥在棄置於堆填區前，會先被去除水分，使固體成分至少達 30% 。在二〇〇一至〇二年，有大約 197 000 公噸脱水污泥及 21 400 立方米篩除物及沙礫被妥善棄置。

渠務署除採取多項措施，確保污水處理設施有效運作外，還指派工程師擔任研究和發展工作，務求精益求精，研究方法解決污水處理的運作問題，以及緊貼業內最新的科技發展。

為了盡量避免污水處理設施產生故障，我們應用先進的電腦軟件，協助污水處理廠機電設備的日常保養工作。同時污水處理廠建築物及混凝土結構的保養工作亦同樣重要，所以我們有一組工程師專責該項工作。我們視乎需要，定期檢查和維修結構物，確保廠房能妥善運作。此外，去年亦進行了多項景觀改善工程，包括在五間污水處理廠植樹 9 232 棵，又為 20 間廠房重新油漆和清洗 139 520平方米的建築物外牆，從而保持和美化這些廠房的外貌。

The sludge arising from the sewage treatment process is currently dewatered to a minimum of 30% dry solid content before final disposal at sanitary landfills. In 2001/2002, a total of around 197,000 tonnes of dewatered sludge and 21,400 $m^3$ of screenings and grit were disposed of.

In addition to all the proactive measures taken to ensure effective operation of our sewage treatment facilities, the department has designated engineers to carry out research and development work with a view to further improving our services, such as finding solutions for operational problems in sewage treatment, and keeping abreast of the latest technological development in the field.

To minimize breakdown of sewage treatment facilities, we have been applying advanced computer software to administer the day-to-day maintenance on the electrical and mechanical equipment in the major sewage treatment works. Proper maintenance of buildings and concrete structures in STWs is equally important and the task is managed by a dedicated team of engineers. Regular inspection and repair, if necessary, of structures is carried out to ensure integrity of structures and proper functioning of the plants. Apart from these, landscaping work including planting of 9,232 trees/shrubs, re-painting of 20 plants and cleansing of 139,520 $m^2$ of structures had been carried out during the year in order to upkeep and beautify the appearance of these plants.

*於筲箕灣對開海面進行排放管道滲漏色素測試*
*Dye test on an effluent outfall at Shau Kei Wan*

## 海底排放管的運作和保養

為有效地排放經處理的污水，全港現時共有43條海底排放管及兩條污水排放隧道。我們定期檢查和保養海底排放管，防止它們爆裂，令污水外溢，使接收水體受到污染。要監察排放管渠的效能，其中一個有效辦法是乘直昇機視察渠管的色素測試。年內，我們曾為24所廠房的45條排放管和排放隧道進行色素測試，並維修17處滲漏的地方。此外，全面預防性保養計劃還包括定期進行水底檢查、水文聲納探測及清理排放管。

## Operations and Maintenance of Submarine Outfalls

There are a total of 43 submarine outfalls and two effluent disposal tunnels built for effective discharge of treated effluent in a controlled manner. To prevent pollution of the receiving water bodies caused by the leakage of effluent through cracked submarine outfalls, inspections and maintenance of the outfalls are carried out regularly. One of the effective means adopted for monitoring the performance of the outfalls is by helicopter inspection of dye test on the outfall pipes. Dye tests on these 45 effluent outfalls and tunnels at 24 plants have been carried out during the year, and 17 detected leakage were subsequently repaired. In addition, underwater inspection, hydrographic sounding survey, regular flushing and desilting of outfalls have been carried out as scheduled in a comprehensive preventive maintenance programme.

*沙灣初級污水處理廠外貌*
*Overview of Sandy Bay Preliminary Treatment Works*

## 淨化海港計劃

在一九八九年，污水策略研究建議實施「策略性污水排放計劃」（現改稱為「淨化海港計劃」），利用深層隧道輸送系統，把收集自維多利亞港兩岸市區的污水輸送到一或兩個中央污水處理廠處理，然後排放入香港南部水域。

該計劃是香港特區政府為改善維多利亞港水質的主要措施，並分數階段推行。第一階段主要是收集並輸送九龍及香港島東北部的污水到昂船洲污水處理廠作中央處理。計劃的餘下各階段是要把來自香港島北部和西南部的污水收集和處理。和把污水處理的程度提高，以符合環保標準。

## Harbour Area Treatment Scheme (HATS)

In 1989, the Sewage Strategy Study recommended the Strategic Sewage Disposal Scheme [now renamed as HATS] to collect and convey all wastewater from the urban areas surrounding Victoria Harbour through a deep tunnel conveyance system to one or two centralized sewage treatment works for treatment, before final disposal to the waters south of Hong Kong.

The Scheme is a major Government initiative to clean up Victoria Harbour and is to be implemented in stages. Stage I focuses on the collection and conveyance of sewage from Kowloon and the northeastern part of Hong Kong Island to Stonecutters Island for centralized treatment, while the furthur stages aim at collecting and treating sewage from the northern and southwestern parts of Hong Kong Island, as well as providing a higher level of treatment for all the sewage in order to meet the environmental standards.

*昂船洲污水處理廠為目前世界上同類型化學污水處理廠中，佔地最少和最具經濟效益*
*The Stonecutters Island STW is the most compact and efficient CEPT plant in the world*

*亞洲最大的污水泵房*
*Asia's largest sewage pumping station*

淨化海港計劃第一階段在一九九四年年中動工，內容包括七個現有初級污水處理廠的改善工程，以及長 23.6 公里的深層隧道輸送系統、昂船洲的大型污水處理廠和一條長 1.7 公里的排放隧道的建造工程，為三百五十萬人提供服務。

深層隧道輸送系統建於地底深處，不但提供最短的路徑，還可減少在工程期間對市民大眾、環境生態、公用設施網絡及交通網絡等各方面所帶來的干擾和不便。隧道系統包括七條深層隧道，完成的直徑由 1.2 至 3.5 米不等，深度則介乎水平線下 76 至 143 米之間，最少由 30 米厚的石層覆蓋。其中最短的是由葵青通往青衣的隧道，以鑽爆方法建造，其餘六條隧道則以硬石隧道鑽土機挖掘。由於隧道建造合約在一九九六年十二月被收回，隧道工程嚴重受阻。而工程的進展，亦受到挖掘期間遇到的惡劣的地質情況所影響。雖然困難重重，但隧道工程終於在二〇〇一年十二月全部完成，而第一階段計劃亦同時全面運作。現在每日經由深層隧道輸送到昂船洲污水處理廠處理的污水有一百三十多萬立方米，處理後才經第一階段排放口排出西面海港。

昂船洲污水處理廠採用了化學輔助一級處理過程，每日可處理達一百七十萬立方米污水。該處理廠的工作效果卓越，是現時世界上同類型污水處理廠中最有效率的處理廠。而主泵房亦是亞洲區最大的地下泵房，每秒的抽水量達三十一立方米。

Construction of HATS Stage I commenced in mid-1994. It entails the upgrading of seven existing preliminary treatment works and construction of a 23.6 km-long deep tunnel conveyance system, a large-scale sewage treatment works at Stonecutters Island and a 1.7 km-long outfall tunnel, serving a population of 3.5 million people.

The deep tunnel conveyance system was adopted not only to allow the shortest route to be chosen but also to minimise the disturbance and nuisance to the public, the environment, utilities, transport systems, etc. during construction. The tunnel system consists of seven deep tunnels of finished diameters from 1.2m to 3.5m and depths at 76m to 143m below sea level, and has a minimum rock cover of 30m. Except for the shortest tunnel section from Kwai Chung to Tsing Yi, which was constructed by drill and blast method, hard rock tunnel boring machines (TBMs) were used for excavating the other six tunnels. Owing to the forfeiture of the original tunnel contracts in December 1996, progress of the tunnel construction had been seriously disrupted. The tunnel progress had also been affected by the adverse geological conditions encountered during excavation. Despite all these problems and difficulties, all tunnels were successfully completed in December 2001 and the Stage I system has since been commissioned and put into full operation. It is now treating over 1.3 million cubic metres of sewage collected via the deep tunnels every day at Stonecutters Island before dispersing the treated effluent into the western harbour through the Stage I Outfall.

*每天排入維港的污染物減少 600 噸 (約 40 個標準貨櫃箱)*
*Stopping 600 tonnes (i.e. 40 standard container units) of pollutants from entering the harbour every day*

至於淨化海港計劃的餘下各階段，根據一九九九年完成的環境影響評估報告，建議把污水作化學處理並加上消毒，然後排放出南丫島東部。但有鑑於市民對上述建議的關注，特區政府遂成立第二個國際專家小組檢討以上建議。檢討已於二〇〇〇年十一月完成，建議應考慮將污水處理提升，把處理後的污水排放至維多利亞港以內的範圍。就此，國際專家小組提出四個備選方案，以不同程度的中央處理設備和排放地點以配合後期淨化海港計劃的發展。

對於國際專家小組的建議，我們現已開始進行一連串的研究和試驗，協助制定未來淨化海港計劃的方向。其中包括環境和工程的可行性研究(由環保署負責)以研究國際專家小組建議的可行性、小規模設備測試(由渠務署負責)，以測試密集處理污水技術對香港污水的應用及研究採購的選擇(由渠務署負責)來確定最有效率和成效的採購程序，以完成後期的淨化海港計劃。所有的研究和試驗已開始，預計於二〇〇四年年初完成。

The Stonecutters Island Sewage Treatment Works adopts a Chemically Enhanced Primary Treatment (CEPT) process and has a capacity for treating 1.7 million cubic metres of sewage each day. It is achieving excellent performance results and is the world's most efficient plant of its kind. Its main underground pumping station is also the largest in Asia having a pumping capacity of 31 cubic metres per second.

As for the further stages of the Scheme, the Environmental Impact Assessment Study, completed in 1999, recommended that chemical treatment enhanced by disinfection should be adopted and the effluent be discharged to the east of Lamma Island. However, in view of the public concerns regarding the above development plan, the Government commissioned a second International Review Panel (IRP) to review the proposed scheme. The review was completed in November 2000 recommending that consideration should be given to upgrading the treatment level to a higher standard and discharging the effluent within the harbour areas. On this basis, the IRP suggested four alternative plans with different degrees of centralization of treatment facilities and locations of outfalls for further development of HATS.

In response to the IRP's recommendations, a series of studies and trials are now being undertaken to assist in formulating the way forward for the subsequent stages of HATS. These include the environmental and engineering feasibility studies (by EPD) to investigate the viability of the IRP's options, the pilot plant trials (by DSD) to study the application of compact sewage treatment technologies for Hong Kong sewage, and the study on procurement options (by DSD) to identify the most efficient and effective procurement arrangement for implementing the further Stages of HATS. All these studies and trials have commenced and are scheduled for completion by early 2004.

## 灣仔東及北角污水收集系統 —

灣仔東及北角污水收集系統改善工程乃為該區「污水收集整體計劃」的主要項目。目的是改善及提升灣仔東及北角一帶現有污水系統，以配合區內至2021年的發展。整項工程包括興建17公里長的污水渠及一個新污水泵房，估計耗資十六億元。工程中最重要但亦是最艱難的部分，就是在銅鑼灣及北角的繁忙街道興建兩條污水幹渠。其中一段長1公里的污水渠將會敷設在銅鑼灣怡和街、軒尼詩道、波斯富街和告士打道，另一段長2.7公里的污水渠則敷設在北角電氣道和渣華道。因此，在籌劃及設計階段，我們首要的考慮是如何減低工程進行期間對交通及大眾造成的滋擾及不便。而最有效興建這些污水幹渠的方法，就是盡量採用無坑挖掘法，大大地減少挖掘的路段範圍，以減輕對交通、工商業及公眾的滋擾，並且能更有效地控制施工期間一切的噪音及沙塵問題，比傳統的方法更環保。

## Wan Chai East and North Point Sewerage — an integrated approach to sewer construction in urban areas

The Wan Chai East and North Point Sewerage Improvement Works is one of the major Sewerage Master Plan projects. It aims to improve and upgrade the existing sewerage systems in Wan Chai East and North Point to meet development needs up to the year 2021. The works comprise the construction of about 17 km of sewers and a new pumping station and the estimated project cost is $1.6 billion. An essential but a very difficult portion of the works is the construction of two lengths of trunk sewers in some of the busiest roads in Causeway Bay and North Point, a 1 km long sewer along Yee Wo Street, Hennessy Road, Percival Street and Gloucester Road and a 2.7 km long sewer along Electric Road and Java Road. Thus an important consideration in our planning and design of the works is to minimize the impact on traffic as well as the nuisance and inconvenience to the public that may be induced by the construction activities. An effective measure is to construct the trunk sewers by means of trenchless methods which can largely reduce the extent of road opening, and can thus minimize disruption to traffic, businesses and public. It is also more environmental friendly because we can minimize and effectively control the environmental impacts such as noise and dust generated from the construction activities.

*於銅鑼灣及北角等繁忙地區興建污水渠實為一項極具挑戰性的工程*
*It is a challenging undertaking to build sewers in the busiest road in Causeway Bay and North Point*


*於銅鑼灣波斯富街進行臨時改道測試*
*Trial run of the temporary traffic scheme at Percival Street, Causeway Bay*

### 引入預備工程合約以減低無坑挖掘法的風險

雖然無坑挖掘技術大大地減少了開路的面積，但它仍需要在合適的地點佔用一定的路面興建工作豎井以敷設地下污水渠。由於大部份的豎井均會置於繁忙的交通交匯處，其位置容易受到施工時的交通情況、地下公用設施和地質情況等因素的影響而需要改動，從而增加了工程的費用和引起延誤。

### Advance Contract Helps Reduce Risks for the Construction of Trenchless Sewer

Trenchless methods, though largely reduce the extent of road openings on the surface, require the construction of working shafts of considerable size at suitable locations for the laying of sewers underneath the road surface. As the shafts are usually located at the heavily trafficked junctions, there are high risks that, after the contract has started, it is found that the location may need to be changed due to prevailing traffic conditions, presence of underground utilities or ground conditions. This would lead to additional cost and delay in the construction.

為了減低無坑挖掘工程的風險、金錢及時間的付出，我們採用了嶄新的預備工程合約概念以便於投標前盡量提供有關的資料數據。在預備工程合約當中，全面測試那些已經批核的臨時交通措施，以探討其效用性，並按需要修改有關的臨時交通安排。經過交通措施測試，並確定豎井的位置後，我們會做進一步的探測以取得更多地質及地下設施的資

免工程受到未有記錄的地下設施所阻礙。如有需要，我們亦能先統籌及計劃地下設施的改道，因而大大減少了建造工程的風險和延誤。

In order to reduce the risks, costs and time associated with trenchless construction, we have adopted an innovative approach by the use of an advance contract to provide relevant information as much as possible before tendering of the construction contract. In the advance contract, we conduct full-scale trial runs for all agreed temporary traffic schemes to demonstrate their effectiveness and to modify the temporary traffic arrangements if necessary. With the agreed traffic schemes and the finalized locations of shaft sites, we carry out further investigation works to obtain more ground and utilities information, including trial trenches at shaft sites to eliminate the risk of uncharted utilities. We also make advance co-ordination and planning for all utilities diversions that are found necessary. This largely reduces unforeseen risks during construction and minimizes delay to the construction works.

*交通措施改道測試*
*Trial run for agreed temporary traffic scheme*

*地底下的公共設施*
*Underground utilities*

## 公共關係策略

雖然我們採用無坑挖掘技術去建造污水幹渠，但工程亦難免會對公眾和商戶造成滋擾。因此，使受影響人士明白工程的效益及知道我們隨時願意解決工程帶來的問題是十分重要的。

因此，在進行合約投標之前，我們已與灣仔區和東區區議會進行多個會議，向議員簡介有關的工程內容和交通改道安排，並得到他們的支持。我們會定時向區議會報告有關工程的進度。我們亦透過民政事務處，向議員和公眾市民，特別是一些受工程影響的商戶和當地居民派發資料小冊子。並在工地的當眼地方放置告示牌，向大眾述說工程計劃的進度、交通和/或行人道改道計劃以及有關工地的資料。我們會定期更新有關資料以知會受影響市民。

*以小冊子定期通知受影響人士工程的最新進度*
*Information leaflets will be distributed to the affected community about the works progress*

*位於北角電氣道的壕坑挖掘測試*
*Excavation of trial trench at Electric Road, North Point*

## Public Relations Strategy

Though we are using trenchless technique for the construction of trunk sewers, some disturbance to the public and shop owners would still be unavoidable. It is very important that those affected are well aware of the benefits of the works and our readiness to mitigate any potential disturbance.

Therefore, we have, prior to tendering of contracts, conducted presentations to the Wan Chai and Eastern District Councils to brief the council members about our proposed works and traffic diversion arrangements in the concerned areas during construction and have obtained their support. We will report regularly to the Councils on the progress during construction. We have also prepared and distributed information leaflets, through District Offices, to the council members and the general public, especially those shop owners and local residents who are likely to be affected by the works. Pictorial signboards have also been placed at predominant locations at the works sites to inform the general public of the progress of proposed works, traffic and/or pedestrian diversion schemes and other relevant information at that particular site. We will regularly update the information to keep the people affected fully informed.

在合約開始後，駐地工程師及其工程人員會與各有關人士，包括受影響的商戶和私人大廈委員有緊密聯繫，並成立巡邏隊在工地作定時檢查，以確保公眾安全和減低工程的滋擾。另外亦設立一條 24 小時的電話熱線，以即時接受和處理公眾的查詢及投訴。除了電話熱線外，市民亦可透過小冊子附頁的回應表以表達對工程的意見。

要封閉繁忙的交通道路、行人路或在商戶門前進行工程絕對不受歡迎。但是次灣仔東及北角污水渠改善工程，融合了先進的建造技術、嶄新的合約策略，以及主動與市民溝通的方式，實為最具經濟效益及可行的解決辦法。這是渠務署首次在投標主要合約之前引進預備工程合約，其效果亦令人滿意，主要工程合約的價格亦因而大幅減低。工程如期於 2002 年 5 月中展開並預計於 2006 年初完成。

After commencement of the contracts, the Resident Engineer and his site staff have established regular contacts with all concerned parties, ie the shop owners and committees of private buildings that might be affected by the works. There is a patrol team specially organised to carry out regular inspection of the works sites to ensure safety and minimum nuisance to the public. A 24-hour hotline has also been set up so that any public concern or complaint can be received and dealt with promptly. In addition to the hotline, the public may also use the feedback forms attached with the information leaflets to provide their feedback on the works.

Closures of heavily trafficked roads or footpaths or construction activities in front of shops will never be welcome. However, we have integrated advanced construction technology, innovative contracting strategy and a proactive public communication approach to provide a cost-effective and workable solution in this Wan Chai East and North Point sewerage improvement project. In particular, this is the first time DSD has introduced an advance contract prior to tendering of the main works. We have achieved a significant reduction in the contract sum of the main works contract. The construction works had started in May 2002 and are scheduled for completion in early 2006.