CHAPTER 4

THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

CAPITAL WORKS RESERVE FUND

GOVERNMENT SECRETARIAT

Environment, Transport and Works Bureau

GOVERNMENT DEPARTMENTS

Drainage Services Department
Environmental Protection Department
Water Supplies Department

Sewerage improvement and connection works for southern part of Hong Kong Island

Audit Commission
Hong Kong
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SEWERAGE IMPROVEMENT AND CONNECTION WORKS FOR SOUTHERN PART OF HONG KONG ISLAND

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Summary and key findings

A. **Introduction.** In the late 1980s, the Government adopted a sewage treatment strategy with the objective of safeguarding public health and protecting the ecosystems and marine environment. To implement the strategy, the Government developed 16 Sewerage Master Plans (SMPs) for the sewerage infrastructure works covering different areas of Hong Kong. One of the SMPs was for the southern part of Hong Kong Island. When new public sewers are laid in the area, property owners of the area are required to connect the sewers of their buildings to the public sewers to dispose of the wastewater. The Drainage Services Department (DSD) was responsible for the implementation of the sewerage works for the southern part of Hong Kong Island (hereinafter referred to as the ISSW — paras. 1.1, 1.2 and 1.4).

B. **Audit review.** Audit has recently carried out a review on the economy, efficiency and effectiveness with which the Government has administered the ISSW project (para. 1.10). The audit findings are summarised in paragraphs C to G below.

C. **Need to improve management of the sewerage works project.** The original approved project estimate (APE) of the main construction works of the ISSW was $468 million in July 1990. As at 30 June 2002, the actual cost of the main construction works of the ISSW was $680 million (excluding cost increase of $138 million due to inflation). The increase in the actual cost over the original APE was $212 million in real terms. The increase included additional payments of $58 million to the contractors in settlement of disputes due mainly to inadequate site investigations and inconsistency in contract terms. Of the 13 works contracts awarded for the main construction works of the ISSW, 12 contracts were not completed within the original scheduled dates of completion. There were 6 works contracts with cost increases totalling $158 million over the original contract sums. Audit considers that there is scope for the DSD to improve the management of works projects to minimise delays in completion and increases in cost (paras. 2.2, 2.3, 2.5, 2.7, 2.8 and 2.9).

D. **Need to improve the estimate of quantities of rock excavation and reinstatement works.** In 1992, the DSD awarded a remeasurement contract (Contract A) to Contractor A. After the commencement of the works, it was found that the actual quantities of rock excavation, and carriageway and footpath reinstatement works were substantially more than those stated in the Bills of Quantities (BQ). The increase in quantities was mainly due to the fact that no specific site investigation had been carried out to ascertain the rock level along the sewer route. Audit considers

that the financial consequences of the underestimate of the BQ quantities could be substantial for items with high BQ rates. Audit also considers that if the DSD had taken more proactive action to monitor the contract preparation work, a more accurate estimate of the BQ quantities for rock excavation works and reinstatement works could have been included in the contract documents (paras. 3.2, 3.6, 3.7, 3.9, 3.11, 3.14 and 3.16).

E. **Different interpretations of contract terms.** The BQ of another contract (Contract B) contained three clauses on the measurement of the works affected by tidal water. The first two were standard clauses required by the Standard Method of Measurement for Civil Engineering Works (1988 Edition). The third clause was included to impose additional conditions for qualifying the works to be measured as the works affected by tidal water. However, the contract documents of Contract B did not specify whether the third clause would supplement or supersede the first two clauses. In the event, there were different interpretations of the clauses and a dispute arose between the Government and Contractor B over the type of works to be measured as the works affected by tidal water. Audit considers that the contract provisions and specifications should have been thoroughly vetted to ensure that there were no inconsistencies (paras. 4.3, 4.4 and 4.7).

F. **Need to resolve the leakage problem of two watermains.** In May 1990, the Water Supplies Department (WSD) entrusted the design and construction of three watermains to the DSD under Contract A. In 1995, the watermains were completed and handed over to the WSD. In late 1995, the WSD found that there were leakages in two of the three watermains. The WSD reported the leakage problem to the DSD for investigation. However, as at end of July 2002, i.e. more than six years after their completion, the two watermains still could not be put into operation because of the leakage problem. Audit considers that there is an urgent need to repair the two watermains so that the new water supply system can be commissioned as soon as possible (paras. 5.3, 5.6, 5.7 and 5.11).

G. **Slow progress of the property connection works.** The most effective and reliable way of disposing of the wastewater of premises is by connecting their wastewater pipes to public sewers leading to the sewage treatment facilities. Audit found that the connection works of some government facilities in the areas were not carried out promptly. Audit considers that there is scope for improving the planning and coordination of the connection works of government facilities (paras. 6.2, 6.11 and 6.13).

H. **Audit recommendations.** Audit has made the following main recommendations that:

(a) the Director of Drainage Services should:

(i) closely monitor contractors' works so as to ensure that the works are completed on time and within the contract sums (para. 2.10(a));

(ii) ensure that engineering consultants have taken all necessary measures to obtain accurate information for estimating the quantities of works in the tender documents (para. 3.17(a)); and

(iii) in the preparation of contract documents for works contracts, ensure that provisions and specifications are clearly stated so as to minimise disputes between the Government and contractors (para. 4.9(a));

(b) the Director of Drainage Services and the Director of Water Supplies should take urgent action to resolve the leakage problem in order to put the two watermains into operation as soon as possible (para. 5.13(a)); and

(c) the Secretary for the Environment, Transport and Works should:

(i) consider issuing a circular to advise all government departments of the need to plan early for the connection works of government facilities and to monitor closely the progress of the works (para. 6.15(a)); and

(ii) consider notifying all works departments of the audit recommendations made to the Director of Drainage Services (see inset (a) above), so as to avoid a recurrence of similar cases in future (para. 7.1).

I. **Response from the Administration.** The Administration has agreed with the audit recommendations.

PART 1: INTRODUCTION

Background

1.1 In the late 1980s, the Government adopted a sewage treatment strategy with the objectives of safeguarding public health and protecting the ecosystems and the marine environment. The strategy aimed to formulate a comprehensive programme for the construction of new sewerage works to match the development needs of Hong Kong. To implement the strategy, the Government developed 16 Sewerage Master Plans (SMPs) for the sewerage works covering different areas of Hong Kong. Each SMP (including that for the southern part of Hong Kong Island) is a blueprint of an area's sewerage works required for sewage collection and treatment.

1.2 The southern part of Hong Kong Island has been declared as a Water Control Zone, i.e. the Southern Water Control Zone (Note 1), under section 4 of the Water Pollution Control Ordinance (Cap. 358 — Note 2). The Water Pollution Control Ordinance (WPCO) imposes controls on the connection of wastewater to the public sewerage system. When new public sewers are laid in an area, property owners of the area are required to carry out works for conveying wastewater of their properties to the public sewers and sewage treatment facilities. This is the most effective and reliable way of disposing of wastewater.

SMP for the southern part of Hong Kong Island

1.3 The SMP for the southern part of Hong Kong Island is intended to provide:

(a) a comprehensive sewage collection, treatment and disposal scheme to meet the demands of developments from Shouson Hill to Shek O; and

(b) a long-term measure to improve the water quality of the beaches on that part of Hong Kong Island.

Note 1: *The Southern Water Control Zone covers the waters south of Hong Kong and includes the territorial waters south of Shek O, Tai Tam, Stanley, Chung Hom Kok, Deep Water Bay and Repulse Bay.*

Note 2: *The WPCO was enacted in 1980 and amended in 1990 and 1993. It provides the main statutory framework for the declaration of water control zones and the establishment of water quality objectives. The water quality objectives describe the water quality that should be achieved and maintained in order to promote the conservation and best use of the waters of Hong Kong.*

1.4 The Drainage Services Department (DSD) was responsible for the implementation of the works identified under the SMP for Hong Kong Island South sewerage works (hereinafter referred to as the ISSW). The scope of the ISSW included:

(a) the construction and rehabilitation of sewers and pumping stations;

(b) the construction of an underground sewage treatment plant in a rock cavern in Stanley with a submarine outfall;

(c) the construction of a sewage screening plant in Shek O; and

(d) the provision of branch sewers and connection pipes to properties in the Shouson Hill to Shek O area.

1.5 In mid-1989, the DSD engaged two engineering consultants, Consultant A and Consultant B, to undertake the design and supervision of the main construction works of the ISSW. The DSD awarded 13 works contracts during the period 1991 to 1997. Consultant A and Consultant B were the Engineers for some of the contracts.

1.6 On the completion of the main construction works of the ISSW in December 1999, a comprehensive sewage collection and treatment disposal scheme has been provided to meet the demands of the developments in the southern part of Hong Kong Island. Since 1999, the water quality of the beaches in the area has improved (see para. 6.5 below).

Increase in cost and delay in completion of ISSW

1.7 ***Increase in cost of ISSW.*** The approved funding of the Public Works Programme (PWP) project for the main construction works of the ISSW was $468 million at July 1990 prices. The latest approved funding was $836 million at the money-of-the–day prices (Note 3). As at 30 June 2002, the actual cost for the main construction works of the ISSW was $818 million (see para. 2.3 below for details).

Note 3: *Money-of-the-day prices show the estimated cost of the project after allowing for forecast increases in construction prices during the period of construction.*

1.8 ***Delay in completion of ISSW.*** In February 1992, the DSD informed the Finance Committee (FC) of the Legislative Council that the scheduled completion date of the ISSW was mid-1994. In January 1997, the DSD informed the FC that the date of completion would be December 1998. In the event, the construction works of the ISSW were substantially completed by December 1999. There was a delay of more than five years when compared to the original scheduled date of completion of mid-1994.

Entrusted works under ISSW

1.9 The Water Supplies Department (WSD) entrusted the design and construction of watermains in the area covered by the ISSW to the DSD. However, as at end of July 2002, i.e. more than six years after the completion of the watermain works in 1995, two of the three watermains built under an ISSW contract could not be put into operation because of leakage problems (see PART 5 below for details).

Audit review

1.10 Audit has recently carried out a review on the implementation of the main construction works of the ISSW. The objectives of the review are:

(a) to evaluate the economy, efficiency and effectiveness with which the DSD has administered the works of the ISSW;

(b) to examine the coordination between works departments and the adequacy of the procedures for the administration of property connection works and entrusted works; and

(c) to ascertain whether there is room for improvement in the planning and administration of projects for sewerage works.

The audit has revealed that there are lessons to be learnt and scope for improvement in contract administration and project implementation. Audit has made a number of recommendations to address the issues (see PART 2 to PART 7 below).

PART 2: MANAGEMENT OF ISSW

2.1 This PART examines the DSD's management of the main construction works of the ISSW, particularly the control of cost and the time for completion of the works. The audit has revealed that there is room for improvement in the administration of works contracts.

Main construction works of ISSW

Funding approvals

2.2 In July 1990, the FC approved the upgrading of the main construction works of the ISSW to Category A (Note 4) of the PWP at an approved project estimate (APE) of $468 million. The APE was increased in February 1992, and again in January 1997. The latest APE was $836 million at the money-of-the-day prices (see Note 3 to para. 1.7 above). Table 1 below shows the increases in the APE of the main construction works of the ISSW.

Table 1

Increase in the APE of the main construction works of the ISSW

	$ million	
Original APE at July 1990 prices		468
Increase in cost due to:		
Inflation	176	
Additional works	144	
Resident site staff	45	
Others	3	368
Latest APE at the money-of-the-day prices		836

Source: DSD's records

As shown in Table 1 above, excluding the cost increase of $176 million due to inflation, there was an increase in real terms of $192 million (or 41%) over the original APE of $468 million.

Note 4: *Public works projects are classified into several categories under the PWP. Category A projects are projects which are ready in all respects for tenders to be invited and for construction works to proceed, and which have APEs.*

Cost of the ISSW

2.3 As at 30 June 2002, the actual cost of the main construction works of the ISSW was $818 million, which was within the latest APE of $836 million. Table 2 below shows the actual cost of the ISSW.

Table 2

Breakdown of the actual cost of the main construction works of the ISSW as at 30 June 2002

	$ million	%	
Construction works	522	64%	
Resident site staff costs	141	17%	34%
Cost increase due to inflation	138	17%	
Others	17	2%	
Total	**818**	**100%**	

Source: DSD's records

As shown in Table 2 above, excluding the additional cost due to inflation of $138 million, the increase in the actual cost of the main construction works of the ISSW, in real terms, was $212 million ($818 million less $138 million less $468 million). This is an increase of 45% over the original APE of $468 million.

Audit observations on management of main construction works of ISSW

2.4 The Government has invested considerable resources in the construction of new sewerage works in order to improve the environment. The sewerage works contracts should be well managed so as to ensure that the works are completed on schedule and within budget. However, Audit noted that there were delays in completion and increases in the cost of the ISSW works contracts (see paras. 2.5 to 2.9 below for details).

Delay in completion of works contracts of ISSW

2.5 For the 13 ISSW contracts awarded for the main construction works, Audit compared the completion dates against the original scheduled dates of completion. For some works contracts, the DSD had granted extension of time (EOT) to the contractors. The EOT granted would determine the extended date of completion of the contracts. Table 3 below shows the delays in the completion of the works contracts.

Table 3

Analysis of delay of the ISSW contracts for main construction works

Extent of delay	Delay when compared with the original scheduled date of completion		Delay when compared with the extended date of completion	
	(No. of contracts)	(%)	(No. of contracts)	(%)
None	1	8%	11	84%
1 to 6 months	2	16%	1	8%
7 to 12 months	5 (12)	38%	1 (2)	8%
13 to 18 months	5	38%	–	–
Total	13	100%	13	100%

Source: DSD's records and Audit's analysis

As shown in Table 3 above, of the 13 works contracts, only 1 contract was completed within the original scheduled date of completion. For the other 12 works contracts, the contractors were granted EOT. If the EOT granted was taken into account, 11 out of the 13 contracts were completed within the extended dates of completion, but 2 contracts suffered delays of a few months (for which liquidated damages were deducted). **Audit considers that there is scope for the DSD to improve the management of the contracts to minimise delays in the completion of sewerage works in future.**

Increases in cost of ISSW contracts

2.6 According to Table 3 in paragraph 2.5 above, for 12 out of 13 works contracts, the contractors were granted EOT. The prolonged period of time taken to complete the works led to an escalation in cost. This was because the contracts had provided for the reimbursement of fluctuations in the cost of labour and materials (hereinafter referred to as price fluctuation adjustments — PFAs). Additional amounts had to be paid to the contractors for price increases and for site supervision during the extended period. As shown in Table 2 in paragraph 2.3 above, the additional cost due to inflation of $138 million and the resident site staff costs of $141 million represented 34% of the actual cost of the works.

2.7 Audit compared the final cost (including the cost of the works entrusted to the DSD by the WSD) of the 13 works contracts against their original contract sums. Table 4 below shows the increases in cost of the works contracts.

Table 4

Increases in cost of the ISSW contracts

			Total original contract sum	Total final cost	Cost increase		Cost saving
			(a)	(b)	(c) = (b)-(a)	(d) = (c) ÷ (a) × 100%	(e) = (b)-(a)
	(No. of contracts)		($ million)	($ million)	($ million)	(%)	($ million)
Contracts with cost savings	7		174	148	—	—	(26)
Contracts with cost increases of:							
1% to 10%	4		330	351	21	6%	—
11% to 100%	1	6	46	72	**26**	**57%**	—
Over 100%	1		58	169	**111**	**191%**	—
Total	13		608	740	**158**	**26%**	(26)

Source: DSD's records and Audit's analysis

2.8 As shown in Table 4 above, 7 works contracts were completed within the original contract sums, with a total cost saving of $26 million. However, there were cost increases for 6 works contracts. **The total cost increase for these 6 contracts amounted to $158 million, which included additional total payments of $58 million to 2 contractors in settlement of disputes.** Taking into account the cost saving and other recoveries, there was a net cost increase of $59 million for the 13 contracts. Of the 6 works contracts with cost increases, the cost of 2 contracts increased by more than 50%, as follows:

(a) ***Contract A.*** This contract was for the construction of sewers, pumping mains and watermains. The cost increase of $111 million was due to the substantial increase in the quantity of rock excavation and reinstatement works (see PART 3 below for details) and additional cost due to inflation and variations of works; and

(b) ***Contract B.*** This contract was for the construction of a pumping station and the associated works. The cost increase of $26 million was due to inconsistencies in the contract provisions concerning the works affected by tidal water (see PART 4 below for details) and additional cost due to inflation and variations of works.

2.9 Of the 13 works contracts awarded, 12 (or 92%) contracts were not completed within the original scheduled date of completion (see Table 3 in para. 2.5 above). There were also significant cost increases in some of the works contracts (see Table 4 in para. 2.7 above). **Audit considers that:**

(a) **there is scope for the DSD to improve the management of works projects to minimise increases in the cost of sewerage works; and**

(b) **there is a need for the DSD to carry out a post-implementation review to identify lessons learnt from the ISSW so as to make improvements in the implementation of sewerage projects.**

Audit recommendations on management of main construction works of ISSW

2.10 **Audit has *recommended* that the Director of Drainage Services should:**

(a) **closely monitor contractors' works so as to ensure that the works are completed on time and within the contract sums; and**

(b) **conduct a post-implementation review of the ISSW so as to identify lessons learnt and to make improvements in the implementation of sewerage projects**.

Response from the Administration

2.11 The **Director of Drainage Services** agrees with the audit recommendations. He has said that the DSD has reviewed all major problems during the implementation of the ISSW and identified lessons to be learnt. In the light of the lessons learnt from the ISSW, the DSD:

(a) organised 15 experience sharing seminars/workshops specifically on contract management and consultancy management in the last 5 years;

(b) has promulgated technical circulars, such as DSD TC No. 9/2000 "The assessment of risk and cost of time-critical projects" and DSD TC No. 2/2001 "Project estimates and pre-tender estimates" to address the issues; and

(c) will promulgate shortly a new DSD technical circular entitled "Guidelines for improving project delivery" to address aspects such as design quality, work coordination, commissioning and maintenance requirements to improve project delivery.

2.12 The **Secretary for the Environment, Transport and Works** agrees with the audit observations and welcomes the recommendations as mentioned in paragraph 2.10 above. She has said that:

(a) the audit recommendations are in line with those made by the Construction Industry Review Committee on similar subjects. The Committee has recommended that project teams should ensure that there is adequate supervisory arrangement for critical stages of construction having regard to the nature and complexity of works. This will ensure that adequate resources will be made available to the supervision team to monitor the performance of the contractors and the progress of the contract; and

(b) the Project Administration Handbook for Civil Engineering Works will be amended accordingly.

PART 3: SUBSTANTIAL INCREASE IN QUANTITIES OF ROCK EXCAVATION AND REINSTATEMENT WORKS

3.1 This PART examines the causes of the substantial increase in the cost of Contract A for the construction of sewers, pumping mains and watermains. The audit has revealed that there are lessons to be learnt in contract administration.

Excavation and reinstatement works of Contract A

3.2 Contract A was a remeasurement contract with the provision for PFAs. For a remeasurement contract with PFAs, the works would be remeasured, and payment would be made to the contractor based on the works actually done together with adjustments for changes in the cost of labour and materials. The works of Contract A involved the construction of sewers, pumping mains and watermains along the existing roads in the southern part of Hong Kong Island. The laying of sewers and watermain pipes required:

(a) breaking up of existing concrete/bituminous carriageways and footpaths;

(b) excavation of materials including rock in trenches for installing the pipes; and

(c) reinstatement of the carriageways and footpaths.

3.3 According to Contract A, the method of measurement was based on the document titled "Standard Method of Measurement for Civil Engineering Works (1988 Edition)" (SMM). The SMM laid down the method and criteria for the measurement of civil engineering works undertaken for the Government. According to the SMM, for each type of excavation-related works, a separate item for the measurement of rock excavated was included in the Bills of Quantities (BQ — Note 5) of Contract A.

3.4 In late 1989 and early 1990, site investigations were carried out by Consultant A at places where there might be technical engineering problems. However, no specific site investigation was carried out to ascertain the rock level along the sewer route.

3.5 During the assessment of the tenderers' submissions, it was found that the BQ rates for the excavation-related works items submitted by a tenderer, who later became the successful tenderer of Contract A (hereinafter referred to as Contractor A), were very high. In late 1992, after seeking clarification from the tenderer, the DSD awarded the contract to Contractor A. Consultant A (see para. 1.5 above) was the Engineer for the Contract (hereinafter referred to as Engineer A).

Note 5: *The BQ of a contract is a list of items giving descriptions of the works to be performed and the quantities estimated. Tenderers are required to price the BQ items.*

Substantial increase in quantities of rock excavation and reinstatement works

3.6 In December 1992, shortly after the commencement of the works, the DSD was informed that, based on a brief visual examination of the topography, rock face and rock outcrops along the proposed route of the sewer trench, the quantities of rock excavation allowed for in the BQ had been grossly underestimated. The DSD was also informed that the quantity for the reinstatement of the existing carriageways would also be substantially more than that allowed for in the BQ.

3.7 In January 1993, additional site investigations were carried out along the sewer route in order to properly assess the actual extent of the rock level. Based on the investigation results of the trial pits and on the assumption that there would be no change in the design, Consultant A advised the DSD that there would be a substantial increase in the quantities of rock excavation, and carriageway and footpath reinstatement works, as follows:

(a) ***Rock excavation.*** The quantity would be increased by 31 times, i.e. from the original quantity of 194 cubic metres to 6,195 cubic metres;

(b) ***Reinstatement of existing carriageways.*** The quantity would be increased by 5 times, i.e. from the original quantity of 1,200 square metres to 7,150 square metres; and

(c) ***Reinstatement of existing footpaths.*** The quantity would be increased by 6 times, i.e. from the original quantity of 250 square metres to 1,766 square metres.

Based on the estimated increased quantities at the contract BQ rates, Consultant A considered that the contract sum would be increased by $55 million.

3.8 In order to reduce the quantity of rock excavation, the works for laying the sewer were re-designed. The sewer would be laid to a depth of 2.5 metres, instead of the original design depth of 4 metres. The works of a pumping main and a pumping station were deleted.

Revision of BQ rates for rock excavation due to increase in quantities

3.9 In view of the substantial increase in the quantities of works related to rock excavation, it was considered that the contract BQ rates were no longer applicable because there had been a change in the excavation method. In mid-1994, Contractor A was notified of the revised BQ rates for rock excavation which would be applicable to both the original and additional quantities. Contractor A did not agree to the revised rates and a dispute arose between the Government and Contractor A. In the event, the dispute arising from the substantial increase in the quantities of

rock excavation was settled by an arbitration. In early 1998, the DSD paid an additional amount, including an amount as interest, to Contractor A (Note 6).

3.10 Following the completion of the first arbitration, the contract BQ rates were used to value the rock excavation works. According to Contract A, Contractor A was entitled to PFAs (i.e. adjustment for increase in the cost of labour and materials). However, the DSD considered that Contractor A was not entitled to the PFAs for the increased quantity of rock excavation works. The DSD deducted the amount already paid as interest (see para. 3.9 above) from the interim payments to offset the PFAs. A dispute arose between the Government and Contractor A over his entitlement to the PFAs. As Contractor A raised the PFA issue at a late stage of the first arbitration, it would be necessary to either extend the first arbitration onto a further stage or deal with it under a separate arbitration. In the event, it was decided to deal with the issue under another arbitration (hereinafter referred to as the second arbitration). In January 2000, based on the advice of the Legal Advisory Division (LAD) of the then Works Bureau, the DSD decided to end the case. After negotiations, the dispute was settled with Contractor A. In April 2000, the DSD paid another additional amount to Contractor A (see Note 6 below).

Substantial increase in the quantity of reinstatement works

3.11 As mentioned in paragraph 3.7(b) and (c) above, the quantities of the carriageway and footpath reinstatement works had increased by more than 5 times. Nevertheless, it was considered that the contract BQ rates for the carriageway reinstatement works were still applicable as there was no change in the method of working. In May 1997, the DSD considered that, based on the increased quantities of the reinstatement works, the rates should have been much lower. The DSD estimated that, based on the lower rates, the cost of the reinstatement works would have been less than that paid to Contractor A.

3.12 Arising from the substantial increase in the BQ quantities for rock excavation, and carriageway and footpath reinstatement works, the DSD had to incur other costs, such as professional fees and legal costs involved in the arbitration proceedings.

3.13 In view of the substantial increase in the BQ quantities, the DSD and Consultant A had a dispute over whether the BQ quantities had been accurately estimated during the preparation of the contract documents. In April 2000, the DSD received a proposal to settle the dispute, on a without prejudice basis, in order to save the concerned parties' time and costs. In mid-2000, the DSD accepted the proposal.

Note 6: *"The Lands and Works Branch Model Arbitration Rules" of 1985 was used to resolve the disputes of Contract A. This also applies to Contract B (see para. 4.6 below). Although the rules did not contain a confidentiality clause, the DSD was concerned about whether it was appropriate for the Government to disclose information relating to arbitrations. According to the DSD, under the common law system, a party to an arbitration had an implied obligation on confidentiality. Therefore, the amounts paid to contractors for the settlement of individual disputes are not separately disclosed in this Report. For two ISSW contracts, $58 million was paid to contractors in settlement of disputes (see para. 2.8 above).*

Audit observations on substantial increase in rock quantities and reinstatement works

3.14 As mentioned in paragraph 3.7 above, the estimated quantities of rock excavation, and reinstatement of existing carriageways and footpaths were 31, 5 and 6 times respectively more than the original quantities in the BQ. According to a DSD internal report of November 1999, for the tender assessment, the DSD only checked whether Consultant A had complied with the requirements of the relevant manuals/circulars for assessing tender bids. Audit considers that the financial consequences of the underestimate of the BQ quantities could be substantial for items which had high BQ rates. Audit noted that, in September 1999, the DSD issued a DSD Technical Circular No. 5/1999 to address the problems associated with unreasonably high rates in the BQ.

3.15 The second arbitration with Contractor A (see para. 3.10 above) mainly dealt with the deduction of the interest from the interim payments to offset the PFAs. Based on the advice of the LAD given in January 2000, the DSD decided to end the case which had continued for more than three years since mid-1996. Audit considers that in future the Government should try to settle outstanding disputes with contractors in one arbitration in order to save cost.

3.16 Arising from the substantial increase in the quantities of rock excavation and reinstatement works, the Government had incurred additional costs. The substantial increase in the actual quantities over the BQ quantities of rock excavation and reinstatement works was mainly due to the fact that no specific site investigation had been carried out along the sewer route (see para. 3.4 above). **Audit considers that if the DSD had taken more proactive action to monitor Consultant A's pre-tender preparation work, a more accurate estimate of the BQ quantities for rock excavation and reinstatement works could have been included in the contract documents.**

Audit recommendations on substantial increase in rock quantities and reinstatement works

3.17 **Audit has *recommended* that the Director of Drainage Services should:**

(a) **ensure that engineering consultants have taken all necessary measures, such as carrying out adequate site investigations, to obtain accurate information for estimating the quantities of works in the tender documents;**

(b) **take more proactive action to monitor the work of engineering consultants to ensure that they discharge their duties with due care and diligence; and**

(c) **in consultation with the LAD, attempt to settle with the contractor all outstanding matters arising from related issues under contractual dispute in one dispute resolution proceeding in order to save the time and cost of the Government.**

Response from the Administration

3.18 The **Director of Drainage Services** agrees with the audit recommendations. He has said that:

(a) he issued a technical circular, DSD TC No. 5/1999 "Guidelines to prevent and to deal with problems associated with unreasonable high rates in Bills of Quantities" to ensure that engineering consultants take necessary measures for estimating the quantities of works; and

(b) there are rules governing arbitration proceedings that may prohibit the Government from settling all outstanding matters arising from related issues under contractual dispute in one arbitration. The DSD relies on the advice of the LAD on all legal matters relating to arbitration proceedings.

3.19 The **Secretary for the Environment, Transport and Works** agrees with the audit observations and welcomes the recommendations as mentioned in paragraph 3.17 above. She has said that:

(a) as one of the possible improvement measures, the Environment, Transport and Works Bureau is considering the conduct of a sensitivity assessment on the likely impact of quantity variations for items with exceptionally high BQ rates in the tenders;

(b) the Bureau has reviewed the adoption of Alternative Dispute Resolution techniques in public works contracts, including the use of arbitration and other less adversarial methods in resolving disputes. It has recently endorsed the use of such techniques. General training on how these techniques can be used in a cost effective manner will be provided to project engineers of the works departments; and

(c) the Bureau has completed a review on risk allocation in respect of unforeseen ground conditions and has made the following recommendations:

(i) to reduce the exposure to such risk, sufficient site investigations during the planning and design stages have to be carried out. Works departments will be required to set up a panel chaired by a directorate officer to examine the scope and adequacy of site investigation works for geotechnically complex projects; and

(ii) in line with international practices, the employer should share the risk associated with ground conditions with contractors by suitable contract provisions, such as the use of remeasurement contract.

PART 4: CONTRACT PROVISIONS CONCERNING WORKS AFFECTED BY TIDAL WATER

4.1 This PART examines the construction of a pumping station and the associated sewerage works under Contract B. The contractor of Contract B (hereinafter referred to as Contractor B) and the Engineer for the Contract (i.e. Engineer A) had different interpretations of the contract provisions concerning the works affected by tidal water. The audit has revealed that there are lessons to be learnt in the preparation of contract documents.

Contract documents of Contract B

4.2 ***Works affected by tidal water.*** In mid-1991, the DSD awarded Contract B to Contractor B for the construction of a pumping station and the associated sewerage works. The General Preambles to the BQ of Contract B were prepared in accordance with the SMM. The SMM required that any works affected by tidal water should be measured separately under the sub-heading of "Works affected by tidal water" in the BQ. This would enable contractors to price the works items at a different rate to reflect the difficulties in carrying out the works under tidal conditions.

4.3 ***Contract clauses on works affected by tidal water.*** Concerning the works affected by tidal water, paragraph 8 of the General Preambles to the BQ of Contract B stated that:

(a) "The Contractor shall allow in the rates for taking all measures required to execute the works described as being affected by … tidal water and measured separately";

(b) "For the measurement of such works, the extent of the works described in the Contract as being affected by … tidal water shall be used irrespective of the actual extent of the works so affected"; and

(c) "For measurement purpose, all permanent works below +2.5 metres AOD which are directly affected by tidal water shall be measured as works affected by tidal water" (Note 7).

4.4 The two clauses mentioned in paragraph 4.3(a) and (b) above were standard clauses required by the SMM. For Contract B, an additional clause, i.e. the clause mentioned in

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Note 7: *AOD stands for Above Ordnance Datum and is a survey datum level used in Britain.*

paragraph 4.3(c) above, was included. This clause imposed additional conditions (i.e. "below +2.5 metres AOD" and "directly affected") for qualifying the works to be measured as the works affected by tidal water. According to the DSD, "AOD" is the survey datum level used in Britain. The Hong Kong equivalent of the AOD had not been specified in Contract B. According to the contract documents of Contract B, survey datum levels in Hong Kong were referred to as either the Principal Datum (i.e. 5.435 metres below a copper bolt established on a seawall in the then Royal Naval Dockyard), or the Chart Datum (i.e. 0.146 metre below the Principal Datum).

4.5 ***Items of works affected by tidal water in Contract B.*** The sewerage works under Contract B involved numerous items of works to be carried out near the sea. In the BQ of Contract B, six items of works were included under the sub-heading of "Works affected by tidal water".

Different interpretations of clauses on works affected by tidal water

4.6 According to the contract clause on the works affected by tidal water in paragraph 4.3(c) above, only works, which were carried out below the level of "+2.5 metres AOD" and were directly affected by tidal water, could be measured as the works affected by tidal water. However, the other two clauses on the works affected by tidal water (i.e. the clauses in para. 4.3(a) and (b) above), which followed the standard wording of the SMM, did not specify the requirements of "below +2.5 metres AOD" or "directly affected by tidal water". There were different interpretations of the contract clauses. Subsequently, a dispute arose between the Government and Contractor B over the type of works to be measured as the works affected by tidal water. In the event, the dispute was settled by arbitration. In March 2001, the DSD paid an additional amount to Contractor B (see Note 6 to para. 3.9 above).

Audit observations on works affected by tidal water

4.7 ***Different interpretations of contract provisions.*** An additional qualifying clause on the measurement of the works affected by tidal water (i.e. the clause as mentioned in para. 4.3(c) above) was included in the General Preambles to the BQ of Contract B. However, there was no specification in Contract B stating that the qualifying clause would supplement or supersede other relevant clauses in Contract B. **There were different interpretations as to which type of works should be measured as the works affected by tidal water and a dispute arose between the Government and Contractor B. Audit considers that, in order to minimise disputes, the contract provisions and specifications should have been thoroughly vetted to ensure that there were no inconsistencies.**

4.8 ***Survey datum level.*** As mentioned in paragraphs 4.3(c) and 4.4 above, the AOD, which was referred to in the qualifying clause on the works affected by tidal water, was the survey datum level used in Britain. The survey datum level used in Hong Kong is either the Principal Datum or

the Chart Datum. For Contract B, the Principal Datum was in fact used as the AOD equivalent for the measurement of the works affected by tidal water and no dispute arose over its use. **Audit considers that, for the avoidance of doubt, the DSD should have ensured that the Hong Kong survey datum levels were used in contract documents, instead of the survey datum level used in Britain.**

Audit recommendations on works affected by tidal water

4.9 **Audit has *recommended* that, in the preparation of contract documents for works contracts, the Director of Drainage Services should:**

(a) **ensure that provisions and specifications are clearly stated so as to minimise disputes between the Government and contractors; and**

(b) **use Hong Kong survey datum levels (i.e. the Principal Datum or the Chart Datum), instead of the survey datum levels of other countries.**

Response from the Administration

4.10 The **Director of Drainage Services** agrees with the audit recommendations. He has said that:

(a) a set of standard clauses of consultancy and contract documents for use by project engineers has been drawn up; and

(b) the use of the survey datum of "AOD" had been mistakenly specified in the contract documents by Consultant A. Nevertheless, the term "AOD" was never disputed in the course of the contract or in arbitration between the Government and Contractor B.

PART 5: LEAKAGE OF WATERMAINS CONSTRUCTED UNDER ISSW

5.1 This PART examines the works of three watermains which the WSD entrusted to the DSD for construction under Contract A. The audit has revealed that, as at end July 2002, i.e. more than six years after the completion of the watermain works in 1995, two of the three watermains still could not be put into operation because of leakage problems.

WSD entrusted watermain works to DSD

5.2 In August 1989, Consultant A started the planning work for the ISSW. At the same time, the WSD was planning to lay watermains along similar routing of the DSD's sewers. In order to minimise inconvenience to the public, the WSD's watermains would be laid in common trenches with the sewers.

5.3 In May 1990, the WSD entrusted the design and construction of three watermains (hereinafter referred to as Watermains A, B and C) to the DSD, as follows:

(a) ***Watermain A.*** This was a ductile iron pumping watermain of 600 millimetres nominal diameter (Note 8) and 360 metres in length. This watermain would be used to deliver water to a service reservoir in the area;

(b) ***Watermain B.*** This was a ductile iron pumping watermain of 450 millimetres nominal diameter and 1,600 metres in length. This watermain would be used to deliver water to another service reservoir in the area from other sources if the water storage at the Tai Tam Reservoirs was inadequate; and

(c) ***Watermain C.*** This was a ductile iron distribution watermain of 600 millimetres nominal diameter and 1,600 metres in length. This watermain would be used to improve the water supply pressure in the area.

According to the BQ of Contract A, the estimated total cost for the construction of Watermains A, B and C was $23 million. The actual total cost for the construction of the three watermains was $78 million. The increase in cost was mainly due to the increase in the quantity of the rock

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Note 8: *A nominal diameter refers to the numerical designation of diameter common to all components in a pipework system. This is expressed as a convenient round number in millimetre for reference purpose and is normally only loosely related to the actual internal diameter of the pipework.*

excavation works, PFAs for the changes in the cost of labour and materials, and share of arbitration awards and costs relating to the dispute over the quantity of the rock excavation works.

5.4 According to the requirement of the WSD, for the design of the watermains works, the following documents should be referred to:

(a) the WSD General Specification for Civil Engineering Works (1987 Edition) concerning the standard WSD specifications and testing requirements for the watermains; and

(b) "British Standard 4772 on Specification for Ductile Iron Pipes and Fittings".

5.5 In February 1991, the WSD received a design proposal for the watermains. In July 1991, the WSD raised no objection to the design proposal of the watermains. In mid-1992, the DSD invited tenders for Contract A.

5.6 ***Handing over of watermains.*** The construction works of Watermain A were substantially completed in February 1995. In the same month, Watermain A was handed over to the WSD after the WSD, Engineer A and Contractor A had carried out a joint site handing-over inspection. For Watermains B and C, the works were substantially completed in September 1995. The watermains were handed over to the WSD in September 1995 after a joint site inspection.

Leakage problem of watermains

5.7 ***Leakage of Watermains B and C.*** After the DSD had handed over Watermains A, B and C to the WSD, the WSD kept the watermains in an "empty" condition pending the completion of the connection works to the existing watermains. In November 1995, in the process of commissioning Watermains A, B and C, the WSD found that there were leakages in Watermains B and C. The WSD reported the leakage problem to the DSD for investigation. Up to July 2002, Watermains B and C had not been put into operation. For Watermain A, no leakage was reported since its handing over in February 1995.

5.8 During the period January to October 1996, there were still leakages in Watermains B and C. By November 1996, the repair works were completed and no more leakage was reported.

5.9 In January 1997, the maintenance certificate was issued for Contract A. During the period January to April 1997, in the process of the commissioning of Watermains B and C, the

WSD again found leakages. In April 1997, the DSD urged Engineer A to ask Contractor A to repair all the outstanding leakages as soon as possible. Contractor A had carried out repair works for the leakages and those subsequently identified. The repair works were ceased in December 1999.

5.10 In early 2000, the WSD informed the DSD of the need to have the outstanding defects in the leaking watermains repaired in order to secure the water supply to the southern part of Hong Kong Island. As there was disagreement between the parties concerning the liability for the defects, the matter was subsequently referred to the LAD and is currently the subject of ongoing legal proceedings.

Audit observations on leakage of WSD's watermains constructed under ISSW

5.11 Watermains B and C are an important part of the waterworks project for augmenting the water supply to the southern part of Hong Kong Island. In November 1995, in the process of commissioning the watermains, the WSD found that there were leakages in Watermains B and C. **As at end of July 2002, i.e. more than six years after their completion in 1995, Watermains B and C still could not be put into operation because of the leakage problem. Audit considers that there is an urgent need to repair the two watermains so that the new water supply system can be commissioned as soon as possible.**

5.12 For Watermain A, no leakage has been reported since its completion in February 1995 and it has been put into operation. In the light of the leakage problem encountered by Watermains B and C, as a precautionary measure to ensure a continued water supply to the area, Audit considers that the WSD should closely monitor the operation of Watermain A and to take immediate rectification action if a leakage occurs. In July 2002, in response to Audit's enquiry, the WSD said that the WSD had been closely monitoring Watermain A since its commissioning.

Audit recommendations on leakage of WSD's watermains constructed under ISSW

5.13 **Audit has *recommended* that the Director of Drainage Services and the Director of Water Supplies should:**

(a) **take urgent action to resolve the leakage problem in order to put Watermains B and C into operation as soon as possible; and**

(b) **in conjunction with the LAD:**

(i) **investigate the cause of the leakage of the two watermains;**

(ii) **identify the parties responsible for the leakage; and**

(iii) **pursue legal remedies from the parties concerned.**

5.14 **Audit has *recommended* that the Director of Water Supplies should continue to closely monitor the operation of Watermain A in order to take immediate rectification action if a leakage occurs.**

Response from the Administration

5.15 The **Director of Drainage Services** agrees with the audit recommendations as mentioned in paragraph 5.13 above. He has said that the DSD is working closely with the WSD and the LAD on this matter.

5.16 The **Director of Water Supplies** agrees with the audit recommendations as mentioned in paragraphs 5.13 and 5.14 above. He has said that the WSD is working closely with the DSD and the LAD for a workable solution to complete the repair to Watermains B and C as soon as possible.

PART 6: PROPERTY CONNECTION WORKS

6.1 The main construction works of the ISSW included the construction of branch sewers for conveying wastewater from private and government premises to public sewers. When the public sewers (i.e. main sewers and branch sewers) are laid, owners of premises are required to construct necessary pipeworks for conveying the wastewater of their premises to the public sewers (hereinafter referred to as property connection works). This PART examines the coordination between government departments and the adequacy of the procedures for the administration of the property connection works. The audit has revealed that there is room for improvement in the planning and coordination of property connection works.

Requirements of the Water Pollution Control (Sewerage) Regulation

6.2 The most effective and reliable way of disposing of the wastewater of individual premises is by connecting their wastewater pipes to the public sewers leading to the sewage treatment facilities. In June 1994, the Water Pollution Control (Sewerage) Regulation (WPCR) under the WPCO came into force. Under section 3 of the WPCR, when public sewers have been laid and are ready for connection, the Director of Environmental Protection may serve a notice to the owner of the concerned property requiring him to carry out construction works for conveying wastewater from his premises to a place specified in the notice, and to complete the construction within a time specified in the notice. The owners of individual properties are required to pay for the works. After the DSD and the Environmental Protection Department (EPD) have inspected the works carried out by the owners, the owners are required to seal up the pipes leading to the private domestic sewage treatment facilities (Note 9) and to divert the wastewater to the public sewers. According to section 27 of the WPCR, any person who fails to comply with any requirements specified in a notice served by the EPD under section 3 commits an offence and is liable to a fine of $100,000 and, in addition, to $5,000 for each day during which it is proved to the satisfaction of the court that the person has continuously since the date of offence failed so to comply. In addition, the Government may carry out the works on behalf of the owner and recover the cost from him. The Government is responsible for the construction of the branch sewers.

6.3 In November 1997, the DSD awarded two works contracts for the construction of branch sewers to collect sewage from private properties in the southern part of Hong Kong Island. The works of these two contracts were substantially completed in 1999.

Note 9: *Discharges from private domestic sewage treatment facilities, such as septic tanks, are subject to control under the WPCO.*

Water quality of beaches on southern part of Hong Kong Island

6.4 The WPCO provides for the establishment of water quality objectives. The objectives describe the water quality that should be achieved and maintained in order to promote the conservation and best use of the waters of Hong Kong. For bathing beaches, one of the water quality objectives set under the WPCO is that the E. coli count (Note 10) should not exceed 180 per 100 millilitres of beach water.

6.5 The EPD is responsible for monitoring the water quality of all gazetted beaches in Hong Kong. A rating system developed by the EPD to assess the water quality of beaches is the annual ranking system. The annual ranking (Note 11) of a beach is determined by the E. coli count of water samples collected from the beaches for the bathing season from March to October. Figure 1 below shows the beach water quality ranking of the gazetted beaches on the southern part of Hong Kong Island for the past 11 years.

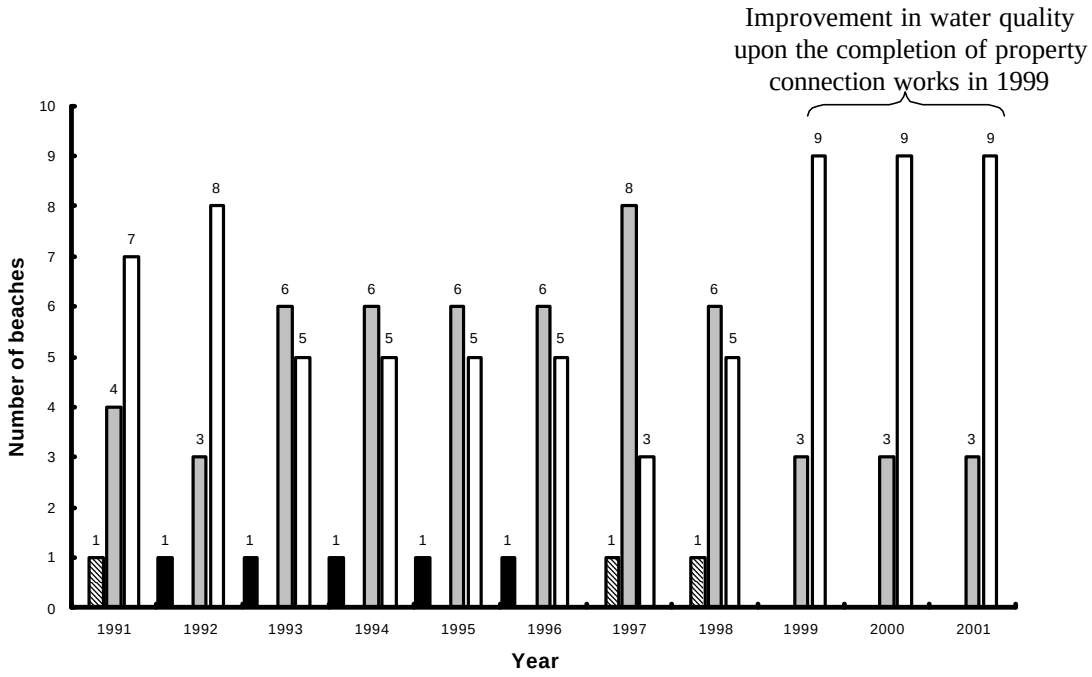
Note 10: *E. coli is a bacterium found in human faeces. It is the most commonly used and internationally accepted indicator of sewage pollution. A high E. coli count indicates high faecal contamination and high health risk.*

Note 11: *The EPD's annual ranking system of beaches, based on the E. coli count per 100 millilitres of beach water, is as follows:*

Beach water quality ranking	***E. coli count per 100 millilitres of beach water***	***Compliance with the water quality objective***
Good	*Up to 24*	*Yes*
Fair	*25 to 180*	*Yes*
Poor	*181 to 610*	*No*
Very poor	*More than 610*	*No*

Figure 1

Beach water quality ranking of gazetted beaches on the southern part of Hong Kong Island 1991 to 2001



Legend:

Beach water quality ranking:

- Good (E. coli count not exceeding 25 per 100 millilitres of beach water)
- Fair (E. coli count between 25 and 180 per 100 millilitres of beach water)
- Poor (E. coli count between 181 and 610 per 100 millilitres of beach water)
- Very poor (E. coli count exceeding 610 per 100 millilitres of beach water)

Source: EPD's records

As can be seen from Figure 1 above, before 1999, of the 12 gazetted beaches on the southern part of Hong Kong Island, 11 beaches had either "Good" or "Fair" water quality. After the completion of the property connection works in 1999, there had been a steady improvement in the water quality. From 1999 to 2001, the water quality of all the beaches was mostly ranked as "Good". No beach was ranked as "Poor". **It is evident that, with the completion of the property connection works and the implementation of the ISSW, there has been a general improvement in the water quality.** Nevertheless, Audit has found that there is room for improvement in the planning and monitoring of the connection works of the private properties (see paras. 6.6 to 6.8 below) and of the government facilities (see paras. 6.11 to 6.13 below).

Connection works of private properties

6.6 As mentioned in paragraph 6.3 above, the construction works of the branch sewers were substantially completed in 1999. When public sewers have been laid, owners of private properties are required to carry out the connection works. Audit requested the EPD to provide a list of private properties the wastewater of which had not yet been diverted to the public sewers. In April 2002, the EPD provided a list of 54 properties. As at 30 June 2002, the position changed and the number of properties the wastewater of which had not yet been diverted to the public sewers dropped from 54 to 49. Of the 49 properties, Audit noted that the property connection works of 24 properties had been completed and were awaiting the EPD's inspection, the works of 14 properties were in progress, and the works of 11 properties had not yet been started. See Appendix A for details.

Audit observations on connection works of private properties

6.7 For the 49 private properties, the wastewater of which had not yet been diverted to the public sewers, the EPD had issued notices to the owners (except for one unoccupied property) between February 1996 and September 1999. Since the issue of the notices, the EPD had taken follow-up action by issuing reminders to the owners. However, Audit noted that for nine cases, the EPD issued the first reminder in March 2002. In Audit's view, the EPD should have issued the reminders much earlier.

6.8 In August 2002, in response to Audit's enquiry, the EPD said that its staff relied on a manual system to take follow-up action on the owners from whom no response had been received. For the nine cases, the EPD said that there was apparently an oversight which indicated that the manual system needed improvement. The EPD informed Audit that the EPD was considering the replacement of the manual system by a computer system. **Audit considers that, to ensure effective monitoring of the progress of works carried out by private property owners, the EPD should improve its follow-up system. In cases where the progress of works is slow, more stringent measures, such as the enforcement action under the WPCR (see para. 6.2 above), should be considered.**

Audit recommendations on connection works of private properties

6.9 **Audit has *recommended* that the Director of Environmental Protection should:**

(a) **take prompt action to improve the system of issuing reminders to private property owners so as to monitor closely the progress of sewage connection works carried out by them; and**

(b) **in cases where the progress of sewage connection works carried out by private property owners is slow, consider taking enforcement action against them in accordance with the WPCR.**

Response from the Administration

6.10 The **Director of Environmental Protection** agrees with the audit recommendations. He has said that:

(a) there is room for improving the EPD's present system of issuing reminders to property owners. The EPD is developing an integrated enforcement database system named "Environmental Database Model for Enforcement and Monitoring" to computerise all the enforcement and related data. Once the system is in place, the enforcement staff can be promptly alerted to issue reminders to the property owners;

(b) the nine cases identified in the report are served by septic tanks and soakaway systems that are functioning properly. These private properties are regarded as low priority cases; and

(c) the EPD's Enforcement Guidelines on Sewer Connection set out clearly the criteria and procedures to be followed for effecting sewer connections under the WPCR. The guidelines caution the use of prosecution action as a means to achieve sewer connection. The EPD staff will continue to follow the guidelines and take all the relevant factors including progress of connection into account when considering prosecution on a case by case basis.

Connection works of government facilities

6.11 In March 2002, Audit randomly selected a sample of 36 government facilities in the area and asked the EPD to provide information on the status of the connection works (see para. 6.1 above), the date of EPD's notice served, the date of connection and the date of the EPD's inspection. In April 2002, the EPD provided to Audit information on the status of the connections of the government facilities and the date of EPD's inspection. However, the information concerning the date of connection and the date of the EPD's notice served was not provided. Of the 36 government facilities:

(a) 29 (or 80%) had been connected to the public sewers and the EPD had inspected the connections;

(b) the connection works of 5 (or 14%) had not been carried out as there were no public sewers nearby;

(c) the status of connection of 1 (or 3%) government facility was unknown; and

(d) the connection works of 1 (or 3%) government facility were in progress.

Of the 29 government facilities mentioned in inset (a) above, 15 were inspected at least more than 3 years after the commissioning of the relevant pumping station or treatment facilities. For details, see Appendix B.

Audit observations on connection works of government facilities

6.12 To achieve the water quality objective for bathing beaches set under the WPCO, the Government, as the owner of government facilities located in the area, should ensure that the sewers of the facilities are promptly connected to the public sewers. However, Audit found that there were 15 government facilities which were inspected at least more than 3 years after the commissioning of the relevant pumping station or treatment facilities. In the absence of information about the date of connection, Audit was unable to ascertain whether the long elapsed time (between the EPD's inspection date and the date of the commissioning of the treatment facilities) was due to a delay in carrying out the connection works or due to a delay in the EPD's inspection.

6.13 In order to dovetail the connection works of government facilities with the construction of the public sewers and the treatment facilities in the area, reliance has to be placed on the coordination and cooperation of the parties concerned. **The Government is expected to set a good example to owners of private properties that the connection works of government facilities should be functioning as soon as the public sewers are available. Audit considers that there is scope for improving the planning and coordination of the connection works of government facilities.**

Audit recommendations on connection works of government facilities

6.14 **Audit has *recommended* that, for effective planning and coordination of sewage connection works of government facilities in future, the Director of Environmental Protection should**:

(a) **in conjunction with the DSD, promptly ascertain the government facilities requiring connection to the new public sewers so that the connection works can be carried out as soon as possible; and**

(b) **in conjunction with the DSD and the departments concerned, draw up a programme for the implementation of the connection works of government facilities so that the works can be carried out as soon as possible when the new public sewers are available.**

6.15 **Audit has *recommended* that the Secretary for the Environment, Transport and Works should**:

(a) **consider issuing a circular to advise all government departments of the need to plan early for the connection works of government facilities and to monitor closely the progress of the works; and**

(b) **in conjunction with the EPD, closely monitor the progress of the connection works of government facilities so as to ensure that the progress of the works complies with the implementation programme and there is no undue slippage.**

Response from the Administration

6.16 The **Director of Environmental Protection** agrees with the audit recommendations as mentioned in paragraph 6.14 above. He has said that early identification of government facilities requiring sewer connection and agreement with the concerned works departments on the implementation programme will help speed up the connection works.

6.17 The **Secretary for the Environment, Transport and Works** agrees with the audit observations and welcomes the recommendations as mentioned in paragraph 6.15 above. She has said that:

(a) the property connection works essentially form an integral part of the public sewers scheme to which they will eventually be connected. The Environment, Transport and Works Bureau is considering the inclusion of the works as part and parcel of the same funding application for the public sewers scheme. This would help avoid delays to the property connection works due to funding application procedures;

(b) the Bureau will work in conjunction with the EPD to monitor the progress of the connection works of government facilities so as to ensure compliance with the implementation programme; and

(c) the Bureau will prepare a circular to advise all government departments of the need to plan early for the connection works of government facilities and to monitor closely the progress of the works.

PART 7: AUDIT RECOMMENDATIONS FOR OTHER WORKS DEPARTMENTS

7.1 Based on the lessons learnt from this report, other works departments may also benefit in improving their contract administration and project implementation of major capital works projects. **Audit has *recommended* that the Secretary for the Environment, Transport and Works should consider notifying all works departments (e.g. by promulgating technical circulars) of the audit recommendations mentioned in paragraphs 2.10, 3.17 and 4.9 above, so as to avoid a recurrence of similar cases in future.**

Response from the Administration

7.2 The **Secretary for the Environment, Transport and Works** welcomes the audit recommendations as mentioned in paragraph 7.1 above. She has said that some of the audit recommendations are indeed potent management principles which have already been put into practice.

Appendix A
(para. 6.6 refers)

No. of private properties the sewage of which had not yet been diverted to public sewers as at 30 June 2002

	Reason	No. of properties	
Connection works completed and awaiting EPD's inspection			
(a)	inspection to be arranged	11	
(b)	re-inspection required due to minor defects, etc.	13	24
Connection works in progress			
(c)	connection works in progress	6	
(d)	awaiting Buildings Department's approval of the drainage plans	8	14
Connection works not yet started			
(e)	reminders sent to owners	3	
(f)	owners not willing to connect their sewage pipes to the public sewers	2	
(g)	properties under development or to be redeveloped	3	
(h)	no works carried out as the owner was bankrupt	1	
(i)	unoccupied property	1	
(j)	works suspended by owner due to geotechnical problems	1	11
	Total		**49**

Source: EPD's records

Appendix B
(para. 6.11 refers)

Status of sewer connections of 36 government facilities as at 19 April 2002

Status		**Government facilities**			
		(No.)		**(No.)**	**(%)**
(a)	not connected	5			
(b)	connection status unknown	1			
(c)	connection works in progress	1		7	20%
(d)	connected and inspected before the commissioning date of the corresponding sewage treatment facility	4			
(e)	deemed connected by visual inspection	4			
(f)	connected and inspected. The elapsed time between the date of inspection of the sewer connection of the government facility and the commissioning date of the corresponding sewage treatment facility was as follows:				
	(i) less than 1 year	1			
	(ii) 1 year to less than 2 years	3			
	(iii) 2 years to less than 3 years	2			
	(iv) 3 years to less than 4 years	1			
	(v) 4 years to less than 5 years	13			
	(vi) 5 years to less than 6 years	–	15		
	(vii) 6 years to less than 7 years	–			
	(viii) 7 years or more	1		29	80%
	Total			**36**	**100%**

Source: EPD's records, Architectural Services Department's records and Audit's analysis

Chronology of key events

Management of ISSW

July 1990	The FC approved the upgrading of the main construction works of the ISSW to Category A of the PWP at an APE of $468 million at July 1990 prices.
January 1997	The FC approved an increase in the APE for the main construction works to $836 million at the money-of-the-day prices. The DSD also informed the FC that the date of completion of the ISSW would be December 1998, instead of mid-1994.
December 1999	The construction works of the ISSW were substantially completed. There was a delay of more than five years when compared to the original scheduled date of completion of mid-1994.
June 2002	The actual cost of the main construction works of the ISSW was $818 million. Excluding the cost increase due to inflation of $138 million, the increase in actual cost of the main construction works of the ISSW, in real terms, was $212 million (or an increase of 45% over the original APE of $468 million).

Substantial increase in quantities of rock excavation and reinstatement works

Late 1989 and early 1990	No specific site investigation was carried out to ascertain the rock level.
January 1993	Additional site investigations were carried out along the sewer route in order to properly assess the actual extent of the rock level.
Mid-1994	Contractor A was notified of the revised BQ rates for rock excavation works.
Early 1998	The DSD paid an additional amount to Contractor A in settlement of the dispute over the revised BQ rates.
April 2000	The DSD paid an additional amount to Contractor A in settlement of the dispute over the entitlement of the PFAs.

Contract provisions concerning works affected by tidal water

July 1991	Contract B included a clause which imposed additional conditions on the two standard clauses for qualifying works to be measured as the works affected by tidal water.
March 2001	The DSD paid an additional amount to Contractor B in settlement of the dispute over the type of works to be measured as the works affected by tidal water.

Leakage of watermains constructed under the ISSW

May 1990	The WSD entrusted the design and construction of three watermains (Watermains A, B and C) to the DSD under Contract A of the ISSW.
November 1995	In the process of commissioning Watermains A, B and C, the WSD found that there were leakages in Watermains B and C. No leakage was reported for Watermain A.
November 1996	The repair works of Watermains B and C were completed.
April 1997	The WSD again found leakages after the issue of the maintenance certificate in January 1997.
July 2002	Watermains B and C were still not put into operation.

Property connection works

June 1994	The WPCR came into force. Property owners are required to carry out construction works for conveying wastewater from their premises to public sewers.
1999	The branch sewers of the ISSW were substantially completed.
Since 1999	The water quality of all the beaches on the southern part of Hong Kong Island was mostly ranked as "Good". No beach was ranked as "Poor". However, before 1999, 11 beaches out of the 12 gazetted beaches on the southern part of Hong Kong Island had either "Good" or "Fair" water quality.

Appendix D

Acronyms and abbreviations

AOD	Above Ordnance Datum
APE	Approved project estimate
BQ	Bills of Quantities
DSD	Drainage Services Department
EPD	Environmental Protection Department
EOT	Extension of time
FC	Finance Committee
ISSW	Hong Kong Island South sewerage works
LAD	Legal Advisory Division
PFA	Price fluctuation adjustment
PWP	Public Works Programme
SMM	Standard Method of Measurement for Civil Engineering Works (1988 Edition)
SMP	Sewerage Master Plan
WPCO	Water Pollution Control Ordinance
WPCR	Water Pollution Control (Sewerage) Regulation
WSD	Water Supplies Department