

## **CHAPTER 9**

### **Environmental Protection Department Drainage Services Department**

<h4><b>Provision of village sewerage</b></h4>
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**Audit Commission  
Hong Kong  
25 October 2010**

*This audit review was carried out under a set of guidelines tabled in the Provisional Legislative Council by the Chairman of the Public Accounts Committee on 11 February 1998. The guidelines were agreed between the Public Accounts Committee and the Director of Audit and accepted by the Government of the Hong Kong Special Administrative Region.*

Report No. 55 of the Director of Audit contains 11 Chapters which are available on our website at <http://www.aud.gov.hk>.

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# PROVISION OF VILLAGE SEWERAGE

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## **PART 1: INTRODUCTION**

1.1 This PART describes the background to the audit and outlines the audit objectives and scope.

### **Background**

1.2 Many rural villages (Note 1), particularly those in the New Territories, are not provided with public sewerage. Sewage from unsewered rural villages is discharged into nearby watercourses after treatment by private treatment facilities, such as septic tanks (Note 2) and soakaway systems (Note 3). These facilities are, in general, not effective in removing pollutants due to the constraints of the local environment, the close proximity to watercourses and inadequate maintenance (Note 4). There have been cases of village septic tanks and soakaway systems failing to effectively treat sewage, causing pollution of the environment and potential health hazards to the villagers in the vicinity.

### ***Village sewerage programmes***

1.3 According to the Environmental Protection Department (EPD), a proper sewerage network for collecting sewage from village houses for suitable treatment and disposal is the long-term solution to water pollution problems. In order to protect public health and achieve the declared Water Quality Objectives (WQOs — Note 5), since late 1980s, the EPD had commissioned sewerage studies for drawing up Sewerage Master Plans

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**Note 1:** *Rural villages mainly refer to those included in the list of district rural committees and villages published by the Home Affairs Department and those included in the electoral boundary map of the District Councils.*

**Note 2:** *A septic tank is a device used for the collection, storage and treatment of sewage. The sewage will be partially decomposed in the septic tank.*

**Note 3:** *Soakaway systems operate by allowing the effluents to filter through the gravel whereby the pollutants would be removed in a natural manner.*

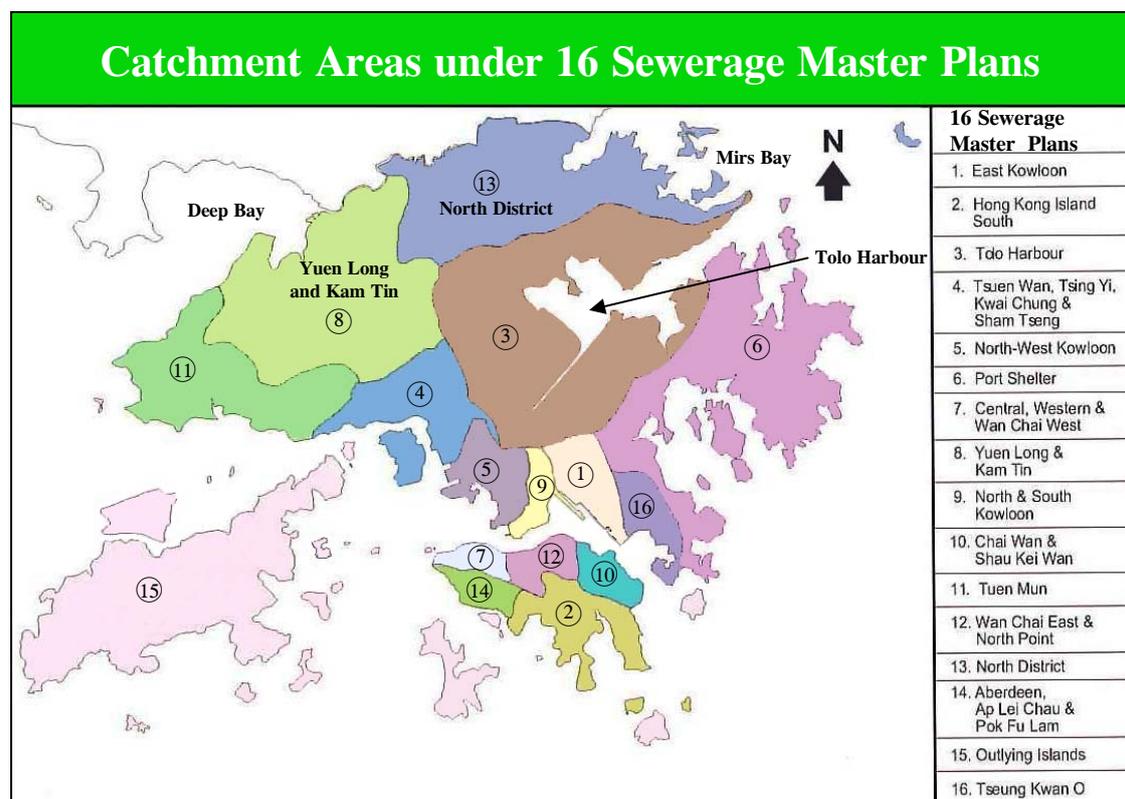
**Note 4:** *The performance of septic tanks or soakaway systems would be affected by factors such as local conditions, development density, design, operation and maintenance. Unsatisfactory maintenance of septic tanks or soakaway systems would also affect their pollutant removal efficiency and may even lead to an overflow of effluents.*

**Note 5:** *WQOs are established under the Water Pollution Control Ordinance (Cap. 358), which describe the water quality that should be achieved and maintained in order to promote the conservation and best use of Hong Kong waters. Compliance with WQOs would be determined based on the achievement of certain parameters, including dissolved oxygen, total inorganic nitrogen, unionised ammonia, E. Coli, suspended solids and pH values.*

(SMPs — Note 6) for Hong Kong (see Figure 1 for various catchment areas). Each SMP study contained recommendations on the collection, treatment and disposal of sewage to meet the present and future development needs. The SMPs included implementing programmes to provide public sewerage systems to unsewered rural villages (hereinafter referred to as **village sewerage programmes**).

Figure 1

Sewerage Master Plan catchment areas



Source: EPD and Drainage Services Department records

**Note 6:** An SMP sets out at the regional/district level a sewage collection, treatment and disposal strategy on a catchment basis with the objectives of safeguarding public health, and protecting the ecosystem, rivers and coastal waters.

1.4 The village sewerage programmes require a lot of resources and efforts from the Government and cooperation of stakeholders especially that of the villagers in order to take the programmes forward. In view of limited resources and other project constraints, the EPD needs to set priority in implementing the village sewerage programmes (see para. 2.8).

1.5 The progress of village sewerage programmes has a direct impact on the water quality of receiving waters (Note 7). The provision of village sewerage and proper connection of village houses to the public sewerage network will significantly reduce pollution to the nearby rivers and coastal waters. Implementing village sewerage programmes under the Tolo Harbour SMP and the Port Shelter SMP has helped improve the water quality in the nearby waters.

1.6 Of the 980 rural villages in Hong Kong, 660 villages had been included in the village sewerage programmes. The remaining 320 villages did not have any sewerage plans because they were either too remote or restricted by the peculiar topographical constraints. Of the 660 villages included under the village sewerage programmes, public sewers were completed for 130 villages and sewerage works for 55 villages were under construction. As of July 2010, of the 7,900 village houses covered by public sewers, about 6,000 village houses had been connected to the public sewers.

1.7 The EPD is responsible for planning the village sewerage programmes. It is also responsible for monitoring the marine and river water quality, and taking enforcement action against water polluters. The Drainage Services Department (DSD), as the works agent of the EPD, is responsible for implementing the sewerage infrastructure works.

#### ***Implementing village sewerage programmes in Yuen Long and North District***

1.8 Discharge from unsewered areas in Yuen Long and Kam Tin (hereinafter referred to as Yuen Long) and North District (Note 8) had an adverse impact on the water quality of Deep Bay and the nearby rivers. According to the EPD, Deep Bay is one of the Hong Kong marine waters with poor water quality. In 2009, Deep Bay achieved a 40% rate of compliance with WQOs (Note 9). This compared unfavourably with the overall compliance rate of 87% territory-wide, and also 71% for the Tolo Harbour.

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**Note 7:** *Receiving waters include groundwater, streams, rivers, lakes, oceans or other watercourses into which wastewater or treated effluents are discharged.*

**Note 8:** *North District includes Sheung Shui, Fanling and Sha Tau Kok.*

**Note 9:** *The rate of compliance with WQOs refers to the average rate of compliance with the six WQO parameters (see Note 5 in para. 1.3) recorded by the monitoring stations during a year.*

1.9 To address the Yuen Long and North District sewerage needs and to improve Deep Bay water quality, the Government has been implementing a number of sewerage infrastructure projects in these two districts. Since 2002, the Government has spent over \$1.3 billion on sewerage projects in the two areas. Subject to the availability of funding, the Government planned to spend \$4.6 billion from 2010 to 2015 for implementing further sewerage projects there.

1.10 Implementing village sewerage programmes in Yuen Long and North District is an integral part of the Yuen Long SMP and the North District SMP (see para. 1.3). As of July 2010, 306 villages in Yuen Long and North District had been included in the village sewerage programmes, accounting for 46% of the villages included in the programmes. Table 1 shows the distribution of villages in Yuen Long and North District, and their coverage by public sewers.

**Table 1**  
**Villages in Yuen Long and North District**  
**(July 2010)**

	Yuen Long (a)	North District (b)	Total (c) = (a) + (b)
(A) Number of villages included in village sewerage programmes (Note)	180	126	306
(B) Number of villages with public sewers completed	2	22	24
(C) Number of villages with sewerage works under construction	9	12	21
<b>(D) Coverage rate</b> <b>(D) = (B) ÷ (A) × 100%</b>	<b>1%</b>	<b>17%</b>	<b>8%</b>

Source: EPD and DSD records

Note: There were 225 and 185 villages in Yuen Long and North District respectively. The remaining 45 (225 less 180) and 59 (185 less 126) villages in these two districts respectively were not included in the village sewerage programmes because of: (a) costly pumping facilities; (b) insufficient space; (c) complex internal drainage; (d) land resumption issues; and (e) remote location with small populations.

## Audit review

1.11 The Audit Commission (Audit) has recently conducted a review to examine the planning and administration of the village sewerage programmes by the EPD and the DSD. The review, which focused on the village sewerage programmes in Yuen Long and North District, covered the following areas:

- (a) village sewerage programme in Yuen Long (PART 2);
- (b) village sewerage programme in North District (PART 3);
- (c) sewer connection of village houses (PART 4); and
- (d) planning and administering village sewerage projects (PART 5).

Audit has found areas where improvements can be made and has made a number of recommendations to address the issues.

## Acknowledgement

1.12 Audit would like to acknowledge with gratitude the full cooperation of the staff of the Environment Bureau (ENB — Note 10), the EPD and the DSD during the course of the audit review.

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**Note 10:** *Before 1997, the then Planning, Environment and Lands Bureau was responsible for the policy on environmental matters. In 2001, the then Environment and Food Bureau was formed to take up the policy on environmental matters. In July 2002, the then Environment, Transport and Works Bureau was formed to take up the environment portfolio from the then Environment and Food Bureau. In July 2007, the ENB was formed to take up the policy on environmental matters. For simplicity, all the previous policy bureaux which had been responsible for the policy on environmental matters are referred to as the ENB in this Report.*

## **PART 2: VILLAGE SEWERAGE PROGRAMME IN YUEN LONG**

2.1 This PART examines the implementation of the village sewerage programme in Yuen Long.

### **Planning of village sewerage programme in Yuen Long**

#### *The 1992 Yuen Long SMP Study*

2.2 In March 1992, the EPD completed the SMP Study for Yuen Long, including the provision of public sewerage to unsewered villages. According to the study report:

- (a) about 53% of the study area population lived in unsewered villages and squatter areas. The effluents were not adequately treated by septic tanks before entering local drains and watercourses;
- (b) the need for a more effective sewerage system was critical because of the rapid growth in the number of village houses;
- (c) trunk sewers were proposed under the SMP to serve the Yuen Long area, including both the villages and the new development area in Yuen Long; and
- (d) **successfully implementing public sewerage to serve villages was an essential element of the whole SMP. Without a comprehensive public sewerage system for villages, much of the considerable investment in trunk sewerage would be wasted and the environment improvement sought would not be achieved.**

2.3 The 1992 SMP Study also set out the implementation schedule of the village sewerage programme, as follows:

- (a) public sewerage should be provided to the majority of unsewered villages within the study area;
- (b) the progress of village sewerage programme was dependent on the cooperation and support of individual village communities. The implementation programme was drawn up based on normal procedures and conditions of design, land resumption, tendering and construction; and
- (c) **sewerage works should be implemented by stages (see para. 2.5) in 14 years for completion by the end of 2005.**

### *The 1999 Yuen Long SMP Review*

2.4 In January 1999, the EPD completed another study to update the 1992 Yuen Long SMP in the light of changes in the population forecast. According to the study:

- (a) it was important to recognise the role of village sewerage. Without it, the overall environmental objectives for Deep Bay and the Northwest New Territories would not be achieved;
- (b) traditional villages had undergone substantial redevelopment over the last 15 years. As a result, many villages had been transformed in an ad hoc fashion, from orderly and well planned traditional villages into congested and built-up urban environment, while sewerage infrastructure provision had lagged behind the redevelopment;
- (c) there were new development proposals in the Northwest New Territories since completing the SMP in 1992;
- (d) priority of implementing infrastructure projects focused on the construction of the trunk sewer system to permit the planned development of the Northwest New Territories without causing further deterioration to the water quality in Deep Bay; and
- (e) the time required to complete village sewerage was prolonged. There were difficulties in resuming lands for the works, partly due to incomplete or missing land records.

### *Implementing sewerage works under SMP studies*

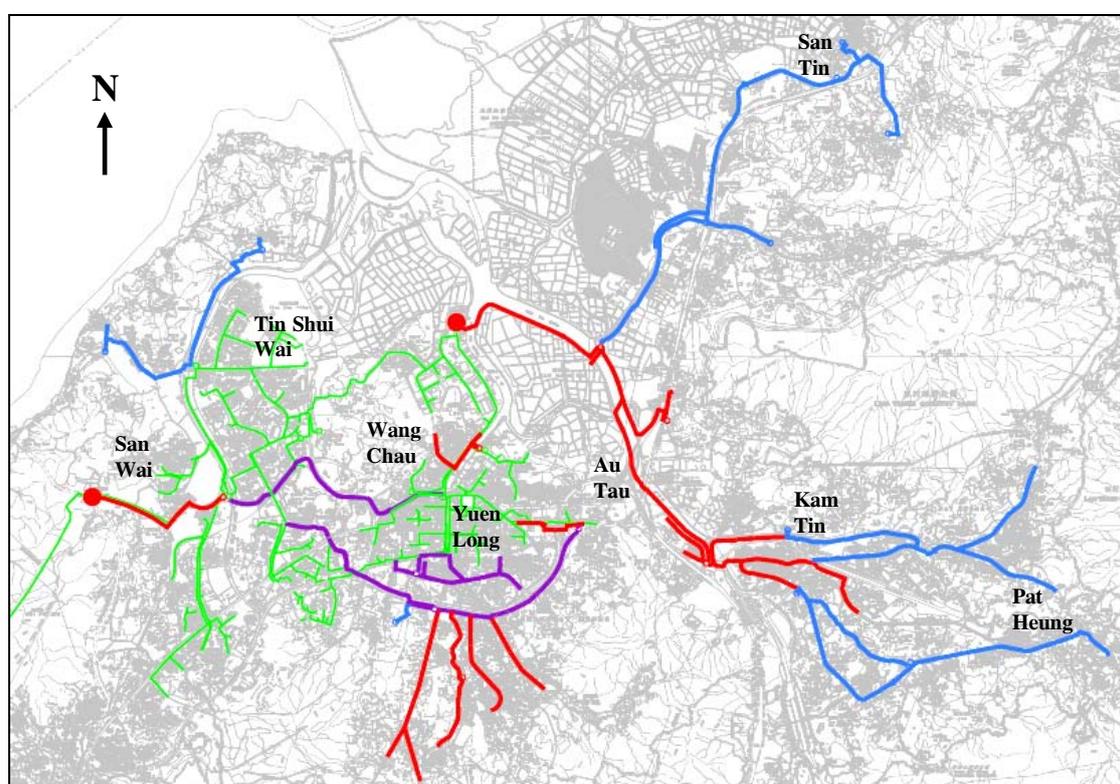
2.5 An important objective of the Yuen Long SMP was to extend the sewerage networks to cover unsewered villages to minimise pollutants flowing into nearby watercourses and Deep Bay. Figure 2 shows the extension of sewerage network planned under the Yuen Long SMP. According to the DSD, the works would be implemented by three stages, as follows:

- (a) **Stage 1.** The works included improvement works for about seven kilometres of existing sewers in Yuen Long Town and constructing three kilometres of new sewers for diverting some of the sewage flow from Yuen Long Sewage Treatment Works to San Wai Sewage Treatment Works;

- (b) **Stage 2.** The works included the provision of trunk sewers and village sewerage for the unsewered areas in Yuen Long West (Note 11); and
- (c) **Stage 3.** The works included the provision of trunk sewers and village sewerage for unsewered areas in Yuen Long and Yuen Long fringe areas (including Yuen Long South, east of Yuen Long Town and Au Tau).

Figure 2

Extension of sewerage network in Yuen Long  
(July 2010)



- Legend:
- Existing sewers before Yuen Long SMP
  - Sewers completed
  - Sewers under construction
  - Sewers under planning
  - Sewage treatment works

Source: DSD records

**Note 11:** These include Ping Shan, Kiu Tau Wai, Shek Po Tsuen, Fui Sha Wai, Hung Shui Kiu, Tan Kwai Tsuen, Chung Uk Tsuen, Nai Wai and Lam Tei.

2.6 In December 1992 and October 1995, two new Category B items (Note 12) were included in the Public Works Programme (PWP) respectively for implementing the proposed sewerage works. The Stage 1 works were completed in 1998 (Note 13). Planning of sewerage works under Stage 2 and Stage 3 was in progress. In May 2001, the Administration informed the Legislative Council (LegCo) Panel on Environmental Affairs of the progress of village sewerage programme under the Yuen Long SMP, as follows:

- (a) construction of public sewers for the unsewered villages under Stages 2 and 3 would commence in phases between 2001 and 2006; and
- (b) **all sewerage works under the SMP were scheduled for completion in 2008.**

*Prioritisation of capital works projects*

2.7 From 2002 to 2004, there were funding constraints in the delivery of capital works projects. The Government prioritised the funding bids for new capital works projects, having regard to the need to achieve more effective spending of public funding. During the period, there was no new programme for village sewerage projects, and project planning and design by the DSD were largely put on hold. In 2004, the EPD carried out a review to map out the way forward to complete the remaining village sewerage projects. The review found that:

- (a) **over 90% of the unsewered village houses were not in remote rural areas.** Many of them were located close to high density developments in the new towns in North District and Yuen Long. The sewage discharge contributed to pollution in the Deep Bay and Tolo Harbour catchments;
- (b) among the village sewerage projects to be funded, higher priority should be accorded to larger village areas located within or around new towns, as well as those close to highways and main roads; and

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**Note 12:** *Category B items included in the Public Works Programme refer to projects which have resources earmarked for the capital works expenditure with technical feasibility established. For a Category B project, works departments may undertake the necessary pre-construction work including planning, site investigation and design to render the project ready in all aspects for seeking funding approval by the Finance Committee of the Legislative Council and proceeding with the construction works (i.e. upgrading to Category A).*

**Note 13:** *In May 1993 and May 1995, the Finance Committee approved funding for two projects for implementing the Stage 1 works.*

- (c) while the long-term solution to village pollution problem was related to the policy on small house development and the proper planning of village house development, sewerage provision to the population residing in the established village areas remained to be the most effective means to tackle the pressing sanitary and environmental problems in the foreseeable future.

2.8 In 2004, the EPD initiated action to seek funding to enable the early implementation of downstream works including trunk sewers and pumping stations, followed by the implementation of village sewerage programme in Yuen Long (details of the downstream sewerage works in Yuen Long are shown in Appendix A). In November 2006, the EPD informed the LegCo Panel on Environmental Affairs that, in determining the priority for implementing the recommended village sewerage projects, the EPD would consider various factors including:

- (a) the extent of the environmental problems and the benefits;
- (b) population projections for the area;
- (c) future urban and rural area planning intentions;
- (d) proximity to trunk sewers;
- (e) cost-effectiveness and project readiness; and
- (f) local community views and support.

#### *The 2008 Yuen Long Sewerage Study*

2.9 In September 2008, the EPD completed a sewerage study (2008 Sewerage Study Report) on the provision of public sewerage to unsewered villages in Yuen Long. The study found that:

- (a) the provision of public sewerage systems to unsewered villages and areas to collect sewage for centralised treatments was one of the direct and effective ways to alleviate the pollution problems of Deep Bay;
- (b) a key constraint on the provision of sewerage to villages was the interfacing between the construction programme of the downstream trunk sewers and that of the village sewerage; and

- (c) 180 villages were unsewered. The provision of public sewerage to 44 of these unsewered villages was included in the PWP for progressive completion by 2013-14.

2.10 The 2008 Sewerage Study recommended that the implementation of the village sewerage works should be divided into eight packages based on the priority set and the completion of downstream trunk sewers. Table 2 shows the implementation programme for the Yuen Long village sewerage works.

**Table 2**

**Implementation programme for Yuen Long village sewerage works  
(2008 Sewerage Study)**

Priority	Village area	Status of downstream sewers	Village sewerage works	
			Target completion (Note)	No. of villages covered
N/A	Yuen Long West	Completed	Completed	2
1	Wang Chau, Ha Tsuen and Yuen Long South	Completed	2015	44
2	Ping Shan	Completed	2015	134
3	Ha Tsuen	Completed	2015	
4	Kam Tin	In progress	2016	
5	Pat Heung	To be completed in 2012	2023	
6	Lau Fau Shan	To be completed in 2012	2016	
7	Shap Pat Heung	To be completed in 2012	2023	
8	San Tin	To be completed in 2012	2019	
<b>Total number of villages covered:</b>				<b>180</b>

Source: EPD records

Note: According to the EPD, the priority of project and target completion provided a general reference on the time-frame of implementation. The actual priority would be decided at the detailed design stage, subject to the availability of funds, and the time required for resolving various statutory (e.g. environmental assessment) and administrative processes.

## Audit observations and recommendations

### *Need to formulate long-term strategies for unsewered villages in Yuen Long*

2.11 Table 3 shows the coverage of village sewerage programme in Yuen Long. Figure 3 shows the unsewered areas under the Yuen Long SMP as of July 2010.

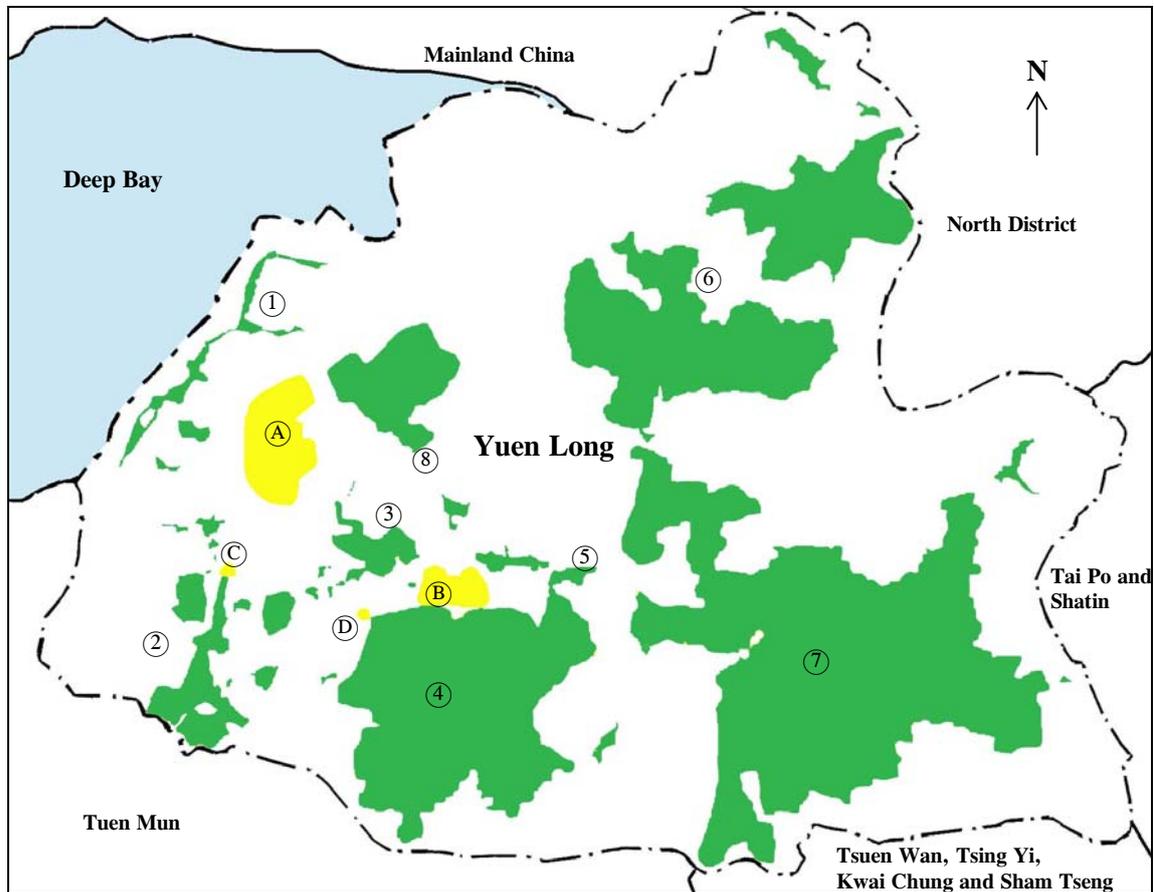
**Table 3**  
**Coverage of village sewerage programme in Yuen Long**  
**(July 2010)**

Village sewerage works	Number of villages	Percentage
Completed	2	1%
Under construction	9 (Note) } 44	5%
Under planning (included as Category B projects in the PWP)	35 }	20%
Under preliminary planning (not yet included in the PWP)	134	74%
<b>Total</b>	<b>180</b>	<b>100%</b>

*Source: Records of the EPD and DSD*

*Note: The sewerage works commenced in July 2009 and were scheduled for completion in 2013-14 (see Table 4 in para. 2.14).*

**Figure 3**  
**Unsewered areas under the Yuen Long SMP**  
**(July 2010)**



Legend: - - - Study area boundary

■ Unsewered areas

- |                  |  |             |
|------------------|--|-------------|
| ① Lau Fau Shan   | ② Ha Tsuen   | ③ Ping Shan |
| ④ Shap Pat Heung | ⑤ Kam Tin  | ⑥ San Tin   |
| ⑦ Pat Heung      | ⑧ Wang Chau (with sewerage works under construction) |             |

■ Areas with sewerage works completed

- |                     |                  |
|---------------------|------------------|
| Ⓐ Tin Shui Wai Town | Ⓑ Yuen Long Town |
| Ⓒ Village W         | Ⓓ Village X      |

Source: EPD and DSD records

2.12 Audit noted that, as of July 2010:

- (a) the village sewerage systems for Yuen Long only covered 2 villages (i.e. Village W and Village X — see paras. 4.9 to 4.11);
- (b) sewerage works of 9 unsewered villages in Wang Chau were in progress (see Table 4 in para. 2.14);
- (c) about 35 unsewered villages in Yuen Long (located mainly in Ha Tsuen and Yuen Long South) under Stages 2 and 3 were included in the PWP; and
- (d) the works for the remaining 134 unsewered villages were under preliminary planning and not yet included in the PWP.

2.13 Audit notes that the existing projects included in the PWP covered 44 villages only. The other 134 unsewered villages in Yuen Long have not been included in the PWP. The 2008 Sewerage Study (see para. 2.9) proposed an implementation programme to deal with the remaining unsewered villages in the district. **Audit considers that the EPD needs to formulate a long-term strategy to implement village sewerage works for the remaining 134 unsewered villages which are currently not included in the PWP (see para. 2.12(d)).**

*Need to review progress of village sewerage programme in Yuen Long*

2.14 Table 4 shows the progress of village sewerage projects under the Yuen Long SMP as of July 2010.

Table 4

**Progress of village sewerage projects under the Yuen Long SMP  
(July 2010)**

PWP Category	Project title	Scheduled completion		No. of villages covered
		Original	Revised	
A (in progress)	Village sewerage in Wang Chau of Yuen Long (Note)	2013-14	On schedule	9
B (under planning)	Yuen Long and Kam Tin sewerage Stage 2	2013-14	2016-17	10
B (under planning)	Yuen Long and Kam Tin sewerage Stage 3	2013-14	2017-18	25
<b>Total</b>				<b>44</b>

Source: EPD and DSD records

Note: In June 2009, the sewerage project for 9 villages was upgraded to Category A of the PWP.

2.15 Audit notes that the progress of the two Category B projects for the 35 unsewered villages is slower than originally planned (see Table 4). According to the DSD, of the 44 villages, only 15 villages had given support to the proposed village sewerage programme and more time was required to further consult the local communities and to seek their support for the remaining villages.

2.16 In response to Audit's enquiry concerning the progress of village sewerage works, in August 2010, the EPD and the DSD said that:

**EPD**

- (a) the SMP studies and subsequent reviews entailed the systematic review of the sewerage needs in each sewerage catchment. They made recommendations for various sewerage projects, including the identification of villages that could be seweraged, where appropriate. The suggested priorities and the implementation timetables in the SMP were essentially overviews for planning purposes;

- (b) the detailed scope and extent of sewerage works, the villages to be covered, the facilities to be constructed and the realistic delivery programme for each of the recommended sewerage projects could only be examined and developed during the design stage of the projects;
- (c) in determining the priority for implementing the recommended sewerage works, the EPD would consider various factors, including the extent of the environmental problems, population projections, cost-effectiveness of projects and local community views and support (see para. 2.8);
- (d) as of April 2010, the public sewerage system in Yuen Long served 389,600 people, which accounted for about 70% of the total population in the area. As regards the village sewerage programme, the Government would first construct trunk sewers and then extend branch sewers to the lot boundary of the village houses;

***DSD***

- (e) the implementation of the village sewerage programme for Yuen Long depended on community support. The support of individual village community could vary greatly from village to village depending on the local environment;
- (f) when the SMPs were first implemented in early 1990s, the EPD had assigned priorities to the village sewerage projects based on various criteria, such as population and environmental conditions of the area;
- (g) in the past 10 years (from April 2000 to March 2010), the Government spent about \$650 million on sewage treatment and sewerage facilities in Yuen Long (see Appendix A). Major sewerage projects for constructing/upgrading sewage treatment works and pumping stations, and extending trunk sewers would need to be completed first before the laying of branch sewers to the lot boundaries of village houses (i.e. the upstream branch sewer and village sewerage works); and
- (h) the planning and design of village sewerage projects slowed down between 2002 and 2004 (see para. 2.7).

2.17 **Audit considers that the DSD, in collaboration with the EPD, needs to closely monitor the progress of the Yuen Long village sewerage programme, and consider devising an action plan to expedite the implementation of the works for the 35 unsewered villages which have been included in the PWP (see Table 4 in para. 2.14).**

*Need to consider implementing mitigation measures*

2.18 The DSD had adopted alternative measures to reduce the pollution impact of unsewered villages, including the provision of dry weather flow interceptors. These facilities would re-direct sewage flowing into the stormwater drainage system (Note 14) back to the sewerage networks. The facilities had been provided in Yuen Long Nullah and Kam Tin River.

2.19 There are 179 villages in Yuen Long (including the 134 villages without tentative implementation programme (see para. 2.12(d) and the 45 villages excluded from the village sewerage programme (see Note to Table 1 in para. 1.10)) which would not be provided with public sewers in the foreseeable future. **Audit considers that the DSD needs to consider implementing mitigation measures to reduce the pollution impact of the unsewered villages, where feasible.**

*Need to expedite the planning of village sewerage projects in Yuen Long*

2.20 According to the EPD, there is a need to prioritise resources in implementing sewerage projects given the large number of such projects which have to be carried out in the New Territories. For village sewerage projects, priority had been given to those in the eastern half of the New Territories to protect and maintain the high quality of clean waters in Sai Kung, and to improve water quality in the semi-enclosed Tolo Harbour, Port Shelter and Mirs Bay.

2.21 As of April 2010, the estimated rural populations in North District and Yuen Long were 47,440 and 123,870 respectively. Table 5 shows the increase in village populations in these two districts since completing the relevant SMP studies.

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**Note 14:** *According to the DSD, sewage improperly disposed of (including sewage from unsewered villages) will enter the stormwater drainage system. Special facilities are required to deal with the problem.*

Table 5

## Village populations in North District and Yuen Long

Population estimate as of	North District	Yuen Long
(a) SMP	29,980 (in 1994)	<b>94,550 (in 1992)</b>
(b) 2006 By-census	41,720	<b>119,120</b>
(c) April 2010	47,440	<b>123,870</b>
(d) Increase in village population since SMP (d)=(c) – (a)	17,460	<b>29,320</b>
(e) Percentage increase (e)=(d) ÷ (a) × 100%	58%	<b>31%</b>

Source: Audit estimate based on records of the EPD and the Census and Statistics Department

2.22 As shown in Table 5, there have been substantial increases in village populations both in North District and Yuen Long since the completion of SMPs in the 1990s. Audit notes that the progress of village sewerage programme in North District (see PART 3) is ahead of that in Yuen Long. In contrast, substantial village areas in Yuen Long with dense population remained unsewered (e.g. Kam Tin — see Photograph 1). In response to Audit's enquiry, in August 2010, the EPD said that the progress of village sewerage programme in Yuen Long was affected by:

- (a) the lack of support from the rural committees, village representatives and villagers;
- (b) the objection of villagers to pay for the cost of sewer connection;
- (c) the lead time required for completing trunk sewer before implementing village sewerage; and
- (d) the competition of resources with other works projects.

**In view of the substantial increase in village population in Yuen Long since the completion of SMP in 1992, Audit considers that the EPD needs to expedite the planning of village sewerage in the district.**

**Photograph 1**

**Discharge of wastewater  
from unsewered villages in Kam Tin**



*Source: Photograph taken by Audit staff in April 2010*

***Audit recommendations***

**2.23 Audit has recommended that the Director of Drainage Services should, in collaboration with the Director of Environmental Protection:**

- (a) **closely monitor the progress of the Yuen Long village sewerage programme and consider devising an action plan to expedite the implementation of the sewerage works for the 35 unsewered villages which have been included in the PWP (see para. 2.17); and**
- (b) **consider implementing mitigation measures to reduce the pollution impact of the unsewered villages, where feasible (see para. 2.19).**

**2.24 Audit has recommended that the Director of Environmental Protection should, in collaboration with the Director of Drainage Services:**

- (a) **formulate a long-term strategy to implement village sewerage works for the unsewered villages in Yuen Long which are currently not included in the PWP (see para. 2.13); and**
- (b) **expedite the planning of village sewerage in Yuen Long in view of the substantial increase in village population (see para. 2.22).**

### **Response from the Administration**

2.25 The **Director of Drainage Services** agrees with the audit recommendations in paragraph 2.23 and will collaborate with the EPD on the audit recommendations in paragraph 2.24.

2.26 The **Secretary for the Environment** and the **Director of Environmental Protection** agree with the audit recommendations in paragraph 2.24. They have said that:

- (a) the Government is committed to providing proper public sewerage and sewage treatment facilities. A total of 16 SMPs have been derived and have set out the overall strategy and programmes for the entire territory and are being implemented. The EPD and the DSD will continue to plan and seek resources for implementing the sewerage projects in a prioritised manner, taking into account the extent of environmental problems and benefits, population projection, planning intentions, proximity to trunk sewers, cost-effectiveness and project readiness, as well as local community views and support;
- (b) with respect to the Yuen Long area, the 2008 Sewerage Study Report (see para. 2.9) has set out the implementation strategy and proposed the priority of the remaining 134 unsewered villages for the long-term strategic implementation. The EPD, in collaboration with the DSD, will continue to follow up the strategy and seek resources for village sewerage improvement works in the Yuen Long catchment;
- (c) the sewerage programmes recommended in the 2008 Sewerage Study Report have allowed for population increase in the Yuen Long area, including the increase in village population. The ENB and the EPD will continue to follow the established system in seeking resources to implement the programmes; and
- (d) the EPD, in collaboration with the DSD, will continue to consult the rural committees, the District Councils and the Heung Yee Kuk as necessary in taking forward the village sewerage projects in a prioritised manner.

## **PART 3: VILLAGE SEWERAGE PROGRAMME IN NORTH DISTRICT**

3.1 This PART examines the implementation of the village sewerage programme in North District.

### **Planning of village sewerage programme in North District**

#### *The 1994 North District SMP Study*

3.2 In August 1994, the EPD completed the North District SMP Study. The Study assessed the conditions of the unsewered areas in North District and found that sewage from the unsewered areas was discharged into the stormwater drains and nearby rivers directly without proper treatment, thus causing pollution to Deep Bay. To abate the water pollution and overloading problems, the SMP Study recommended the implementation of sewerage works including the construction of public sewers and pumping stations.

3.3 In October 1994, the DSD included a new Category B item into the PWP (see Note 12 in para. 2.6) to take forward the SMP Study recommendations. The project included constructing public sewers and pumping stations to convey sewage flows from the unsewered areas into existing sewerage systems in North District. The project was divided into two stages covering 74 unsewered villages:

- (a) **Stage 1.** The works covered the extension of the existing sewerage network to the eastern and western parts of the district (Phase 1A — western trunk sewer) and village sewerage works in 38 unsewered villages (Phases 1B and 2); and
- (b) **Stage 2.** The works covered the extension of the sewerage network to the southern and north-eastern parts of the district (eastern trunk sewer) and village sewerage works to the remaining 36 unsewered villages.

**According to the DSD, the works were planned to be carried out from 1999 to 2005 and the project was scheduled to be completed in late 2005 at a cost of \$1 billion.**

3.4 In November 1998, the Administration submitted a funding application to the Public Works Subcommittee (PWSC) of the Finance Committee (FC) of LegCo for constructing the western trunk sewer in North District (see para. 3.3(a)). The project was approved by the FC. At the PWSC meeting held in the same month, the DSD said that:

- (a) **the sewerage works proposed for North District (see para. 3.3) had been programmed under a comprehensive SMP study; and**
- (b) **upon completing the project, the sewerage overloading and water pollution problems in the district should virtually be eliminated.**

3.5 Stages 1 and 2 were further divided into different phases and implemented under a number of PWP projects (see Table 6 in para. 3.11).

#### *Review of the North District SMP Study in 2002*

3.6 In November 2002, in order to assess whether the existing sewerage systems in North District had the capacity to cater for the planned development and change in forecast population, the EPD completed a review of the North District SMP. According to the review:

- (a) there would be a major increase in population in Fanling and Sheung Shui, particularly if the proposed **New Development Area (NDA — Note 15)** in Ping Che/Ta Kwu Ling would proceed; and
- (b) the existing sewerage systems serving Fanling, Sheung Shui and Sha Tau Kok might need to be extended to serve additional rural areas. The review had recommended further regional sewerage extension.

#### *Northeast New Territories Landfill village sewerage project*

3.7 In addition to the works recommended under the SMP, other local sewerage projects have been implemented or planned to cater for certain unsewered villages and future developments in North District. These included the Northeast New Territories (NENT) Landfill village sewerage project.

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**Note 15:** *According to the “Hong Kong 2030: Planning Vision and Strategy” completed in 2007, the NDA developments were recommended to address the long-term housing demand and provide employment opportunities in Hong Kong.*

3.8 The NENT Landfill was developed in the late 1980s. The development plan included constructing a trunk sewer which would convey pre-treated leachate (Note 16) from the NENT Landfill to the Shek Wu Hui Sewage Treatment Works. The sewerage system would also serve 16 nearby villages.

3.9 In the early 1990s, the Government initiated the “Northeast New Territories Landfill leachate treatment and village sewerage” scheme to provide leachate treatment facilities to the NENT treatment works. During the consultation on the project, the Government agreed to install sewer pipes to connect individual village houses to public sewers for those houses which existed before the operation of the landfill in mid-1995. The house owners, in return, had to give consent for house connection works to be carried out within their premises and for taking up the subsequent maintenance of the completed works. The leachate treatment works and Phase 1 of the sewerage scheme were completed in 1995 and 1996 respectively.

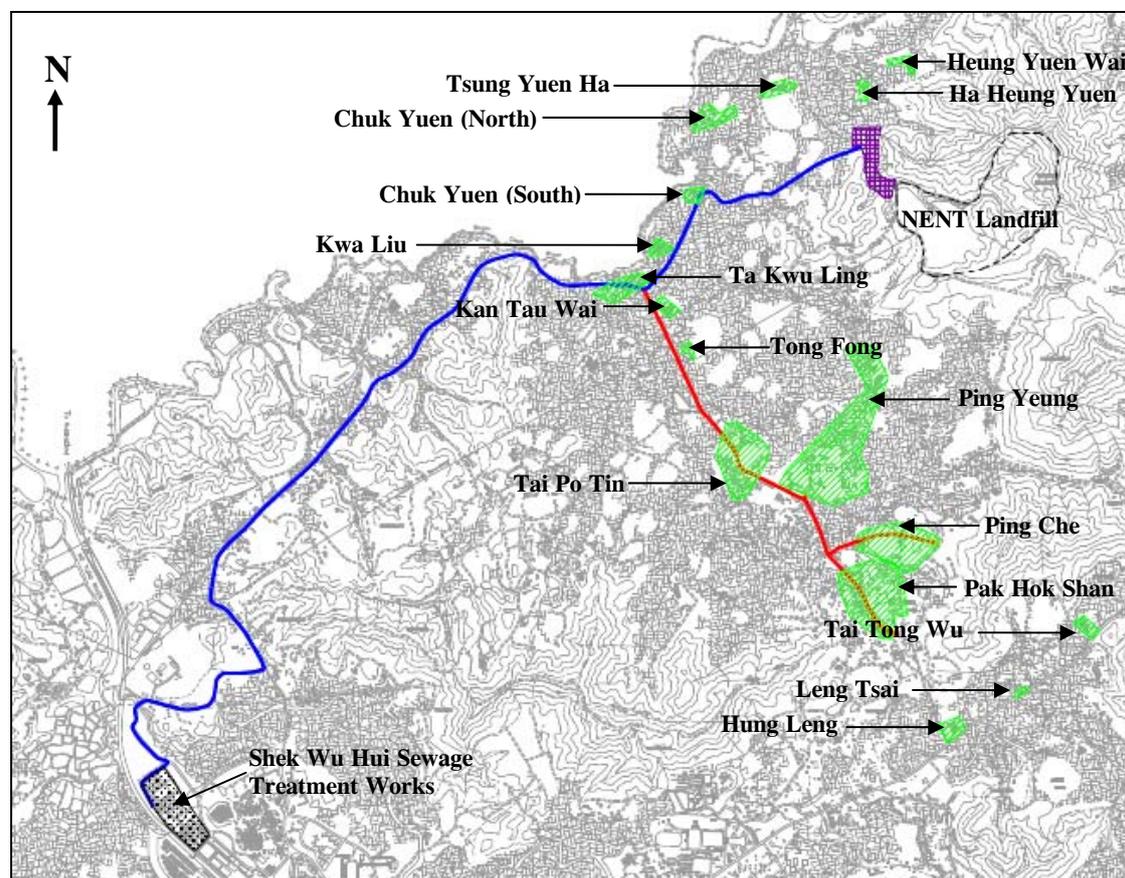
3.10 *NENT Landfill village sewerage project.* In April 2002, the FC approved \$107 million for implementing the NENT Landfill village sewerage project (Project A — see Figure 4). In January 2003, the DSD awarded a contract for Project A in the sum of \$83 million for implementing the sewerage works for completion in February 2006 (Note 17).

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**Note 16:** *Leachate is highly polluted underflow discharged from landfill site due to decomposition of waste materials in the landfill.*

**Note 17:** *During the implementation of the NENT Landfill village sewerage project, the DSD found that there were insufficient funds to cover the costs of the works due to additional works and cost claims. In June 2006, the FC approved an increase of the approved project estimate from \$107 million to \$145 million. The contract sum was increased from \$83 million to \$108 million. In the event, the project was completed in June 2007 (see para. 5.11).*

**Figure 4**  
**Sewerage network under NENT Landfill village sewerage programme**  
**(July 2010)**



- Legend:
- Trunk sewer serving villages near NENT Landfill
  - Trunk sewer connecting NENT Landfill and Shek Wu Hui Sewage Treatment Works
  - ▨ Village areas to be covered by the proposed sewerage
  - ▤ Existing leachate treatment works

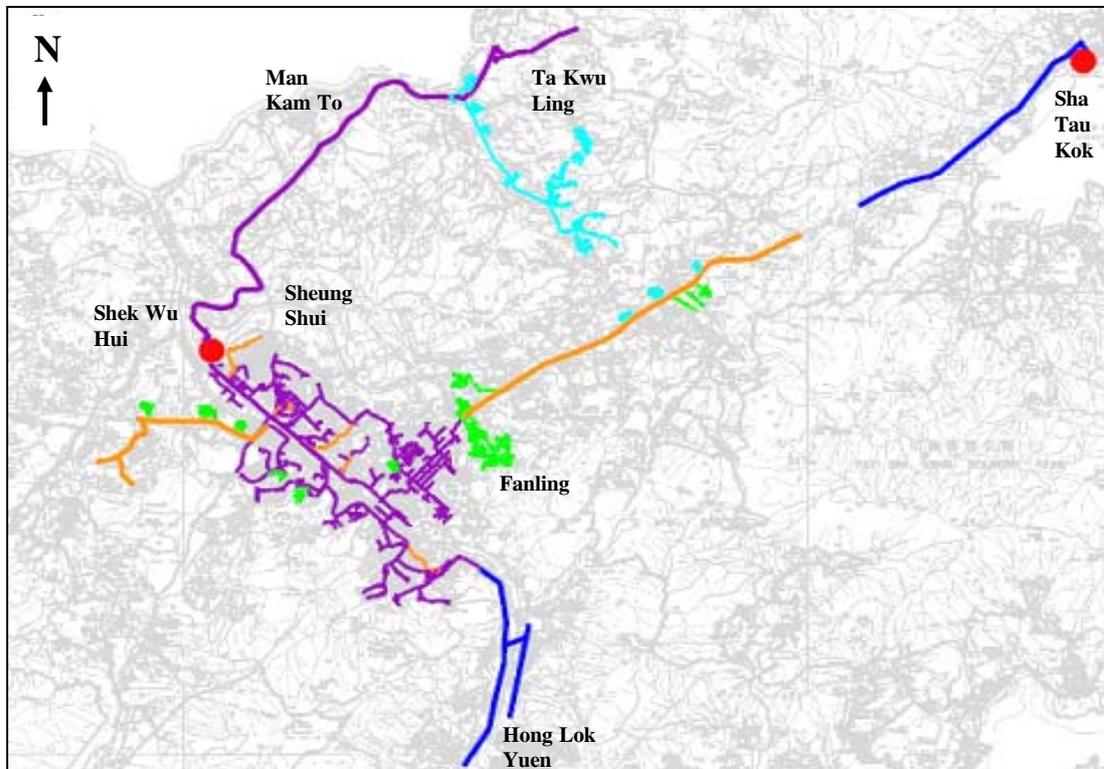
Source: DSD records

### Audit observations and recommendations

#### *Need to expedite planning of North District village sewerage projects*

3.11 Unlike Yuen Long (see para. 2.16(g)), the village sewerage works and the extension of sewerage network were carried out concurrently in North District. Figure 5 shows the proposed extension of the sewerage network in North District. Table 6 shows the progress of village sewerage projects in North District.

**Figure 5**  
**Extension of sewerage network in North District**  
**(July 2010)**



Legend: *North District SMP*

- Existing sewers before North District SMP
- New trunk sewers (under planning)
- New branch sewers (completed or under construction)
- New trunk sewers (completed or under construction)
- Sewage treatment works

*NENT Landfill village sewerage programme*

- New trunk and branch sewers (completed)

Source: *DSD records*

**Table 6**  
**Progress of village sewerage projects in North District**  
**(July 2010)**

Project/ PWP Category	Village sewerage works (Note 1)	Scheduled completion		Number of villages covered
		Original	Revised	
Project A (Category A)	NENT Landfill Village Sewerage	December 2004	June 2007 (actual — Note 2)	16
Project B (Category A)	Stage 1 Phases 1B and 2A	December 2004	January 2006 (actual)	6
Project C (Category A)	Stage 1 Phase 2B	November 2010	February 2011	12
Project D (Category B)	Stage 1 Phase 2C and Stage 2 Phase 1	2012-13	2018-19	22
Project E (Category B)	Stage 2 Phase 2A	2015-16	2017-18	16
Project F (Category B)	Stage 2 Phase 2B	2015-16	2015-16	18
<b>Total</b>				<b>90</b>

Source: EPD and DSD records

Note 1: In addition to village sewerage works, the scope of the projects included constructing downstream facilities such as trunk sewers and pumping stations.

Note 2: Works under the contract for Project A (see para. 3.10) were completed in June 2007. The remaining works under Project A (see para. 5.13(b) and (c)) would be carried out by the DSD's term contractor, subject to the availability of funds.

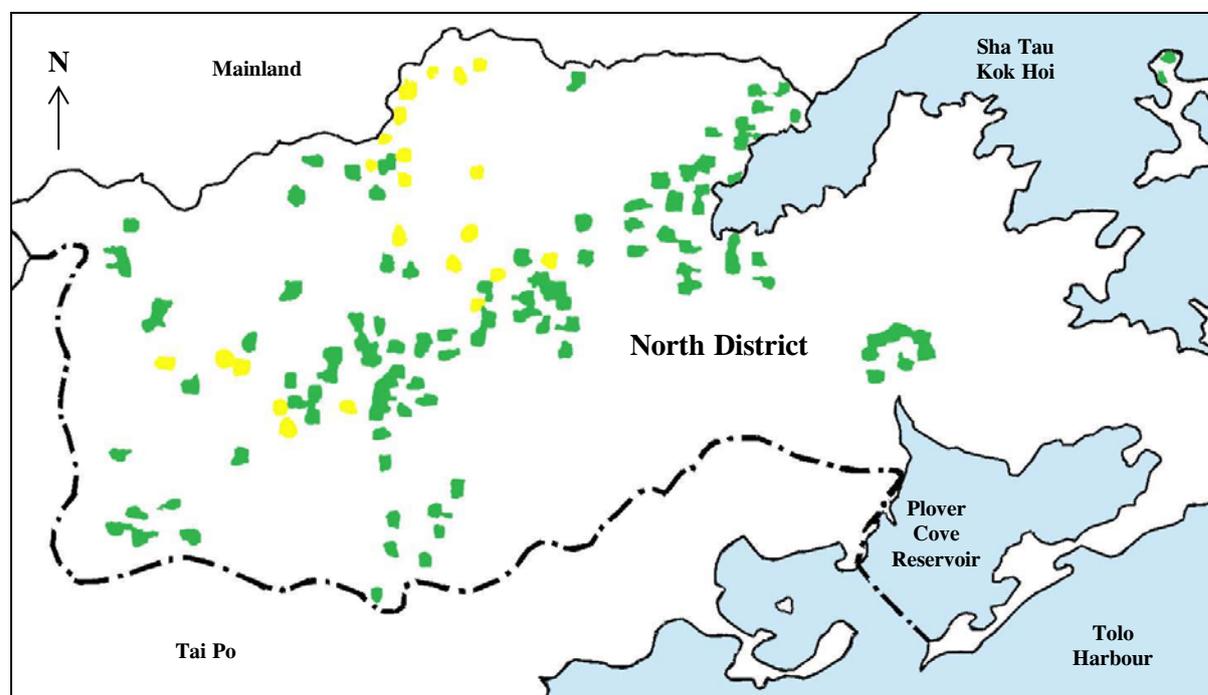
3.12 According to the 1994 SMP Study, the North District village sewerage programme was planned to be completed in 2005 (see para. 3.3). According to the EPD, as of July 2010, 126 villages were included in the village sewerage programme. **Audit noted that, as of July 2010, as shown in Table 7, only about 17% of these villages were covered by public sewerage system, and sewerage works were in progress for 10% of the villages.** Figure 6 shows the seweraged and unsewered villages in the district.

**Table 7**  
**Coverage of village sewerage programme in North District**  
**(July 2010)**

<b>Progress of village sewerage works</b>	<b>Number of villages</b>	<b>Percentage</b>
Completed	22	17%
Under construction	12	10%
Under planning (included as Category B projects in the PWP)	56	44%
Under preliminary planning (not yet included in the PWP)	36	29%
<b>Total</b>	<b>126</b>	<b>100%</b>

*Source: EPD and DSD records*

**Figure 6**  
**Sewered and unsewered villages under North District SMP**  
**(July 2010)**



Legend: — · — Study area boundary  
■ Unsewered villages  
■ Areas completed with sewerage works

Source: EPD and DSD records

3.13 As of July 2010, the planning of the three PWP Category B projects covering 56 villages (see Table 6 in para. 3.11) was in progress. The scheduled completion dates of Projects D and E had been revised. Details are shown in Table 8. The remaining village sewerage works for the 36 villages had not been included in the PWP and were still under preliminary planning.

**Table 8**  
**Progress of village sewerage projects under planning**  
**(July 2010)**

Project title	Scheduled completion	
	Original	Revised
Project D: Stage 1 Phase 2C and Stage 2 Phase 1	2012-13	2018-19
Project E: Stage 2 Phase 2A	2015-16	2017-18
Project F: Stage 2 Phase 2B	2015-16	Tentatively on schedule

Source: EPD and DSD records

3.14 In response to Audit's enquiry, in August and September 2010, the DSD and the EPD said that:

***DSD***

- (a) the works programme for village sewerage would be reviewed and prioritised annually under the Capital Works Resource Allocation Exercise;
- (b) the DSD was ready to upgrade the sewerage works for 2 of the 56 villages (i.e. Ping Kong and Fu Tei Pai) under Project D to Category A of PWP in 2010-11. In addition, the initial packages of sewerage works for four villages in Kau Lung Hang under Project D and 10 villages in Sha Tau Kok under Project E were targeted for a start in 2011-12, depending on the progress of ongoing local consultation and the resolving of villagers' concerns;

***EPD***

- (c) as of April 2010, the public sewerage system in North District served 255,500 people, which accounted for about 80% of the total population in the area;
- (d) the EPD would keep in view the environmental conditions of the unsewered villages;
- (e) more projects would be included in the PWP for the unsewered villages according to the priority order when resources and funding were available; and

- (f) the 2002 SMP review had included an action plan to deal with the 36 unsewered villages which were not included in the PWP (see para. 3.13).

**3.15 Audit considers that the DSD needs to closely monitor the progress of village sewerage projects in North District which have been included in the PWP. The EPD, in collaboration with the DSD, also needs to expedite the planning for the unsewered villages in North District which are currently not included in the PWP.**

*Need to incorporate village sewerage requirement into NDA development programme*

3.16 According to the SMP review in 2002, new development in North District might entail additional village sewerage requirement (see para. 3.6). In the 2007-08 Policy Address, the Government announced the planning of the proposed NDA in the NENT as one of the ten major infrastructure projects for economic growth. The NDA would cover a total area of about 800 hectares in Kwu Tung North, Fanling North and Ping Che/Ta Kwu Ling.

3.17 In June 2008, the Civil Engineering and Development Department (CEDD) and the Planning Department commissioned the “North East New Territories New Development Areas Planning and Engineering Study”. The objective of the Study was to formulate a development plan for the NDA taking into consideration the latest planning circumstances, community aspirations and development needs to guide future development. According to the Stage 1 Technical Report on Drainage and Sewerage Impact Assessment prepared in February 2010, the following recommendations were made to cater for the additional sewage generated from the NDA:

- (a) the existing Shek Wu Hui Sewage Treatment Works in Fanling would be expanded and upgraded; and
- (b) a new sewage treatment works in Ping Che/Ta Kwu Ling NDA would be built.

According to the CEDD, these proposals would be further investigated in the Stage 2 technical assessment.

3.18 Audit notes that the NDA development may provide an opportunity to improve the village sewerage of existing villages (i.e. those preserved under the NDA development) and other villages in the adjacent area. In response to Audit’s enquiry, in August and September 2010:

- (a) the EPD said that for strategic developments such as the planning for the NDA, the associated feasibility and environmental studies would assess the need for, and the provision of new sewerage infrastructure in a holistic manner; and
- (b) the CEDD said that the NDA development could not take up the whole village sewerage project for villages in the NDA and its adjacent areas as the NDA project and the village sewerage project served different purposes. However, some works such as trunk sewers which were common to both projects might be examined for incorporating into the NDA development programme.

**3.19 Audit considers that the EPD, in consultation with the CEDD and the Planning Department, needs to examine the feasibility of incorporating the village sewerage requirement into the NDA development programme.**

*Need to improve the planning process of village sewerage projects*

3.20 According to the DSD, the revision of the scheduled completion dates for Projects D and E (see Table 6 in para. 3.11) was attributable to the need for further consulting the local communities and seeking their support. For Project D, there was also a need to negotiate/finalise the sewer alignments before commencing land resumption.

3.21 In November 2006, the Administration informed the PWSC that, the DSD had adopted various measures to expedite the implementation of drainage and sewerage improvement projects, including:

- (a) maintaining a close liaison with local communities including District Councils and the Heung Yee Kuk;
- (b) avoiding resumption of private land as far as possible to minimise possible objections from the local residents, and to achieve timely project delivery;
- (c) repackaging the sewerage works for phased implementation so as to minimise the lead time for the commencement of works;
- (d) taking parallel actions under different statutory procedures, including the environmental impact assessment under the Environmental Impact Assessment Ordinance (Cap. 499) and the gazettal of road works under the Roads (Works, Use and Compensation) Ordinance (Cap. 370); and

- (e) working closely with other government departments including the EPD, the Lands Department (Lands D) and the relevant District Offices of the Home Affairs Department.

3.22 Notwithstanding the above, according to the DSD, there was still the possibility of further slippage in village sewerage projects in view of the scale of land resumption, the changes in sewer alignment in response to villagers' requests, and the need to sort out site handover arrangement and to complete the relevant gazette procedures. In response to Audit's enquiry, in August 2010, the DSD and the EPD said that:

***DSD***

- (a) it had taken specific action to expedite the planning of village sewerage projects, including:
  - (i) prioritising the village sewerage projects and allowing flexibility in the works programme;
  - (ii) consulting local communities on sewer alignment and addressing villagers' concern over fung shui (Note 18);
  - (iii) sub-dividing projects into smaller works packages so as to facilitate works to be implemented in a manageable size for land resumption and early start of works; and
  - (iv) initiating and completing the public sewerage works for areas/villages with no objections first so that examples could be set for the rest/nearby areas to follow;

***EPD***

- (b) the inherent difficulties for providing village sewerage were due to site and geographical constraints in certain villages. These could only be resolved by better planning of village house development; and
- (c) in addition, village sewerage programme also suffered from a lack of support from some local villagers. Much time, resources and efforts were involved in the consultation to obtain the acceptance of the rural committees, the District Councils and the Heung Yee Kuk to the village sewerage proposals before the projects could proceed to funding allocation and construction.

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**Note 18:** *Fung shui is a discrete Chinese belief system involving a mix of geographical, religious, philosophical, mathematical, aesthetic, and astrological ideas.*

3.23 **Audit considers that, in planning village sewerage projects in future, the DSD, in collaboration with the EPD, needs to allow more time for consultations with villagers concerned and seek the assistance of the Heung Yee Kuk and the relevant District Councils early in the planning stage. The DSD also needs to minimise, where feasible, the need for land resumption in such projects and closely liaise with the Lands D with a view to expediting the land resumption process (see para. 3.21(e)).**

*Audit recommendations*

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

- (a) **closely monitor the progress of village sewerage projects in North District which have been included in the PWP (see para. 3.15); and**
- (b) **in planning village sewerage projects in future:**
  - (i) **in collaboration with the Director of Environmental Protection, allow more time for consultations with villagers concerned and seek the assistance of the Heung Yee Kuk and the relevant District Councils early in the planning stage (see para. 3.23);**
  - (ii) **take action to minimise, where feasible, the need for land resumption in such projects (see para. 3.23); and**
  - (iii) **closely liaise with the Lands D with a view to expediting the land resumption process (see para. 3.23).**

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

- (a) **in collaboration with the Director of Drainage Services, expedite the planning for the unsewered villages in North District which are currently not included in the PWP (see para. 3.15); and**
- (b) **in consultation with the Director of Civil Engineering and Development and the Director of Planning, examine the feasibility of incorporating the village sewerage requirement into the NDA development programme (see para. 3.19).**

## Response from the Administration

3.26 The **Director of Drainage Services** agrees with the audit recommendations in paragraph 3.24. He has said that the DSD will collaborate with the EPD on the audit recommendation in paragraph 3.25(a).

3.27 The **Secretary for the Environment** and the **Director of Environmental Protection** agree with the audit recommendations in paragraph 3.25. They have said that:

- (a) the 2002 North District SMP Review (see para. 3.6) has recommended, among others, the strategy, priority and sewerage programmes for unsewered areas in North District. The ENB and the EPD will continue to follow the established system in seeking resources for the programmes in a prioritised manner;
- (b) for the 56 unsewered villages under planning (see Table 7 in para. 3.12), the EPD, in collaboration with the DSD, will continue to expedite the planning of these projects. For the 36 unsewered villages under preliminary planning, the EPD would closely monitor the environmental conditions in these areas; and
- (c) the EPD and the DSD will continue to consult the rural committees, the District Councils and the Heung Yee Kuk as necessary.

3.28 The **Secretary for Development** appreciates Audit's concern over the implementation of the village sewerage programme. She has said that the Lands D, the Planning Department and the CEDD will assist with their best endeavours from their respective areas to expedite the provision of village sewerage.

3.29 The **Director of Lands** has said that the Lands D will assist the DSD to minimise where possible the need for land resumption in village sewerage projects and expedite the land resumption process.

3.30 The **Director of Civil Engineering and Development** has said that the CEDD would provide common trunk sewers for connection to the villages in the NDA and its adjacent areas in future.

## **PART 4: SEWER CONNECTION OF VILLAGE HOUSES**

4.1 This PART examines the sewer connection of village houses.

### **Connection of village houses to public sewers**

4.2 According to the EPD, proper connection of village houses to public sewerage network would bring about the following improvements:

- (a) reducing sewage to be discharged directly into the nearby rivers and coastal waters;
- (b) addressing the problems of septic tanks, such as overflowing of sewage; and
- (c) improving the environmental and sanitary conditions.

4.3 Provision of sewerage infrastructure for rural villages can improve the environment only after the relevant village houses are properly connected to the public sewerage system. Under the existing policy, the Government will provide public sewerage to selected unsewered village areas through constructing trunk sewers with branch sewers and tapping points (Note 19) extended to the lot boundaries of village houses, as far as practicable. In most cases, village house owners need to construct a terminal manhole within their private lots and to complete the final sewer connection works from their terminal manholes to the tapping points at their own cost (see Type A connection arrangement in Table 9 of para. 4.5).

4.4 According to the Water Pollution Control (Sewerage) Regulation (Cap. 358AL), in an area provided with public sewers, village house owners are required to convey wastewater from their premises to the public sewers and to cease using septic tanks for sewage treatment. The EPD is responsible for enforcing the requirements under the Regulation. Failure to comply with the requirements constitutes an offence. Upon completion of the village sewerage works by the DSD, the EPD will:

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**Note 19:** *A tapping point refers to the collection point (at the end of the branch sewers) through which the sewage of a village house can be discharged to the public sewerage system.*

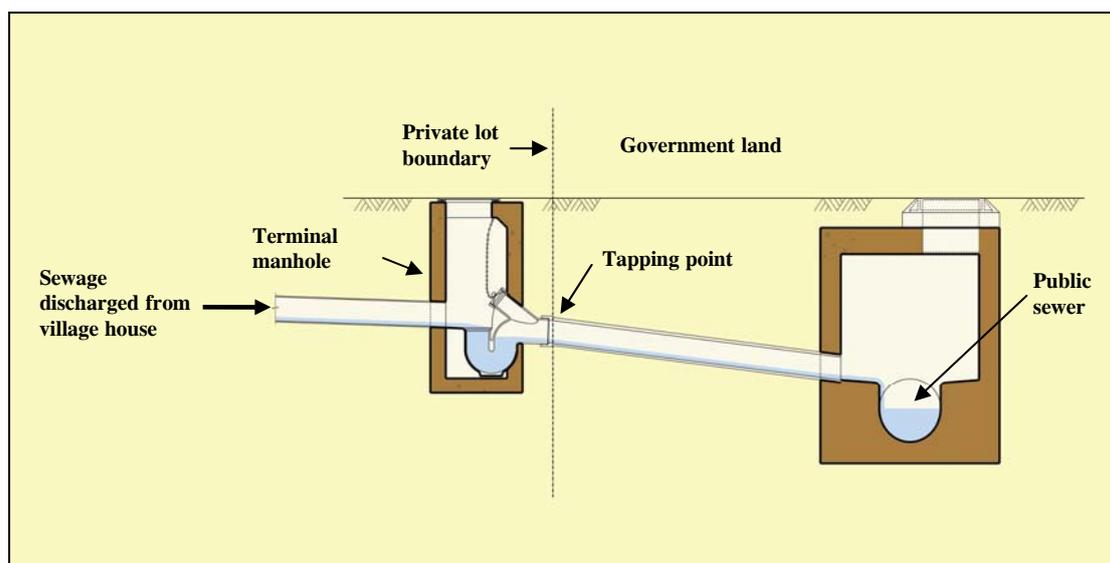
- (a) invite the village representatives and house owners to briefing sessions with a view to explaining the legal and technical requirements and details of making sewer connection;
- (b) visit individual house to identify if there are technical constraints and offer assistance if necessary; and
- (c) issue advisory letters to the village house owners whose houses are technically feasible for making sewer connection, requesting them to complete the sewer connection works and decommission the septic tanks within a specified time.

### *Sewer connection arrangement*

4.5 Figure 7 shows a typical arrangement of village sewer connections to public sewers. According to the DSD, there are three different types (Types A, B and C) of sewer connections. Types B and C connections are special arrangements tailored for the NENT Landfill village sewerage project. Details of the different types of connection arrangement are shown in Table 9.

**Figure 7**

### **Typical arrangement of village sewer connections to public sewers**



Source: DSD records

**Table 9****Types of sewer connections**

***Type A connection.*** The works involve provision of standard branch sewers and tapping points extended to the lot boundaries of village houses. After the laying of branch sewers by the DSD, house owners are required to construct a terminal manhole and connect their houses to the public sewers through the tapping points. Type A connection is generally adopted in village sewerage programmes.

***Type B connection.*** The works involve, in addition to the provision of standard sewerage, the construction of a terminal manhole within the house lot and the completion of house connection (i.e. installing sewer pipes to connect individual village houses to the public sewers). In the NENT Landfill development, the Government undertook to complete the house connection works for those village houses existing before mid-1995 and of which the owners could be located (see para. 5.6).

***Type C connection.*** This is similar to Type B connection. The works involve, in addition to the provision of standard sewerage, the construction of a terminal manhole in front of the house lot but without the house connection. In the NENT Landfill development, Type C connection was adopted for village houses existing before mid-1995 and of which the owners could not be located.

Type B and Type C connections had only been adopted in the NENT Landfill village sewerage project. These connection types were one-off arrangement specially tailored for the project (see para. 3.9).

*Source: DSD records*

## Audit observations and recommendations

### *Need to closely monitor sewer connection of village houses*

4.6 In April 2009, the EPD informed the LegCo Panel on Environmental Affairs that, as at the end of 2008, of the 7,729 village houses covered by public sewers, 5,972 village houses were connected to the public sewerage network (i.e. the overall connection rate was 77%). In July 2010, the Administration informed LegCo that, as of April 2010, the overall connection rate was 92%, after excluding the village houses which could not be connected to the public sewerage network due to technical constraints. Table 10 shows the connection rate of village houses.

**Table 10**  
**Connection rate of village houses**  
**(as of April 2010)**

Area	Houses covered by public sewers (a) (No.)	Houses excluded due to technical constraints (b) (No.)	Houses suitable for connection (c) = (a) – (b) (No.)	Houses connected to public sewers (d) (No.)	Connection rate for houses suitable for connection (e) = (d) ÷ (c) × 100% (%)	Connection rate for houses covered by public sewers (f) = (d) ÷ (a) × 100% (%)
Sai Kung	1,078	96	982	950	97%	88%
Sha Tin	2,328	394	1,934	1,934	100%	83%
Islands	364	12	352	286	81%	79%
Tsuen Wan	209	6	203	77	38%	37%
Tai Po	2,035	460	1,575	1,568	99%	77%
North District	1,879	416	1,463	1,225	84%	65%
Yuen Long	34	0	34	0	0%	0%
<b>Overall</b>	<b>7,927</b>	<b>1,384</b>	<b>6,543</b>	<b>6,040</b>	<b>92%</b>	<b>76%</b>

Source: EPD records

- 4.7 In response to Audit's enquiry, in August 2010, the EPD and the DSD said that:
- (a) as of April 2010, although rural public sewerage catchments had been extended to 7,927 village houses, 1,384 houses could not be connected to public sewers due to technical constraints (e.g. limited space, inadequate hydraulic gradients, costly pumping requirements and obstructions from underground utilities) and problems associated with land resumption;
  - (b) the connection rates of village houses varied from village to village depending on the technical factors. On average and given time, it was technically feasible to connect about 80% to 90% of the village houses to public sewers; and
  - (c) according to experience, the majority of sewer connection works were completed by the village house owners between two to five years after the laying of branch sewers.

4.8 *Sewer connection in North District.* Table 11 shows that, as of July 2010, the sewer connection rate of houses (excluding those not technically suitable for connection) in the 22 villages in North District was 84%. However, two villages (i.e. Village A and Village B) had a connection rate of 0% and 50% respectively. The difficulties encountered in sewer connection of these two villages were attributable mainly to the objection of house owners for various reasons (see Appendices B and C).

**Table 11**  
**Connection rates of 22 villages in North District**  
**(July 2010)**

Village	Houses covered by public sewers (a) (No.)	Houses excluded due to technical constraints (b) (No.)	Houses suitable for connection (c) = (a) – (b) (No.)	Houses connected to public sewers (d) (No.)	Connection rate for houses suitable for connection (e) = (d) ÷ (c) × 100% (%)	Connection rate for houses covered by public sewers (f) = (d) ÷ (a) × 100% (%)
A	56 (Note 1)	N/A (Note 2)	N/A (Note 2)	0	0%	0%
B	161	71	90	45	50%	28%
C	183	N/A (Note 2)	N/A (Note 2)	90	N/A (Note 2)	49%
D	71			40		56%
E	342			203		59%
F	104			67		64%
G	130			85		65%
H	32			22		69%
I	66			49		74%
J	124			95		77%
K and L	94			72		77%
M	80			66		83%
N	24			20		83%
O	32			27		84%
P	85			72		85%
Q	67			58		87%
R	33			29		88%
S	19			17		89%
T	35			33		94%
U	63	60	95%			
V	78	75	96%			
<b>Overall</b>	<b>1,879</b>	<b>416</b>	<b>1,463</b>	<b>1,225</b>	<b>84%</b>	<b>65%</b>

Source: EPD records

Note 1: According to the DSD, only the western part of Village A (56 houses) was provided with tapping points for sewer connection (see Appendix B).

Note 2: For Villages A and C to V, the breakdowns for houses excluded due to technical constraints were not available.

4.9 *Sewer connection in Yuen Long.* As of July 2010, public sewerage only covered two villages (34 houses) in Yuen Long (Village W and Village X). Table 12 shows the connection rates for the two villages.

**Table 12**  
**Connection rates of two villages in Yuen Long**  
**(July 2010)**

Village	Village houses (No.)	Houses connected (No.)	Connection rate (%)
W	7	0	0%
X	27	0	0%
<b>Overall</b>	<b>34</b>	<b>0</b>	<b>0% (Note)</b>

*Source: EPD records*

*Note: According to the EPD, in view of the small number of houses involved, the connection rate might not be representative for Yuen Long.*

4.10 Village sewerage works for the two villages were originally included in a Category B project “Yuen Long and Kam Tin sewerage, Stage 2”. In May 1999 and February 2001 respectively, two Category D projects (Note 20) were created to advance the village sewerage works for seven village houses of Village W (Note 21) and 27 village houses of Village X. In the event, sewerage works for the two villages were completed in 2000 and 2005 respectively. However, up to July 2010, none of the village houses in the two villages had completed the final connection to the public sewers. Table 13 shows the villagers’ reasons for not connecting their houses to the public sewers.

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**Note 20:** *Category D projects are projects funded under block votes of the Capital Works Reserve Fund.*

**Note 21:** *The trunk sewer constructed for Village W would also serve two elderly homes with a total population of 375 persons. Sewer connection works to these two elderly homes were completed in 2006 and 2010 respectively. According to the EPD, about 89% of pollutants in Village W had been diverted to the public sewers.*

Table 13

## Sewerage works for Villages W and X

Village	Reasons for not connecting to public sewers
W	<ul style="list-style-type: none"> <li>• Insufficient land within the private lots for constructing terminal manhole</li> <li>• Unfair to decommission the septic tank and soakaway system, which had been approved by the EPD, and to make sewer connection at their own expenses</li> <li>• Unable to meet the connection cost</li> </ul>
X	<ul style="list-style-type: none"> <li>• Branch sewers and tapping points located far from the lot boundaries of the village houses</li> </ul>

Source: DSD and EPD records

4.11 As mentioned in paragraphs 1.10 and 2.4(a), village sewerage is an integral part of sewerage works under the SMP. Proper sewer connection to public sewers will improve the effectiveness of the sewerage programme. In August 2010, the EPD and the DSD informed Audit that:

- (a) public consultation was critical to the successful implementation of village sewerage projects;
- (b) at the planning and design stages, the DSD had highlighted the sewer connection requirements during the various public consultation forums, including the meetings with the respective District Councils, the rural committees and village representatives. The EPD and the DSD had explained the demarcation of responsibilities between the Government and the village house owners on the house connection works;
- (c) most objections to the village sewerage works were mainly due to the additional financial burden for connecting village houses to the public sewers. In this connection, there were various grant and loan schemes available (such as the Building Maintenance Grant Scheme for Elderly Owners and the Home Renovation Loan Scheme operated by the Hong Kong Housing Society, and the Comprehensive Building Safety Improvement Loan Scheme operated by the Buildings Department) for relieving the financial burden of the village house owners;

- (d) the DSD had sought views and assistance from the District Councils concerned and the Heung Yee Kuk in a more focused manner by engaging the respective village representatives to address local concerns from time to time throughout the implementation of the village sewerage works; and
- (e) the EPD considered that public consultation at the project planning stage could be improved by involving the Heung Yee Kuk and the District Councils concerned early in the public consultation (i.e. from rural committees/District Councils to village representatives). In April 2009, the Permanent Secretary for the Environment and the Director of Drainage Services attended a Heung Yee Kuk meeting to explain the general policy on village sewerage programme.

**4.12 Audit considers that the EPD and the DSD need to closely monitor the sewer connection of village houses in North District and Yuen Long, and take measures to improve the sewer connection rates. These may include providing appropriate assistance to the villagers to resolve difficulties they encounter in sewer connection and taking appropriate enforcement action (see paras. 4.15 to 4.19).**

*Need to further negotiate with villagers on provision of tapping points*

4.13 According to the DSD, tapping points would be provided at the lot boundaries of village houses to facilitate the final connection from village houses to public sewers (see para. 4.3). However, due to insufficient space on government land and site constraints, tapping points could only be provided at a distance from the lot boundaries in some circumstances. As a result, the villagers may need to construct connecting sewers from their private lots to public sewers.

4.14 Audit noted that there were cases in which the Government and the villagers had different views on the provision and location of tapping points for certain villages (see Village A in Appendix B and Village X in Table 13 in para. 4.10). In response to Audit's enquiry, in August 2010, the EPD and the DSD said that:

***Village A***

- (a) they would approach the villagers in the clusters of houses in the eastern part to seek their views again on whether they would construct their connecting sewers within their clusters of houses up to their lot boundaries for connection to a tapping point provided by the DSD;

- (b) if the villagers requested that the branch sewers and tapping points be extended to reach individual houses, they would further liaise with them and other government departments on land resumption issues; and

*Village X*

- (c) they would approach the villagers again and the DSD would provide technical assistance to the villagers to facilitate the sewer connection, including extending the tapping points and/or revising the branch sewer alignment.

**Audit considers that the EPD and the DSD need to step up efforts in negotiating with the villagers with a view to working out an acceptable solution for the provision of tapping points and branch sewers.**

*Need to take appropriate action for non-compliance with sewer connection requirements*

4.15 According to section 3 of the Water Pollution Control (Sewerage) Regulation, the EPD may require village house owners to complete sewerage connection by issuing a notice setting out the connection requirements, including:

- (a) the place of connection;
- (b) time for completing the connection works; and
- (c) any additional requirement including the installation of pumping systems.

4.16 In practice, upon the completion of the village sewerage works by the DSD, the EPD will conduct briefing sessions for villagers, arrange visits to village houses, and issue advisory letters to house owners (see para. 4.4(c)). In case the owners refuse to complete the works, the EPD may issue reminders or notices under the Regulation to them, advising them of their obligations under the Regulation. Failure to comply with the requirement specified in the notices constitutes an offence.

4.17 Audit noted that, for the four villages (Villages A, B, W and X) with zero or low sewer connection rates, the EPD had issued advisory letters to the village house owners of two villages. For Village W, up to July 2010, sewer connection works had still been outstanding notwithstanding the issue of advisory letters and notices under the Regulation. For Village X, notices had not been issued since the issue of an advisory letter in March 2006 (see Table 14).

**Table 14**

**Issue of advisory letters to village house owners  
(July 2010)**

<b>Village</b>	<b>Sewerage works completed in</b>	<b>Briefing sessions</b>	<b>Issue of advisory letters (Date)</b>	<b>Issue of notices (Date)</b>
A	February 2006	✓	×	×
B	May 2007	✓	×	×
W	October 2000	✓	✓ (First issue: 23.2.2001; Latest issue: 19.8.2009)	✓ From 23.2.2004 to 28.5.2010 (Note)
X	June 2005	✓	✓ (10.3.2006)	×

*Source: EPD records*

*Note: Notices were repeatedly issued during the period.*

- 4.18 In June and August 2010, in response to Audit's enquiry, the EPD said that:
- (a) it had maintained communication with the villagers by conducting briefing sessions/meetings, and making phone calls and arranging site visits. Through these regular contacts, villagers and village representatives were apprised of the legal and technical requirements of house connections as well as the demarcation of responsibility between the Government and the house owners;
  - (b) when considered necessary, the EPD would seek assistance from District Office staff and District Council members to persuade the villagers and the village representatives to proceed with house connection works;
  - (c) it had been adopting a collaborative approach in enforcing the Regulation and had achieved good overall sewer connection rates. As of April 2010, the territory-wide sewer connection rate of village houses without insurmountable technical problems was above 92%;
  - (d) notwithstanding the above, the EPD recognised that there were village house owners who continued to refuse to make connection to public sewer with no good reasons. For these, notices under section 3 of the Regulation would be served, and failure to comply with the requirements set out in the notices without a reasonable excuse would be subject to prosecution; and
  - (e) it had taken (or would take) specific enforcement actions for Villages A, B, W and X (see Table 15).

Table 15

## Enforcement actions for Villages A, B, W and X

Village A	The EPD had reiterated the sewer connection requirements for the western part to the villagers concerned and for those village houses that had no technical problems in sewer connection, the EPD would issue advisory letters to the house owners. In the event that the house owners failed to make connection with no justifiable reasons, notices under section 3 of the Regulation would be served against them.
Village B	The EPD would pursue with those houses that were provided with Type A connections and issue the advisory letters in due course. Legal notices would be issued to those who failed to provide sewer connection works without valid reasons after the DSD had completed the downstream sewers.
Village W	Legal notices were issued on 28 May 2010 to house owners requiring them to complete the sewer connection works before 30 November 2010. As the Government had made considerable efforts and assistance including technical advice, financial subsidy schemes and extending the tapping points to lot boundaries, the EPD would consider taking prosecution actions if the house owners still refused to make sewer connection by 30 November 2010.
Village X	Upon extending the tapping points to the lot boundaries by the DSD, the EPD would issue advisory letters to the house owners informing them to complete the sewer connection works before a specified date. Legal notices would be issued to those who refused to provide sewer connection works without valid reasons.

Source: EPD records

4.19 **Audit considers that the EPD needs to closely monitor the cases of non-compliance with the sewer connection requirements. The EPD also needs to continue dialogue with villagers and consider taking appropriate action to enable connection to public sewers in accordance with the Water Pollution Control (Sewerage) Regulation.**

*Audit recommendations*

4.20 **Audit has recommended that the Director of Environmental Protection, in collaboration with the Director of Drainage Services, should:**

- (a) **closely monitor the sewer connection of village houses in North District and Yuen Long (see para. 4.12);**
- (b) **take measures to improve the sewer connection rates of villages in North District and Yuen Long, including providing appropriate assistance to the villagers to resolve difficulties they encounter in sewer connection (see para. 4.12);**
- (c) **step up efforts in negotiating with the villagers with a view to working out an acceptable solution for the provision of tapping points and branch sewers (see para. 4.14);**
- (d) **closely monitor the cases of non-compliance with the sewer connection requirements (see para. 4.19); and**
- (e) **continue dialogue with villagers and consider taking appropriate action to enable connection to public sewers in accordance with the Water Pollution Control (Sewerage) Regulation (see para. 4.19).**

**Response from the Administration**

4.21 **The Secretary for the Environment and the Director of Environmental Protection agree with the audit recommendations. They have said that:**

- (a) **sewer connection works for North District and Yuen Long are still ongoing. The EPD and the DSD will continue to closely liaise with the local communities and village representatives to monitor the progress of sewer connection;**

- (b) the sewer connection works for the four villages mentioned in paragraph 4.17 are still ongoing and some are at an advanced stage. The EPD and the DSD have been conducting regular contacts with the villagers and village representatives and explaining to them the public health considerations, the importance of the sewer connection and the benefits to the village environment as well as the legal and technical requirements for the sewer connections;
- (c) the EPD and the DSD will continue to seek the assistance of the rural committees, the District Councils and the Heung Yee Kuk on the sewer connection issues. The EPD and the DSD will step up education and publicity efforts regarding the importance and benefits of sewer connection;
- (d) the Government will continue to make available, and facilitate villagers to apply for, loan and grant schemes (see para. 4.11(c)) to assist eligible house owners in need for carrying out sewer connection works;
- (e) the EPD and the DSD are in the process of reprovisioning new tapping points and branch sewers to facilitate sewer connection, and will continue to communicate with the villagers and village representatives to sort out the detailed arrangements;
- (f) the EPD and the DSD have been maintaining and will continue dialogue with villagers, reiterating the sewer connection requirements and advising them of the environmental and public health benefits that the connection will bring upon the villages and villagers; and
- (g) appropriate legal actions on non-compliance with the sewer connection requirements would be considered. Where necessary, advisory letters would be issued, to be followed by notices served under section 3 of the Water Pollution Control (Sewerage) Regulation. For villages with legal notices issued, the EPD will continue to closely monitor the completion of sewer connections by the specified date, and follow up on appropriate actions where necessary.

4.22 The **Director of Drainage Services** has said that the DSD will collaborate with the EPD on the audit recommendations in paragraph 4.20.

## **PART 5: PLANNING AND ADMINISTERING VILLAGE SEWERAGE PROJECTS**

5.1 This PART examines the DSD's planning and administration of village sewerage projects.

### **Implementing village sewerage projects**

5.2 The implementation progress of village sewerage works in North District is ahead of that in Yuen Long. As of July 2010, the progress was as follows:

- (a) *For North District.* Two major village sewerage projects (Projects A and B — see Table 6 in para. 3.11) had been completed and one (Project C) was in progress; and
- (b) *For Yuen Long.* Only one major village sewerage project (Project G) commenced in July 2009, covering nine villages in Wang Chau (see Table 4 in para. 2.14).

Table 16 shows the progress of the village sewerage projects.

**Table 16**  
**Progress of village sewerage projects**  
**(July 2010)**

Project	Original completion	Revised completion	Slippage as of July 2010	Project cost			
				Original approved project estimate	Latest estimated expenditure	Cost increase	Percentage
			(Month)	(a) (\$ million)	(b) (\$ million)	(c) = (b) - (a) (\$ million)	(d) = (c) ÷ (a) × 100% (%)
Project A (Note 1)	December 2004	June 2007 (Note 2)	30	107	143.7	36.7	34.3%
Project B (Note 1)	December 2004	January 2006 (Note 3)	13	125.1	128.3	3.2	2.6%
Project C (Note 4)	November 2010	February 2011	3	130	180.5	50.5	38.8%
Project G (Note 5)	June 2013	N/A	N/A	219.2	167.2	N/A	N/A

Source: Audit analysis of DSD records

Note 1: Projects A and B were completed.

Note 2: The works under the contract for Project A (see para. 3.10) were completed in June 2007. The remaining works under Project A (see para. 5.13(b) and (c)) would be carried out by the DSD's term contractor, subject to the availability of funds.

Note 3: The works under Project B (comprising construction of trunk sewers, pumping stations, village sewerage and landscaping works) were completed in January 2007. The village sewerage works implemented under the project were completed in January 2006.

Note 4: Up to July 2010, Project C had not yet been completed. The slippage and cost overrun were based on its anticipated completion date and estimated final contract sum.

Note 5: Project G commenced in July 2009.

5.3 As shown in Table 16, there were slippages and cost overruns in implementing the village sewerage projects. For Project A and Project C, approval had been sought from the FC to increase the approved project estimate (APE).

- 5.4 In response to Audit's enquiry, in August 2010, the DSD said that:
- (a) implementing village sewerage works required extensive consultation with villagers, liaison with the Lands D on land resumption, and resolution of site constraints and technical problems in the village areas;
  - (b) in addition to conventional capital works remeasurement contracts, the DSD had explored the use of works-order-type contracts and term contracts with schedule of rates. This would allow greater flexibility in works planning and sequencing in response to site constraints and public objections/requests;
  - (c) it would adopt careful planning to deal with existing septic tanks at village alleys and temporary flow diversions arising from demolition of septic tanks; and
  - (d) it would prioritise the construction of downstream works and pumping stations.

5.5 *Audit examination.* To identify the reasons for the increase in the project cost and lessons to be learnt, Audit selected Projects A and C for detailed examination.

## **Implementing Project A**

### *Development of NENT Landfill*

5.6 The NENT Landfill was developed in the late 1980s. The development plan included the construction of a trunk sewer to convey pre-treated leachate from the NENT Landfill to the Shek Wu Hui Sewage Treatment Works. The trunk sewer would also serve nearby villages. During the consultation on the implementation of the NENT Landfill project and the sewerage system, the Government agreed to complete the connection works for houses existing before the operation of the landfill in mid-1995, whose owners could be contacted. The owners in return would be required to give consent to government contractors to carry out the house connection works within their premises and take up the subsequent maintenance of the completed works. According to the DSD, this was a unique and one-off arrangement. It involved constructing connections for individual house owners, and required immense efforts in tailoring design and construction works to serve village houses located in scattered areas.

*Funding approval*

5.7 In April 2002, the FC approved \$107 million for implementing the NENT Landfill village sewerage project (Project A — see para. 3.10). In January 2003, the DSD awarded a contract in the sum of \$83 million for implementing the sewerage works. The construction works commenced in January 2003 and were scheduled for completion in February 2006.

*Assessment of the sewerage connection requirements*

5.8 During the planning and design stage, the EPD carried out a survey and issued letters to villagers requesting them to give consent (see para. 5.6) for the Government to complete the house connection works for them. Based on the feedback from the villagers and the village representatives, the EPD estimated that there were about 880 village houses requiring house connection works to be carried out by the Government.

5.9 During the course of connection works, some local villagers who had not given consent to the Government in the survey requested for such house connections, and provided information to substantiate that their village houses had existed before mid-1995. After reviewing its records and the information provided, the EPD found that there were additional houses for which the Government should carry out the house connections. As a result, the number of houses that required house connection works under the project increased from about 880 to 1,150. In 2006, the Administration applied for an increase in funding for Project A.

5.10 At the LegCo Panel on Environmental Affairs meeting of April 2006 to discuss the funding application, the DSD said that:

- (a) efforts had been made to obtain a more accurate assessment on the number of houses which had existed before the operation of the NENT Landfill in mid-1995. These included reference to land records and requests from villagers (for old houses). The number of 1,150 houses was arrived at after re-examining the land records and the evidences provided by villagers, and making reference to the aerial photographs taken in mid-1995; and
- (b) consent had to be obtained from the house owners to carry out the house connection works because part of the works would be carried out within their premises and they would have to take up the subsequent maintenance of the completed works.

*Increase in project vote*

5.11 In June 2006, the FC approved an increase of the APE, from \$107 million to \$145 million (an increase of 36%). The contract sum was increased from \$83 million to \$108 million. The sewerage works under the contract were completed in June 2007 (i.e. about 17 months later than the scheduled completion date). As stated in the funding paper submitted to the FC:

- (a) the reasons for the cost increase included the following:
  - (i) *Additional works arising from house connections.* The number of houses requiring connection works increased to 1,150 (an increase of 31%);
  - (ii) *Variations of works.* Additional works were required to address villagers' concerns over the adverse effects on fung shui and hygiene grounds;
  - (iii) *Inflation allowance.* Due to inflation, there were increases in labour and material costs. As a result, allowance was made to reflect the increase in contract price fluctuation adjustment under the contract for Project A; and
  - (iv) *Resident site staff costs.* Extra residential site staff costs were required to cater for the additional site supervision and liaison arising from the project;
- (b) connections to the additional houses had not been allowed for in the original estimate. However, since these houses met the basic criterion of having been in existence at the time the landfill came into operation in mid-1995, the EPD did not consider it reasonable or equitable to refuse to provide connections for them just because the owners' requests came late;
- (c) it would be environmentally unacceptable to allow the sewage generated from these houses to continue to pollute the environment for an unduly long period of time without the necessary house connections; and
- (d) during the course of construction, the EPD found that many of the houses were equipped with multiple wastewater outlets. As a result, more pits and longer sewers than expected were required to suit the internal drainage layout of the houses.

## Audit observations and recommendations

### *Need to strengthen project planning process*

5.12 As mentioned in paragraph 4.5, there are different types of sewer connections (Types A, B and C) for Project A. Table 17 shows an analysis of the sewerage requirement included under the contract for Project A and the final requirement.

**Table 17**  
**Sewerage requirement for Project A**

Connection type	Original requirement (2002) (No. of houses)	Revised requirement (2005) (No. of houses)	Final requirement (2007) (No. of houses)	Sewerage works implemented (August 2010) (No. of houses)
Type A (Provision of tapping points)	193	189	188	139
Type B (Full house connection)	885	1,150	936	834
Type C (Partial house connection with provision of terminal manholes)	—	—	222 (Note 1)	222 (Note 1)
<b>Total</b>	<b>1,078</b>	<b>1,339</b>	<b>1,346 (Note 2)</b>	<b>1,195 (Note 2)</b>

Source: DSD records

Note 1: For the 222 houses with connection works partially completed, the owners could not be contacted to obtain their consent for the works and to undertake future maintenance (see para. 5.6). The DSD might need to complete the connection works as and when the owners turned up in future.

Note 2: Out of the 1,346 houses, connection works were completed for 1,195 houses. The works for the rest (151 houses) were not completed. Of the 151 houses, 88 houses were deleted from Project A due to insurmountable technical problems. Works for the remaining 63 houses would commence upon completing the downstream sewers.

5.13 As shown in Table 17, there were discrepancies between the planned sewerage requirement and the final requirement, as follows:

- (a) the total number of houses identified at the end of contract (in 2007) was 1,346. However, the original contract (in 2002) only included 1,078 houses;
- (b) of the 1,346 houses, partial connection works with the provision of terminal manholes were carried out for 222 houses for which consent from the owners could not be obtained (see Note 1 in Table 17). The DSD might need to complete the remaining works for these 222 houses when the owners turned up in future;
- (c) as of August 2010, full sewer connection works for 834 houses had been completed. The connection works for 63 houses (see Note 2 in Table 17) had been kept in abeyance pending the completion of downstream sewers; and
- (d) of the \$145 million approved by the FC for Project A (see para. 5.11), \$143.7 million had been spent. The unspent balance of \$1.3 million under the project vote might not be sufficient to cover the remaining works as mentioned in (b) and (c) above.

5.14 In August 2010, in response to Audit's enquiry, the DSD said that:

- (a) Project A was the first large-scale village sewerage project implemented in North District. It was a unique project involving the construction of connection works for individual village houses; and
- (b) implementing house connection works under Project A required much greater liaison and management efforts when compared with other normal village sewerage projects.

**5.15 Audit considers that the DSD needs to strengthen the project planning process to improve the assessment of sewerage requirements as far as practicable. This may help minimise the need for design changes after the commencement of works, and improve project administration and financial control. The DSD may also wish to keep in view the need for seeking an increase in APE to meet the additional cost required for completing the remaining works for Project A (see para. 5.13(b) to (c)).**

*Audit recommendations*

- 5.16 **Audit has recommended that the Director of Drainage Services should:**
- (a) **in implementing village sewerage projects in future, strengthen the project planning process to improve the assessment of sewerage requirements as far as practicable (see para. 5.15); and**
  - (b) **keep in view the need for seeking an increase in APE to meet the additional cost required for completing the remaining works for Project A (see para. 5.15).**

**Response from the Administration**

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

- (a) the DSD has set up a “Village Sewerage Support Group” to consolidate the experience gained in implementing village sewerage works for sharing among fellow engineers in both the DSD and consultants; and
- (b) measures would be strengthened to minimise design changes and contract variations, as follows:
  - (i) enhancing early public engagement with villagers on sewerage alignment and design;
  - (ii) allowing greater flexibility in contracts for re-organising the sequence of works if objection from villagers was envisaged;
  - (iii) liaising with village representatives in the planning stage on the ex-gratia compensation to be granted and ceremonies/rituals that might need to be performed; and
  - (iv) exchanging information among the DSD, the EPD and the Lands D to make appropriate allowance for sewerage requirement of new village house development as far as practicable.

## **Implementing Project C**

### *Funding approval*

5.18 In January 2007, the FC approved \$130 million for implementing the North District sewerage, Stage 1 Phase 2B project (i.e. Project C). The sewerage works included the provision of 11 kilometres of sewers, covering 12 unsewered villages (involving only Type A connection) in Lung Yeuk Tau and Ma Mei Ha of North District. In March 2007, the DSD awarded a contract in the sum of \$100 million for implementing the sewerage works. The works commenced in late March 2007, and were scheduled for completion in November 2010.

### *Slippage and cost overrun*

5.19 As of December 2009, about 70% of the works (8 out of 11 kilometres of sewers) had been completed. The DSD found that additional works were required for the project and the APE would not be sufficient to meet the cost of the remaining works. In April 2010, the FC approved a 42% increase of the APE, from \$130 million to \$185 million. The scheduled completion date of the sewerage works was revised to February 2011 (i.e. three months later than the original scheduled completion date). As of July 2010, the works were in progress. The cost increased because additional sewers were needed to serve new village houses (see para. 5.20), there was variation of works due to site constraints (see para. 5.25), and resident site staff cost and price adjustment increased due to inflation.

## **Audit observations and recommendations**

### *Need to better ascertain development status of village houses*

5.20 Audit noted that, when funding approval was sought from the FC in January 2007, the original design of the Project C contract only covered about 800 village houses in the 12 unsewered villages. However, according to the funding paper seeking an increase in APE, after the award of contract, 100 new houses were identified. In response to Audit's enquiry concerning the development status of the 100 new houses, in July 2010, the DSD said that:

- (a) as of July 2010, 59 of them had been completed or under construction; and
- (b) the others were either under planning awaiting the Lands D's approval or still classified as potential developments pending planning application (see Table 18).

**Table 18**  
**Status of development of 100 new village houses**  
**(July 2010)**

Status	Number of houses
House completed/under construction	59
Planned development (with application for building village houses submitted to Lands D)	18
Potential development	23
<b>Total</b>	<b>100</b>

Source: DSD records

5.21 Further audit analysis of the status of the 100 new houses (see Table 18) revealed that:

- (a) according to the Lands D's records, of the 59 new houses (in 8 villages) completed or under construction, applications for building licences of 41 small houses had been received by the Lands D before seeking funding approval for Project C in January 2007. It appeared that the houses could have been included in the contract for Project C (Note 22); and
- (b) as of July 2010, the status of potential development for the 23 houses could not be ascertained from the Lands D. Apparently, the DSD had relied on the representation of village representatives to include the 23 houses in Project C. If the potential development did not materialise, the branch sewers might become abortive works.

5.22 Of the 59 new houses completed or under construction (see para. 5.20(a)), Audit selected 12 houses for sample checking. Audit found that:

- (a) three houses were existing ones and not new small house developments (i.e. they were granted under government land licences in 1962 (Note 23)); and

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**Note 22:** *The sewerage requirements included in the contract for Project C were based on a survey conducted in May 2005.*

**Note 23:** *The Government remains the owner of the land.*

- (b) one house was an existing squatter identified in 1976 (Note 24).

5.23 In August 2010, in response to Audit's enquiry, the DSD said that:

- (a) the DSD would strengthen communication with the Lands D by setting up special liaison meetings on top of the usual coordination meetings to discuss in greater depth the development status of village houses;
- (b) if the relevant village sewerage project warranted, the DSD would set up a special task force with the Lands D to assess and ascertain the development status of village houses; and
- (c) incorporating additional branch sewers and the requisite modifications of the original ones in one go was more cost-effective and technically sound. Based on the DSD's experience, new houses could be rapidly developed in rural areas. The Lands D also indicated that there was a great pressure to approve and facilitate small house developments. Therefore, the risk that the concerned 23 house developments would not materialise was considered to be minimal.

5.24 Audit appreciates the DSD's efforts in extending the coverage of public sewers to facilitate the connections of future small houses to the public sewerage system. However, there is room for improvement in assessing the development status of village houses and their sewerage requirements. **Audit considers that the DSD needs to review its arrangement for determining the development status of the village houses and their sewerage requirements. The DSD also needs to conduct more extensive consultations with the villagers concerning the sewerage requirements during the project planning stage.**

*Need to conduct more comprehensive site investigation*

5.25 Audit examination revealed that additional works were required to overcome technical difficulties and on-site constraints (e.g. revising alignment/levels of sewerage works to suit site conditions). Deeper piling foundations for pumping stations were found necessary during construction due to adverse ground conditions. In August 2010, in response to Audit's enquiry, the DSD said that:

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**Note 24:** *This house was identified in a survey conducted in 1976. The house was allowed to remain on government land until the land was required for public purposes or the structures had to be demolished for safety reasons.*

- (a) the problem of uncharted underground facilities/utilities in village areas was very serious and there were no reliable records on their exact locations. Records provided by utility undertakings might not fully reflect the actual situation;
- (b) the construction works at two sewage pumping station sites had revealed that the actual profile of the underground rock stratum was considerably more varied than observed in earlier site investigations. The length of piles for the two pumping stations had therefore been significantly increased;
- (c) the situation in several sites where branch sewers would be laid were more constrained than originally envisaged. This was largely due to the presence of uncharted utilities and insufficient width of pedestrian alleys between houses;
- (d) at the request of the villagers, the DSD had adopted the use of trenchless construction (which was more costly) for some of the sewers instead of open excavation; and
- (e) the DSD would continue to carry out more site investigations and trial pits to obtain the actual site information as far as practicable. In cases where the underground facilities were located within private lots, site investigation could not be carried out prior to land resumption.

**5.26 Audit considers that the DSD needs to carry out more comprehensive site investigations, where feasible and practicable, to identify site constraints and adverse ground conditions before the commencement of works.**

*Need to provide information on development status of village houses*

5.27 According to the PWSC paper submitted to LegCo in February 2010 for Project C, an additional cost of \$10 million was required for about 100 new houses (mostly village houses) which had been planned or erected since the completion of studies in January 2007. However, it was not mentioned in the funding paper that the development of the 23 new houses was tentative in nature. **In view of the possibility that sewer connections to potential developments might become abortive, the DSD needs to consider providing information on potential house developments in funding applications, highlighting the tentative nature of these developments. This would facilitate the FC to make an informed decision in approving the funding application.**

*Audit recommendations*

5.28 **Audit has recommended that the Director of Drainage Services should, in implementing village sewerage projects in future:**

- (a) **review the arrangement for determining the development status of village houses and their sewerage requirements (see para. 5.24);**
- (b) **conduct more extensive consultations with the villagers concerning the sewerage requirements during the project planning stage (see para. 5.24);**
- (c) **carry out, as far as practicable, more comprehensive site investigations to identify site constraints and adverse ground conditions before the commencement of works (see para. 5.26); and**
- (d) **consider providing information on the potential house developments in funding applications, highlighting the tentative nature of these developments where feasible (see para. 5.27).**

**Response from the Administration**

5.29 **The Director of Drainage Services agrees with the audit recommendations in paragraph 5.28. He has said that:**

- (a) **small house developments could be very rapid and the Lands D has been under pressure to approve the development applications (see para. 5.23(c)); and**
- (b) **if the potential developments are not taken into account in the planning of village sewerage system, the system may not be available to serve these developments in a timely manner when the need arises.**

5.30 **The Secretary for Financial Services and the Treasury agrees with the audit recommendation in paragraph 5.28(d).**

**Downstream sewerage works in Yuen Long  
(July 2010)**

<b>Project works</b>	<b>Status</b>	<b>Estimated cost (\$ million)</b>
Yuen Long and Kam Tin sewerage — modification works at Ping Shun Street pumping station, sewers to Ha Tsuen pumping station and sewers in Tong Yan San Tsuen	Completed	225.4
Yuen Long and Kam Tin sewerage, Stage 1	Completed	32
Yuen Long and Kam Tin sewerage, Stage 2 (part)	Completed	109.5
Yuen Long and Kam Tin sewerage, Stage 3 (part)	Completed	59.9
Yuen Long and Kam Tin sewerage and sewage disposal — Kam Tin and Au Tau trunk sewers	Completed	477.6
Yuen Long South sewerage and expansion of Ha Tsuen sewage pumping station	To be completed in 2013-14	550.8
Yuen Long and Kam Tin sewerage and sewage disposal	To be completed in 2016-17	1,267
Yuen Long and Kam Tin sewerage treatment upgrade — upgrading of San Wai Sewage Treatment Works	To be completed in 2015-16	1,171

\$647 million  
(Note)

*Source: EPD and DSD records*

*Note: In the past ten years from April 2000 to March 2010, the Government spent about \$650 million on sewage treatment and sewerage facilities in Yuen Long.*

### **Public sewerage for Village A**

Village A is divided into a western part (56 houses) and an eastern part (26 houses). The 26 village houses in the eastern part are built on private land and grouped into several clusters of houses. Each house cluster is enclosed by a boundary wall like a “walled village”. According to the DSD, tapping points in front of village houses lot boundary were provided for the western part but not for the eastern part. In October 2010, the DSD informed Audit that it would not carry out sewerage works on private land. Villagers considered that tapping points for each house should be provided. They refused to carry out the sewer connection works unless tapping points were also provided for the eastern part. Up to July 2010, none of the village houses in Village A had been connected to public sewers.

According to the EPD, the villagers’ main concern was the connection cost. The village representatives had commented that it was unfair to require them to complete the connection works at their own expense. They requested the Government to cover all or part of the connection cost.

In August 2010, the EPD informed Audit that it had requested the DSD to consider completing the sewer connection works (provision of tapping point up to the boundary of eastern part of Village A) if the house owners were willing to complete the sewer works within the boundary of the eastern part. The EPD was working with North District Office to solicit the village representatives’ support to the proposal.

*Source: DSD and EPD records*

**Public sewerage for Village B**

Different types of sewer connection were implemented (Types A, B and C connections). The status of different types of sewer connection in Village B as of July 2010 is as follows:

Connection type	Houses covered by public sewers (a) (No.)	Houses excluded due to technical problems (b) (No.)	Houses technically suitable for connection (c) = (a) - (b) (No.)	Houses connected to public sewers (d) (No.)	Connection rate as a percentage to the number of houses technically suitable for connection (e) = (d) ÷ (c) × 100% (%)
Type A	59	32	27	0	0%
Type B	81	36	45	45	100%
Type C	21	3	18 (Note 2)	0	0%
<b>Overall</b>	<b>161</b>	<b>71</b> (Note 1)	<b>90</b>	<b>45</b>	<b>50%</b>

*Note 1: This included 63 houses for which a downstream portion of the sewers serving these houses had to be relocated. As a result, sewer connection to these houses was kept in abeyance (see para. 5.13(c)).*

*Note 2: The DSD had not been able to obtain consent from the owners of these 18 houses on the internal sewer pipe and pit layouts and their undertaking of future maintenance (see para. 3.9).*

According to the DSD, it had completed a substantial portion of the Type B and Type C connections for village houses which existed before mid-1995 and would complete the outstanding works once the house owners could be contacted. Type B and Type C connections were exceptional arrangement to the normal provision of standard tapping points. According to the EPD, for village houses built after mid-1995 which required the owners to carry out the sewer connection works (i.e. Type A connection) at their own cost, the house owners were reluctant to comply with the requirement. They considered it unfair that the Government did not carry out the works for them.

Source: DSD and EPD records

**Acronyms and abbreviations**

APE	Approved project estimate
Audit	Audit Commission
CEDD	Civil Engineering and Development Department
DSD	Drainage Services Department
ENB	Environment Bureau
EPD	Environmental Protection Department
FC	Finance Committee
Lands D	Lands Department
LegCo	Legislative Council
NDA	New Development Area
NENT	Northeast New Territories
PWP	Public Works Programme
PWSC	Public Works Subcommittee
SMPs	Sewerage Master Plans
WQOs	Water Quality Objectives