CHAPTER 9

THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

CAPITAL WORKS RESERVE FUND

GOVERNMENT SECRETARIAT

Environment and Food Bureau
Works Bureau

GOVERNMENT DEPARTMENTS

Civil Engineering Department
Environmental Protection Department
Territory Development Department

Management of construction and demolition materials

Audit Commission
Hong Kong
20 March 2002

MANAGEMENT OF CONSTRUCTION AND DEMOLITION MATERIALS

Contents

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Summary and key findings

A. **Introduction.** Construction and demolition (C&D) materials are a mixture of inert materials and wastes arising from construction and demolition activities. It is the Government's policy to maximise the use of inert C&D materials in public filling areas for reclamation purposes so as to conserve the valuable landfill space. In February 1997, Audit reported the problem of insufficient provision of public filling facilities from 1991 to 1995 which had resulted in the disposal of large quantities of C&D materials at landfills. In its Report No. 28 of June 1997, the Public Accounts Committee (PAC) recommended that the Administration should take measures to identify more outlets to meet both the current and future public filling needs. The Administration accepted the PAC's recommendations and implemented various management measures. As a result, the Government had increased the rate of reuse of C&D materials in public filling areas from 35% in 1994 to 83% in 2001 (paras. 1.2 to 1.4 and 1.6).

B. **Impending shortage of public filling areas.** To further reduce the disposal of C&D materials at landfills, in the 1998 Waste Reduction Framework Plan, the Government set a target for reusing 84% of C&D materials. To achieve this target, it is necessary to have sufficient public filling facilities. However, the Government has assessed that the demand for public filling facilities will exceed the supply from mid-2002 onwards (paras. 1.5 and 1.6).

C. **Audit review.** Against the above background, Audit carried out a follow-up review of the management of C&D materials to see what further improvements can be made (para. 1.7). The audit findings are summarised in paragraphs D to K below.

D. **Loss of public filling capacity.** In early 2000, the Civil Engineering Department (CED) planned to use the Tseung Kwan O reclamation contract (TKO Contract) to supply 3.6 million tonnes of sorted C&D materials for use in the Penny's Bay Stage 1 reclamation contract (PBR1 Contract). The arrangement involved the formation of a works site in the TKO reclamation by July 2001 for the PBR1 Contractor to select suitable C&D materials for shipment by barges to Penny's Bay. In July 2001, a seawall of the TKO reclamation collapsed, submerging the newly formed works site. As a result, the planned delivery of the 3.6 million tonnes of C&D materials from the TKO Contract to the PBR1 Contract could not be made. Marine sand instead of C&D materials had to be used in the PBR1 Contract. In early 2002, the CED informed Audit that it had identified the potential use of 2.2 million tonnes of C&D materials for the landscaping works of the theme park at Penny's Bay. However, there is still a need to explore other opportunities of using C&D materials to make up for the lost capacity in the PBR1 Contract (paras. 2.25 to 2.27).

E. **Need to follow prudent project management principles.** In 1999, the CED awarded the TKO Contract. This Contract did not have any contractual provision that the works site in the TKO reclamation had to be completed by July 2001 for use by the PBR1 Contractor. However, in April 2000, the CED awarded the PBR1 Contract, which included a commitment to the PBR1 Contractor that the TKO works site would be made available by July 2001, without first securing the TKO Contractor's prior agreement. In December 2000, the CED had to negotiate a supplementary agreement with the TKO Contractor for the completion of the works site by July 2001. The Finance Bureau considered that the CED did not follow the principles of prudent project management in managing the TKO Contract. In the circumstances, the Government was left in a weaker negotiating position than that of the TKO Contractor (paras. 2.17, 2.29 and 2.30).

F. **Problems of using public fill in entrustment works.** In the Land Grant for the Container Terminal No. 9 (CT9) project executed in December 1998, the Government entrusted the reclamation works for the provision of a back-up area to the CT9 developer. However, there was no provision in the Land Grant requiring the use of public fill in the Government's entrustment works. As a result, the Government was unable to use 1.8 million tonnes of C&D materials in the CT9 project. The C&D materials would have to be stockpiled in fill banks with cost implications of $50 million (paras. 2.39 and 2.40).

G. **Need to implement the landfill charging scheme.** Since 1995, the Government has been trying to implement the landfill charging scheme but met with objections from the trades. The Government had suggested various concessions in the charging arrangements to address the trades' concerns. However, there are still objections from the trades. The Administration should decide the way forward on the implementation of the landfill charging scheme as quickly as possible in order to provide an economic incentive to discourage disposal of C&D waste at landfills, the capacity of which is being depleted (paras. 3.6, 3.10, 3.14 and 3.15).

H. **Need to promote wider use of recycled C&D materials.** Based on a CED's study, about 25% of C&D materials generated are hard materials with potential for recycling. To promote the recycling of C&D materials, the Government has relaxed the technical standards to allow the use of recycled aggregates in government works projects. In mid-2002, the Government will set up a new recycling plant to produce aggregates for use of government projects. However, despite repeated appeals by the Works Bureau and the CED, the demand for recycled aggregates by the works departments will only use up about one third of the planned output of the recycling plant. There is a need to promote the wider use of recycled C&D materials by works departments so as to set a good example for the construction industry to follow (paras. 4.10 and 4.11).

I. **Room for improving the planning for off-site sorting facilities.** According to the 1998 Waste Reduction Framework Plan, the objective of setting up off-site sorting facilities was to recover inert C&D materials for reuse in order not to deplete the landfill space. However, the sorting facility set up in the TKO public filling area in August 2000 had only made a limited contribution to the objective of saving landfill space because its throughput was only 35% of its expected level.

Furthermore, because of the early cessation of the TKO public filling operation, the CED considers that there would be contractual complications if it continues the operation of the sorting facility (paras. 5.10 and 5.11).

J. **Need to tighten the control over the disposal of C&D materials.** Since July 1999, the Government has implemented a trip-ticket system to ensure the proper disposal of C&D materials generated in public works contracts. However, in early 2001, it came to light that some 60,000 cubic metres of C&D materials coming from a site in Yuen Long were used for the illegal filling of two fishponds in the Tin Shui Wai Wetland Conservation Area. The requirement of proper disposal of C&D materials promulgated in Works Bureau Technical Circular (WBTC) No. 5/99 had not been fully complied with (paras. 6.13 and 6.14).

K. **Room for improving the accuracy of management information.** The CED needs to estimate accurately the tonnage of C&D materials received at public filling facilities for management purposes. The CED has been using an assumed average load of 11.7 tonnes per dumping truck for estimating the tonnage of C&D materials received in public filling areas for some time. Audit found that the estimates made on the basis of the CED's assumed average load were higher than the measured tonnage of C&D materials. There is a need for the CED to review this assumed average load (paras. 7.10 and 7.11).

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

(a) the Director of Civil Engineering should:

(i) urgently consider requiring the use of more C&D materials for reclamation in the Penny's Bay Reclamation Stage 2 (para. 2.28(a));

(ii) critically examine all existing government reclamation works entrusted to third parties to ascertain whether there are opportunities for using C&D materials in these works projects and, if so, take necessary follow-up action (para. 2.41(a));

(iii) realistically assess the resources required for operating a sorting facility up to its expected throughput (para. 5.12(a)); and

(iv) carry out a review to reassess the average load per dumping truck so as to enable the CED to estimate accurately the tonnage of C&D materials received at public filling facilities for management reporting purposes (para. 7.12);

(b) the Secretary for Works should:

(i) consider issuing guidelines to advise all works departments that they should ensure that prudent project management principles are followed in managing works projects (para. 2.31);

(ii) require all works departments to work closely with the CED to make full use of C&D materials in future entrustment works under their control, and ensure that the legal documents for the entrustment works contain enabling clauses to meet this objective (para. 2.41(b));

(iii) in conjunction with the Director of Civil Engineering, step up efforts to promote the wider use of recycled C&D materials in government projects so as to set an example for the construction industry to follow (para. 4.13(a)); and

(iv) consider ways to strengthen the control over the disposal of C&D materials at sites provided by the contractors (para. 6.16(b));

(c) the Secretary for the Environment and Food should, in conjunction with the Director of Environmental Protection, conduct further consultation with all stakeholders to reach a consensus for finalising the landfill charging arrangement as soon as possible (para. 3.16(a)); and

(d) the Director of Territory Development should ensure that all relevant WBTC requirements for the proper disposal of inert C&D materials and C&D waste, such as those stated in WBTC No. 5/99, are included in contract documents and are complied with by the contractors during the execution of works (para. 6.16(a)).

M. **Response from the Administration.** The Administration has accepted all the audit recommendations (paras. 2.42, 3.17, 3.18, 4.14, 5.13, 6.17, 6.18, 7.21 and 7.22).

PART 1: INTRODUCTION

1.1 This PART describes the background to the audit on the Government's management of construction and demolition (C&D) materials (Note 1).

Background

1.2 C&D materials are a mixture of inert materials and wastes arising from construction, excavation, renovation and demolition activities. Useful inert materials such as rocks, concrete, asphalt, rubbles, stones and earth are collectively called public fill and are suitable for reuse in public filling areas (Note 2). Other C&D wastes (e.g. bamboo, plastic, timber and packaging waste) are often mixed and contaminated. Therefore, they are not suitable for reuse in reclamation works and have to be disposed of at landfills.

1.3 In the 1989 White Paper entitled "Pollution in Hong Kong – A time to act", the Government set out its objective to conserve the scarce landfill capacity by means of waste reduction, reuse and recycling. To implement the waste disposal strategy set out in the White Paper, in December 1989, the then Governor-in-Council approved a statutory Waste Disposal Plan which called for the beneficial use of suitable C&D materials for reclamation purposes as far as practicable.

Audit review in 1997

1.4 In Report No. 28 of the Director of Audit of February 1997, Audit invited attention to the situation where from 1991 to 1995 there was insufficient provision of public filling facilities. Some 14.7 million tonnes of inert C&D materials were disposed of at landfills instead of in public filling areas, resulting in considerable additional disposal costs to the Government and the early depletion of the capacity of the landfills. In its Report No. 28 of June 1997, the Public Accounts Committee (PAC) recommended that the Administration should identify more public filling outlets from the development programmes to meet both the current and future public filling needs.

Note 1: *Before November 1997, C&D materials were known as construction waste and public filling facilities were known as public dumping facilities. The new terminology is used to better reflect the beneficial use of C&D materials in reclamation works.*

Note 2: *A public filling area is a designated part of a development project that accepts public fill for reclamation purposes. Deposition of public fill in a public filling area requires a dumping licence issued by the Director of Civil Engineering.*

1998 Waste Reduction Framework Plan

1.5 In November 1998, in recognition of the problem of fast depletion of the capacity of landfills, the Government launched a Waste Reduction Framework Plan which set out a 10-year programme and targets to reduce waste. In the Waste Reduction Framework Plan, it was stated that after the gradual implementation of the C&D materials management strategy in early 1998, considerable improvement had been made in that about 80% of the total C&D materials produced were delivered to public filling areas. However, the achievement had to be maintained and, if possible, extended. In this connection, the Waste Reduction Framework Plan aimed to increase the rate of reuse of C&D materials from 80% to 84%. This would further reduce C&D materials delivered to landfills from 20% to 16% (i.e. a 20% reduction). However, to achieve this target, the following measures would need to be implemented:

(a) providing adequate public filling areas and barging points at suitable locations;

(b) introducing the landfill charging scheme;

(c) implementing reuse and recycling of C&D materials;

(d) introducing on-site/off-site sorting of mixed C&D materials; and

(e) avoiding and minimising C&D materials through better design and construction management.

Follow-up audit review

1.6 ***Need to conserve landfill capacity and increase supply of public filling areas.*** Audit notes that since the last audit review in 1997, the Government has made considerable improvements in the management of C&D materials (see Appendix A for a summary of the Government's initiatives). This had resulted in an increase in the percentage of C&D materials delivered to public filling areas, i.e. from 35% in 1994 to 83% in 2001. However, as mentioned in the Waste Reduction Framework Plan, these improvements need to be maintained and, if possible, extended. This is because the remaining 17% of C&D materials disposed of at the landfills in 2001 still amounted to 2.34 million tonnes (or 6,410 tonnes per day) and accounted for 38% of the wastes disposed of at the three strategic landfills (Note 3). The landfill capacity is both costly to construct

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Note 3: *The three strategic landfills are the South East New Territories (SENT) landfill, the North East New Territories (NENT) landfill and the West New Territories (WENT) landfill.*

and difficult to replace (Note 4). More importantly, in November 2000 and June 2001, the Administration informed the Legislative Council (LegCo) Panel on Environmental Affairs that the demand for public filling areas would outstrip the supply from mid-2002 onwards. Without adequate public filling areas, it would be extremely difficult to manage the huge volume of C&D materials generated every day.

1.7 ***Objective of follow-up audit review.*** The objective of this follow-up audit review is to ascertain what further improvements can be made by building on the existing arrangements for the management of C&D materials. The audit review focused on the following areas:

(a) the provision of public filling areas (see PART 2 below);

(b) the implementation of the landfill charging scheme (see PART 3 below);

(c) the implementation of measures for recycling C&D materials (see PART 4 below);

(d) the provision of off-site facilities for sorting C&D materials (see PART 5 below);

(e) the implementation of measures to control the disposal of C&D materials in public works contracts (see PART 6 below); and

(f) information system for management of C&D materials (see PART 7 below).

Audit has made a number of recommendations to address the above issues.

Note 4: *As an illustration, the three strategic landfills together occupy 270 hectares of land and cost $6,000 million to construct. In 2000, their annual running cost amounted to $426 million.*

PART 2: PROVISION OF PUBLIC FILLING AREAS

2.1 As mentioned in paragraph 1.5(a) above, the success of the present C&D materials management strategy depends very much on the adequate provision of public filling areas. This PART examines the adequacy of the arrangements for the provision of public filling areas in reclamation projects. The audit revealed that the opportunity of using public fill had been lost in two projects, namely the Penny's Bay Reclamation project and the Container Terminal No. 9 (CT9) project.

Existing arrangements for the provision of public filling areas

Roles and responsibilities

2.2 The Environment and Food Bureau (EFB) has the policy responsibility for the management of C&D materials. The Civil Engineering Department (CED) is responsible for ensuring the adequate provision of public filling facilities for the reception of inert C&D materials as public fill and issuing licence for public filling, which is issued free of charge, under delegated authority from the Director of Lands. The Territory Development Department (TDD) also manages some public filling areas as part of its reclamation projects.

2.3 Under the chairmanship of the Director of Civil Engineering or his Deputy, there are two Committees responsible for fill management. The names and responsibilities of these Committees were changed in April 2000. The following is a summary of such changes:

(a) ***Before April 2000.*** The Fill Management Committee, established in June 1989, was chaired by the Director of Civil Engineering. Its members included representatives from the Works Bureau, the then Planning, Environment and Lands Bureau (PELB), the Environmental Protection Department (EPD) and various works departments. This Committee was responsible for identifying and managing the supply and demand of land and marine fill resources of Hong Kong for all government, quasi-government and major private projects. It was also responsible for ensuring the adequate provision of public filling areas. The role of coordinating the provision and operation of the public filling areas was performed by its Public Filling Subcommittee (known as Public Dumping Subcommittee before 1998). According to Works Bureau Technical Circular (WBTC) No. 6/92, the Fill Management Committee had the authority to require that government and quasi-government projects were made available for public filling, where capacity and other conditions were appropriate; and

(b) ***Since April 2000.*** In April 2000, the Fill Management Committee was reorganised into a Public Fill Committee and a Marine Fill Committee. Both committees are chaired by

the Director of Civil Engineering or his Deputy. The Public Fill Committee is responsible for implementing measures to promote avoidance, minimisation, reuse and recycling of C&D materials. It coordinates the provision and operation of public filling facilities. The Marine Fill Committee is responsible for identifying and managing the supply and demand of marine fill resources for all government, quasi-government and major private projects.

PAC's recommendation

2.4 As mentioned in paragraph 1.4 above, Audit conducted a review and issued a report in 1997. In its Report No. 28 of June 1997, the PAC recommended that the Administration should identify more public filling outlets from the development programmes to meet both the current and future public filling needs.

Vetting of reclamation and earth filling projects

2.5 The Administration accepted the PAC's recommendation. In March 1998, in pursuance of the PAC's recommendation, the Works Bureau promulgated in WBTC No. 4/98 a policy which requires the works departments to consider using public fill for all reclamation and earth filling projects with fill requirements of 300,000 cubic metres or more. The works departments should examine and implement measures to maximise the use of public fill for their projects and notify the Public Fill Committee of their fill requirements. The Secretary of the Public Fill Committee is delegated with the authority to review the proposed fill requirements to see whether the use of public fill is optimised. The works departments which do not want to use public fill in their projects (for example, because of a tight works programme) have to obtain the approval of the Public Fill Committee.

Impending shortage of public filling areas

2.6 In July 1999, the Administration informed the LegCo Panel on Environmental Affairs that, in recent years, public concern and objections had often delayed or stopped the implementation of reclamation projects, in particular those within the inner harbour. This had reduced the provision of new public filling areas and the outlet capacity.

2.7 In November 2000, the Administration informed the LegCo Panel on Environmental Affairs that the approved reclamation projects (in Category A of the Public Works Programme) would only provide sufficient public filling capacity till mid-2002 (see Appendix B). **From mid-2002 onwards, there would be shortage of public filling areas.** Without adequate public filling areas, it would be extremely difficult to manage the huge volume of C&D materials generated each day.

2.8 In June 2001, the Administration informed the LegCo Panel on Environmental Affairs that it had reviewed all planned reclamation and earth filling projects (in Category B of the Public Works Programme) with a commencement date before end-2005. With the support and joint effort of relevant bureaux and departments, most of the planned projects would be using inert C&D materials to meet 70% or more of their fill requirements. There was little scope to increase the percentage further because of engineering and other constraints. The Government estimated that 69 million tonnes of C&D materials would be generated between mid-2002 and end-2005. However, the planned projects would only provide a public filling capacity of about 43.9 million tonnes. **Even with the measures to recycle some 10.3 million tonnes at the local quarries for aggregate production, the Government estimated that by end-2005 there would still be about 14.8 (i.e. 69 - 43.9 - 10.3) million tonnes of surplus C&D materials without any disposal outlet. As a stopgap measure, the Government planned to establish temporary fill banks to stockpile these materials until new reclamation projects were available (Note 5).**

2.9 In October 2001, the Public Fill Committee assessed that the expected shortfall of public filling capacity by end–2005 would further increase, mainly because of the loss of the planned public filling capacity of 3.6 million tonnes under the Penny's Bay Reclamation Stage 1 project mentioned in Appendix B (Note 6). Details are given in paragraphs 2.10 to 2.31 below. Audit also noted that the Government encountered problems in securing a public filling capacity of 1.8 million tonnes in the reclamation works entrusted to the developer of the CT9 project. Details are reported in paragraphs 2.32 to 2.41 below.

Problems encountered in using public fill in Penny's Bay Reclamation Stage 1

Penny's Bay Reclamation

2.10 In December 1999, the Government entered into an agreement with an international company to develop a theme park known as Hong Kong Disneyland (HKD) at Penny's Bay. Under this agreement, the Government had to provide a fully formed and serviced site with a total area of some 200 hectares in Penny's Bay for the HKD Phase 1 development. Furthermore, to support the

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Note 5: *The major drawback of using a fill bank is the additional cost of double handling the public fill (i.e. first from the source to the fill bank, and then from the fill bank to the reclamation area). The fill bank site will also not be available for other uses. Depending on the location and mode of operation of the fill bank, the CED estimated that it would cost at least $28 to manage one tonne of stockpiled public fill. However, stockpiling of C&D materials in fill banks is still better than disposal at landfills which is more costly (i.e. at $215 per tonne – see Note 15 to para. 3.15 below).*

Note 6: *Another contributing factor was that the public filling capacity to be provided under some Category B reclamation projects could not be made available before end-2005.*

HKD Phase 1 development, the Government had to provide land for infrastructure and additional transport facilities. All these facilities would have to be completed between 2002 and 2005 to enable the HKD Phase 1 development to be completed on time. The remaining works, for the HKD Phase 2 development, involving the reclamation of about 80 hectares of land, would start in 2002.

Planned use of public fill in Penny's Bay Reclamation Stage 1

2.11 In December 1999, the Government invited the Public Works Subcommittee to recommend to the Finance Committee to upgrade a project for the Penny's Bay Reclamation Stage 1 works to Category A of the Public Works Programme. In the related Public Works Subcommittee paper, the Government stated that, at the planning and design stages of the reclamation works, it had considered ways to minimise the generation of C&D materials and to maximise the use of public fill. The Penny's Bay Reclamation Stage 1 would use about 60 million cubic metres (or 108 million tonnes) of fill materials comprising both marine sand and public fill. The Government estimated that about 3.6 million tonnes of public fill, which would be sorted to meet quality control requirements, would be placed in the reclamation.

2.12 At the Public Works Subcommittee meeting of 8 December 1999, a Member enquired about the feasibility of using more public fill for the Penny's Bay Reclamation Stage 1. In reply, the Director of Civil Engineering said that:

(a) in order to meet the target schedule for the Stage 1 reclamation works, 3.6 million tonnes of public fill could be placed at the reclamation site at most;

(b) the use of public fill as fill materials would slow down the filling process and the rate of soil settlement;

(c) the unstable supply of public fill and the lack of road access to the reclamation site also posed constraints on the extent of use of public fill for the Stage 1 reclamation works; and

(d) more public fill would be used for the Stage 2 reclamation works (Note 7) which were not subject to such a tight schedule as the Stage 1 works.

Note 7: *According to Public Fill Committee Paper No. 3/2000 of May 2000, in the preliminary design of the Stage 2 reclamation works, it was estimated that about 11 million cubic metres of public fill could be used. The actual quantity would be confirmed in the detailed design stage.*

On the recommendation of the Public Works Subcommittee, on 17 December 1999, the Finance Committee approved the upgrading of the Penny's Bay Reclamation Stage 1 project to Category A of the Public Works Programme.

Supply of public fill to Penny's Bay Reclamation Stage 1 area

2.13 Due to the heterogeneous nature of public fill and the need to control the post-construction settlement for the theme park site, the public fill for the Penny's Bay Reclamation Stage 1 works had to be pre-sorted to remove unsuitable materials. In early February 2000, the CED held a meeting with the consultant for the Penny's Bay Reclamation Stage 1 to discuss the source of supply of 3.6 million tonnes of public fill. The notes of meeting stated that:

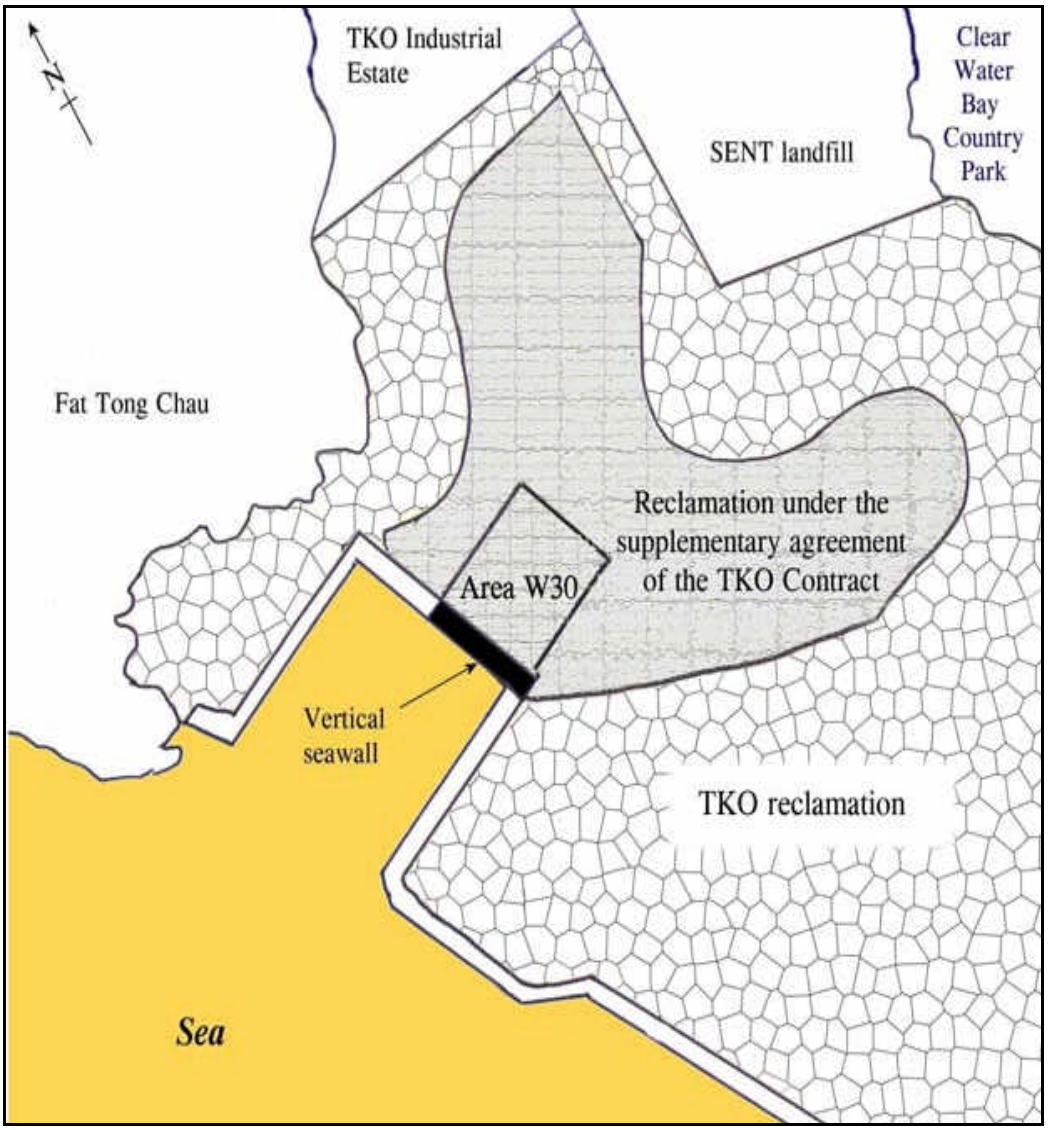
(a) about 1.8 hectares of land (i.e. the area depicted by "Area W30" in Figure 1 below) in Tseung Kwan O Area 137 public filling area (managed under a CED contract, hereinafter referred to as the TKO Contract – see para. 2.15 below) would be handed over to the Penny's Bay Reclamation Stage 1 Contractor as his works area on or before 1 July 2001. The Development Division of the CED responsible for the management of the TKO Contract said that, based on the construction programme submitted by its contractor, the proposed handover date should be achievable (see para. 2.16 below);

(b) the contractor of the TKO Contract (hereinafter referred to as the TKO Contractor) would be responsible for stockpiling and removing public fill to the works area of the Penny's Bay Reclamation Stage 1 Contractor for sorting and processing. After processing, the Penny's Bay Reclamation Stage 1 Contractor would use barges to deliver the sorted public fill to the Penny's Bay Reclamation site; and

(c) **in view of the tight works schedule and the possible delay by the TKO Contractor, a post-meeting discussion was held within the CED for the provision of a fall-back option. The proposed fall-back option was to provide an additional works area in Tuen Mun Area 38 for the supply of sorted public fill for the Penny's Bay Reclamation Stage 1. However, the meeting concluded that the proposal could give rise to complications to the Penny's Bay Reclamation Stage 1 contract and should not be pursued.**

Figure 1

Layout plan of TKO reclamation



Source: CED's records

2.14 ***Penny's Bay Reclamation Stage 1 contract.*** In April 2000, the CED awarded a contract for the Penny's Bay Reclamation Stage 1 works (hereinafter referred to as the PBR1 Contract). The PBR1 Contract specified that:

(a) Area W30 of the TKO Contract would be made available to the contractor of the PBR1 Contract (hereinafter referred to as the PBR1 Contractor) from 1 July 2001 until end June 2002, or such earlier period as may be instructed by the Engineer. The marine barging point of the PBR1 Contractor would be located within Area W30; and

(b) the TKO Contractor would deliver 2 million cubic metres (or 3.6 million tonnes) of public fill to Area W30 for the PBR1 Contractor to sort the suitable filling materials.

2.15 ***TKO Contract.*** The TKO Contract was awarded in October 1999. It is funded by the Public Works Programme item "Tseung Kwan O port development at Area 137, Stage 2 reclamation" (see para. 5.6 below for details of funding approval) for which the TDD is the vote controller. The CED is the works agent responsible for the design and supervision of the contract works. At the time of preparing the TKO Contract in 1999, it was not known that there would be additional requirements for the PBR1 Contract of April 2000. Therefore, the TKO Contract:

(a) was originally scheduled for completion in November 2002; and

(b) did not have provisions for the early completion of Area W30 by 1 July 2001, and the delivery of 3.6 million tonnes of public fill to Area W30 for use by the PBR1 Contractor.

2.16 Based on a construction programme submitted by the TKO Contractor in January 2000, the CED considered that the proposed handover date (by 1 July 2001) of Area W30 to the PBR1 Contractor would be achievable. However, there was subsequent slippage in the progress of the TKO Contract. In September 2000, the CED requested the TKO Contractor to consider changing the sequence of the works so as to complete the vertical seawalls and Area W30 in time for the PBR1 Contractor's use on 1 July 2001. In October 2000, the TKO Contractor provided the CED with a cost estimate for changing the sequence of the works programme and accelerating the works.

2.17 ***Supplementary Agreement.*** On 14 December 2000, the CED informed the TDD that the early completion of Area W30 for the PBR1 Contractor's use and the delivery of 3.6 million tonnes of public fill to Area W30 as required under the PBR1 Contract were outside the original terms of the TKO Contract. As such, a supplementary agreement was required to provide a variation to the TKO Contract. On 19 December 2000, the CED sought the Secretary for the Treasury's approval for a variation to the TKO Contract, in order to meet the PBR1 Contract's requirement (Note 8).

2.18 On 9 January 2001, the Secretary for the Treasury approved the variation to the TKO Contract. On 19 February 2001, the CED entered into a supplementary agreement with the TKO Contractor:

(a) to change the sequence of works for the early completion of Area W30 for the PBR1 Contractor's use by 1 July 2001;

(b) to stockpile 1.8 million tonnes of public fill for subsequent delivery to Area W30; and

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Note 8: *In accordance with the Stores and Procurement Regulations, the approval of the Secretary for the Treasury is required for any contract variation exceeding $3 million in respect of additional works outside the terms of the original contract but within the approved scope of the project.*

(c) to deliver directly another 1.8 million tonnes of public fill to Area W30 by public dumping trucks.

Need to follow prudent project management principles

2.19 ***Secretary for the Treasury's concerns.*** In January and February 2001, the Secretary for the Treasury raised a number of queries about the timing of negotiations for a supplementary agreement with the TKO Contractor. The main concerns of the Secretary for the Treasury were as follows:

(a) **there was a failure to secure the TKO Contractor's prior agreement to complete Area W30 by 1 July 2001 before the CED offered this as a milestone date in the PBR1 Contract (see para. 2.14(a) above). This had created a potential financial liability for the Government; and**

(b) **by committing the Government to the milestone date in the PBR1 Contract, the CED had put the Government in a weaker negotiating position vis-à-vis the TKO Contractor.**

2.20 ***CED's response.*** In response, the CED provided the following explanations:

(a) the CED had not secured the TKO Contractor's prior agreement to complete Area W30 by 1 July 2001 before offering this as a milestone date in the PBR1 Contract because the TKO Contractor's initial construction programme indicated that the milestone date would be achievable. Moreover, it was highly undesirable to disclose the restricted tender information of the PBR1 Contract to the TKO Contractor;

(b) the use of public fill in PBR1 Contract had to be confirmed by an Environmental Impact Assessment study in accordance with the Environmental Impact Assessment Ordinance (Cap. 499). The Environmental Impact Assessment study report was approved by the EPD on 28 April 2000 and the PBR1 Contract was awarded on 29 April 2000. It was therefore not possible to execute the supplementary agreement with the TKO Contractor before the award of the PBR1 Contract;

(c) the Government was left in a weak negotiating position vis-à-vis the TKO Contractor because the requirements of the PBR1 Contract were only known after the TKO Contract had been let;

(d) the cost of delivery of public fill to Area W30 was the major part of the supplementary agreement. If the supplementary agreement had been prepared in early 2000, it would have been assumed that 3.6 million tonnes of public fill would be transported from the stockpile in Tseung Kwan O to Area W30. However, after collecting more data on the public fill supply situation in 2000, the scope of works only involved the TKO Contractor

supplying 1.8 million tonnes of public fill from the stockpile. The remaining 1.8 million tonnes of public fill were to be delivered to Area W30 directly by public dumping trucks;

(e) **if the programme of the PBR1 Contract had not been so tight, the CED could have executed the supplementary agreement prior to the tender for the PBR1 Contract; and**

(f) **the CED would remind its staff to undertake a full assessment of risks and costs and to seek authorisation from the appropriate authority prior to the finalisation of future tenders.**

2.21 ***Secretary for the Treasury's comments.*** In February and March 2001, after considering the CED's explanations, the Secretary for the Treasury stated that **the lesson to be drawn from this incident was that public officers should not offer to commit a third party (i.e. the TKO Contractor in this case) to performing certain tasks unless the prior consent of this third party had been sought.** This was especially so if the commitment itself would create a potential financial liability for the Government. The Secretary for the Treasury also said that:

(a) she disagreed with the CED's assessment that it was not essential to secure the TKO Contractor's prior commitment because there was indication from his initial construction programme that the milestone (i.e. completion of Area W30 by 1 July 2001) would be achievable (see para. 2.20(a) above). This milestone date of 1 July 2001 was not contractually binding on the TKO Contractor. However likely the TKO Contractor could achieve this milestone was not relevant when the CED was considering whether to offer this as a binding offer in the PBR1 Contract with potential financial liability for the Government;

(b) while it was necessary to observe confidentiality rules, it was also necessary to observe the need-to-know and prudent financial management principles. It was not prudent to commit the TKO Contractor to delivering something for a third party (i.e. the PBR1 Contractor) without first securing the TKO Contractor's consent;

(c) the scope of the supplementary agreement covered first and foremost a requirement for the TKO Contractor to form Area W30 by 1 July 2001. The CED should have sought the TKO Contractor's prior agreement before offering this milestone in the PBR1 Contract. The requirement for completion of Area W30 by 1 July 2001 should not be contingent upon the approval of the Environmental Impact Assessment report;

(d) while the CED might not be able to finalise the precise split between the delivery of public fill from the stockpile in Tseung Kwan O and by direct public dumping trucks to Area W30 in early 2000, the broad parameters should have been known earlier. Otherwise, it would not have been possible to incorporate binding clauses in the PBR1 Contract. The CED could have started negotiations with the TKO Contractor on these broad parameters earlier and executed the supplementary agreement concurrently with, if not earlier than, the execution of the PBR1 Contract; and

(e) the TKO Contractor was in an inherently stronger negotiating position vis-à-vis the Government even in early 2000, because he knew that the Government was keen to invite tender for the PBR1 Contract. However, the Government's negotiating position in early 2001 (i.e. some 8 months after the award of the PBR1 Contract in April 2000) was even weaker.

Public fill not used for the Penny's Bay Reclamation Stage 1 area

2.22 ***Area W30 not substantially completed by 1 July 2001.*** In mid-March 2001, i.e. about one month after execution of the supplementary agreement, the CED drew the TKO Contractor's attention to the slippage in his works against the programme of works in the supplementary agreement. In mid-June 2001, the CED expressed its grave concern to the TKO Contractor on the slow progress of the reclamation works for Area W30 despite repeated reminders. **Based on a survey carried out in the morning of 3 July 2001, the reclamation of Area W30 was not yet substantially completed to the level and extent as specified in the supplementary agreement**.

2.23 ***Collapse of the vertical seawall.*** In the afternoon of 3 July 2001, a portion of the newly reclaimed land within Area W30 behind the vertical seawall sank below the sea level and a portion of the vertical seawall collapsed. After the incident, the reclamation works under the supplementary agreement were suspended. Site investigation works were required for identifying the cause of the incident and for detailed design of the remedial works. In late July 2001, the CED commissioned its term contractor to carry out the site investigation works. Up to December 2001, the investigation works were still being carried out.

2.24 ***Use of sand in place of public fill for Penny's Bay.*** In July 2001, the CED estimated that the remedial works for Area W30 would take at least 12 months to complete. **Consequently, the planned delivery of public fill by the TKO Contractor to Area W30 could not be made.** The CED then tried to identify alternative sites in Tseung Kwan O that could be used for the transportation of public fill by the PBR1 Contractor. While the CED was able to identify an alternative works site for sorting public fill, the berthing area available for offloading the public fill into barges was 1.2 kilometres away. Moreover, the length of the berthing area was inadequate to accommodate two barges, as required under the PBR1 Contract. The CED considered that if the alternative site in Tseung Kwan O was used to supply public fill to the PBR1 Contractor, the delay to the PBR1 Contract would be about six months with additional cost implications (Note 9). In order not to delay the PBR1 Contract, the CED considered that the only viable option was to allow the PBR1 Contractor to use 3.6 million tonnes of marine sand instead of public fill. **In October 2001, the CED issued a variation order to allow the PBR1 Contractor to use 3.6 million tonnes of marine sand to fill the Penny's Bay Reclamation Stage 1 area.**

Audit observations on not using public fill for Penny's Bay Reclamation Stage 1

2.25 In early 2000, the CED planned to use the TKO Contract to supply 3.6 million tonnes of sorted public fill for use in the PBR1 Contract from mid-2001 to mid-2002. The planned

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Note 9: *The CED estimated that the additional cost implications would be $192 million.*

arrangement involved the formation of Area W30 in the TKO Contract site by 1 July 2001 so that the PBR1 Contractor could use it to sort and transport the public fill by sea. **However, due to the collapse of the newly constructed seawall on 3 July 2001, the planned delivery of 3.6 million tonnes of public fill to the PBR1 Contract could not be made.**

2.26 **During the planning of the PBR1 Contract, the CED had considered designating the Tuen Mun Area 38 as a fall-back option for the supply of sorted public fill to the PBR1 Contractor, in view of the tight working schedule and possible delays by the TKO Contractor (see para. 2.13(c) above). The CED did not pursue this fall-back option because it considered that this could give rise to complications to the PBR1 Contract. However, there are no detailed explanations in the CED's records showing how this decision was arrived at, and no assessment of the cost and benefit of this fall-back option had been made. Without an alternative for the supply of sorted public fill, the CED had no fall-back option which would enable it to fully meet its public fill requirements under the PBR1 Contract. In order not to delay the PBR1 Contract, the CED was left with no choice but to permit the importation of 3.6 million tonnes of marine sand to fill Penny's Bay.**

2.27 **Moreover, Audit has estimated that if a fill bank is eventually used to stockpile 3.6 million tonnes of surplus C&D materials, there would be additional cost implications of $100 million (i.e. $28 per tonne ´ 3.6 million tonnes – see Note 5 to para. 2.8 above).** Audit understands that the CED is considering various options to deal with the loss of opportunity to use public fill to fill the PBR1 site. In early 2002, the CED informed Audit that it had identified the potential use of about 2.2 million tonnes of C&D materials for landscaping the theme park at Penny's Bay. However, in Audit's view, there is an urgent need to consider using more public fill in the Penny's Bay Reclamation Stage 2 to make up for the lost capacity in the PBR1 Contract.

Audit recommendations on using public fill for reclamation

2.28 **Audit has *recommended* that the Director of Civil Engineering should**:

(a) **urgently consider requiring the use of more public fill for reclamation in the Penny's Bay Reclamation Stage 2;**

(b) **properly document the assessment of options made prior to making major decisions in implementing works projects; and**

(c) **after completing the investigation into the collapse of the seawall in Area W30 of the TKO Contract, ascertain the contractual liability for the additional cost involved and take action to pursue any claims from the parties responsible.**

Audit observations on the need to follow prudent project management principles

2.29 In 1999, the CED awarded the TKO Contract. This contract had no provision for completing Area W30 by 1 July 2001. However, in the PBR1 Contract awarded in April 2000, the

CED committed the Government to making Area W30 available for the use of the PBR1 Contractor by 1 July 2001. **Audit shares the Secretary for the Treasury's concern that it was not prudent to make such a commitment in the PBR1 Contract without first securing the TKO Contractor's prior consent because there could be potential financial liability for the Government.**

2.30 **Furthermore, in negotiating with the TKO Contractor for the supplementary agreement to complete Area W30 by 1 July 2001, the Government was left in a weaker negotiating position than that of the Contractor. The Government's position would have been better if the CED had negotiated with the TKO Contractor before including the specification in the PBR1 Contract.** To prevent the recurrence of such problems, Audit urged the CED to issue guidelines (which the CED had undertaken to do so in early 2001 – see para. 2.20(f) above) for its staff to follow in handling similar situation in future. In January 2002, the CED issued the guidelines to its staff.

Audit recommendation on the need to follow prudent project management principles

2.31 **Audit has *recommended* that the Secretary for Works should consider issuing guidelines to advise all works departments that they should ensure that prudent project management principles are followed in managing works projects. The works departments should also be advised that they should not commit a third party to performing a task, unless the third party's prior consent has been obtained, in order to avoid creating potential financial liabilities for the Government**.

Problems encountered in securing public filling capacity in CT9 project

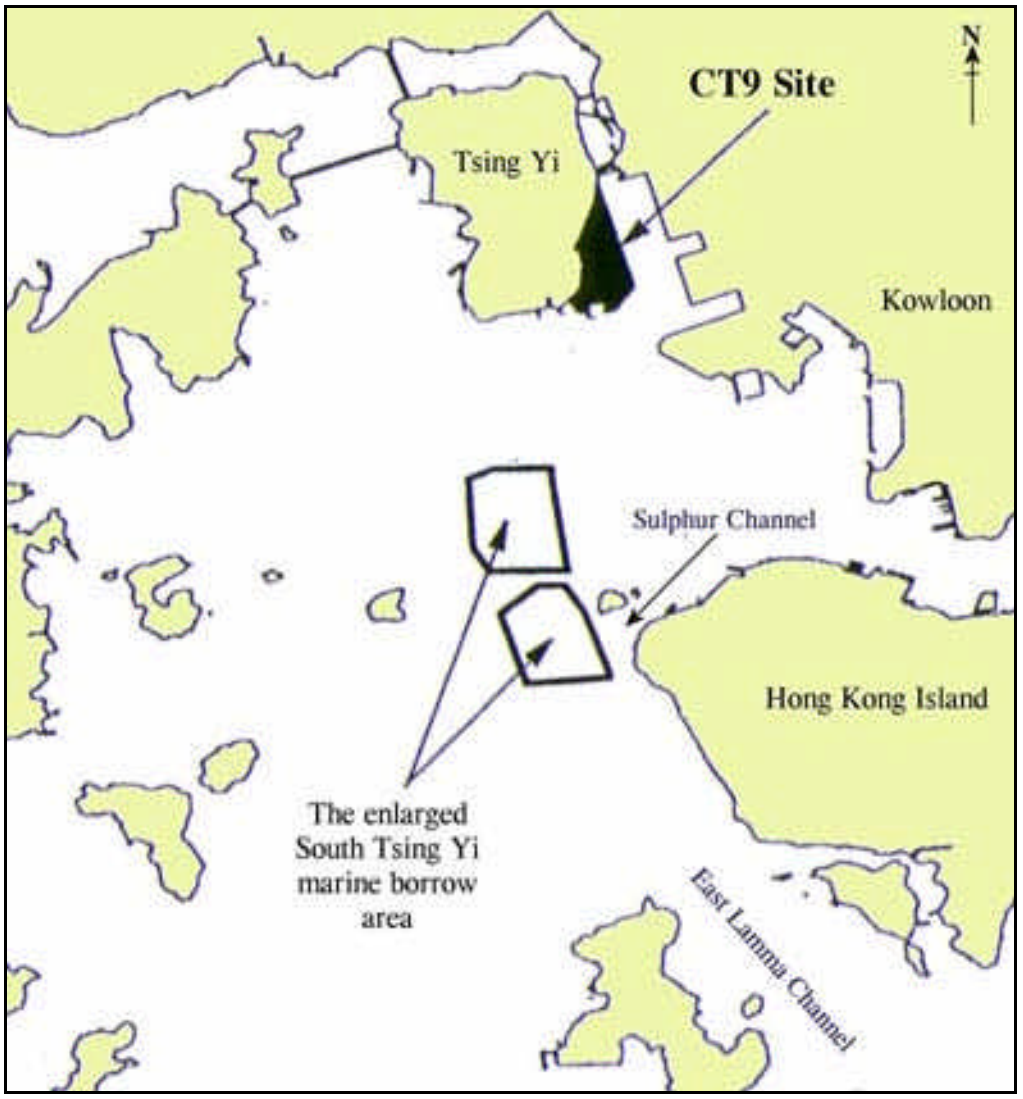
Government's entrustment works in CT9 project

2.32 In January 1992, the then Governor-in-Council agreed in principle to the development of CT9 in south-east Tsing Yi (see Figure 2 below). Construction and operation of CT9 would be undertaken by the CT9 developer while the Government would provide the necessary back-up area and infrastructure.

2.33 In July 1992, the Finance Committee approved the upgrading of a project for the provision of back-up area and infrastructure for CT9 to Category A of the Public Works Programme at an estimated cost of $2,710 million at May 1992 prices. The scope of works to be provided by the Government included the reclamation of about 67 hectares of back-up area for container-related facilities and roads. The related works, including the detailed design and supervision of the works, would be entrusted to the CT9 developer. The Government would reimburse the CT9 developer the cost of the entrustment works.

Figure 2

Location of CT9 and the enlarged South Tsing Yi marine borrow area



Source: CED's records

Fill requirements for CT9 project

2.34 In June 1992, the Fill Management Committee (see para. 2.3 above) noted that the CT9 project would require 35 million cubic metres (or 63 million tonnes) of fill materials. In July 1993, the CT9 project increased its fill requirements from 63 million tonnes to 68 million tonnes. The Fill Management Committee initially agreed to allocate both the East Lamma Channel and the South Tsing Yi marine borrow areas to the CT9 project to meet its fill requirements. In 1995, after obtaining the agreement of the CT9 developer, the Fill Management Committee finally allocated the enlarged South Tsing Yi marine borrow area (i.e. incorporating the marine borrow area west of the Sulphur Channel) for the use of the CT9 project. In the Land Grant of CT9 executed in December 1998, there was a provision that the CT9 developer might extract fill materials from the South Tsing Yi marine borrow area for its reclamation works.

Proposed use of public fill in Government's entrustment works of CT9 project

2.35 In September 1999, the Waste Reduction Task Force for the Construction Industry (Note 10) considered that the CT9 project might have potential for using public fill. In January 2000, at a working group meeting of the Waste Reduction Task Force for the Construction Industry, the Chairman informed the members that he had written to all tenderers of the CT9 construction contract, with copies to the CT9 developer and its consultant, advising them of the possibilities of using public fill. In May 2000, the Chairman informed members of the Task Force that the duration of the CT9 construction contract would be four and a half years. However, as the programme of works in the first two years was very tight, it would not allow the use of public fill. There might be an opportunity to use public fill after the first two years.

2.36 In November 2000, the CED held a meeting with representatives of the CT9 developer to explore the possibility of using public fill in part of the CT9 project. The representatives of the CT9 developer indicated that the use of public fill in the back-up area, entrusted by the Government to the CT9 developer, could be considered if:

(a) the contractual position of the CT9 developer and the progress of the project were not adversely affected; and

(b) the condition of the back-up area to be formed by public fill was acceptable to the Government from the engineering point of view.

Note 10: *The Waste Reduction Task Force for the Construction Industry was formed in pursuance of the recommendations of the 1998 Waste Reduction Framework Plan. Its terms of reference include the provision of a forum for discussion within the construction industry on C&D waste reduction. The Task Force is chaired by a representative of the construction industry. Its membership includes representatives of relevant trades, the Works Bureau, the EFB, the CED and the EPD.*

2.37 After studying the Land Grant of CT9, the CED considered that it was technically feasible to use public fill in part of the back-up area. The CED estimated that the maximum amount of public fill that could be used in the CT9 project would be about 1.8 million tonnes. In March 2001, the CED convened a meeting with the TDD, the Lands Department (Lands D) and the other departments concerned, to explore the way forward. The meeting concluded that it would be complicated to formally ask the CT9 developer to use public fill in the back-up area, as it would affect the Land Grant. The CED then approached the CT9 contractor to check if he would be interested in using public fill in the back-up area. However, the CT9 contractor replied that public fill would not be acceptable unless the specification of the project was revised.

No provision in the Land Grant of CT9 to require the use of public fill

2.38 In May 2001, the Lands D obtained legal advice that there was no provision in the Land Grant of CT9 which empowered the Government to require the CT9 developer to use any particular kind of fill. The Land Grant only required the developer to submit its dredging and reclamation schemes, including the source of fill materials, for the Government's approval. According to the approval given by the TDD in February 2000, under the delegated authority of the Lands D, marine sand from the South Tsing Yi marine borrow area would be used to reclaim the back-up area. The legal opinion was that the developer's agreement was required if the Government required the developer to use any particular source of fill materials in reclaiming the back-up area.

Audit observations on problems of using public fill in entrustment works of CT9 project

2.39 In the Land Grant of CT9 executed in December 1998, the Government entrusted to the CT9 developer reclamation works for the provision of roads and supporting infrastructure of the back-up area. The cost of the entrustment works was funded under the Public Works Programme. In 2001, the CED considered that it was technically feasible to use up to 1.8 million tonnes of public fill in the reclamation of the back-up area. However, there was no provision in the Land Grant of CT9 that empowered the Government to require the CT9 developer to use any particular kind of fill materials in reclaiming the back-up area.

2.40 **In Audit's view, the lesson to be learnt from the CT9 project is that if reclamation works are to be entrusted to a developer, the requirement of using public fill should be included in the legal documents for the entrustment works. If the Land Grant of CT9 had specified that the developer should use public fill in the Government's entrustment works, 1.8 million tonnes of C&D materials would have been used in the CT9 project. The quantity of C&D materials to be stockpiled in the fill banks (see para. 2.8 above) would have been correspondingly reduced by 1.8 million tonnes. There could be a saving in the cost of stockpiling public fill of $50 million (i.e. $28 per tonne ´ 1.8 million tonnes – see Note 5 to para. 2.8 above).**

Audit recommendations on using public fill in entrustment works

2.41 **Audit has *recommended* that:**

(a) **the Director of Civil Engineering should critically examine all existing government reclamation works entrusted to third parties to ascertain whether there are opportunities for using public fill in these works projects and, if so, take necessary follow-up action; and**

(b) **the Secretary for Works should require all works departments to work closely with the CED to make full use of public fill in future entrustment works under their control, and ensure that the legal documents for the entrustment works contain enabling clauses to meet this objective.**

Response from the Administration

2.42 The **Secretary for Works** and the **Director of Civil Engineering** in general welcome the audit recommendations mentioned in paragraphs 2.28, 2.31 and 2.41 above. The **Director of Civil Engineering** has said that:

(a) the CED is considering an alternative design to increase the use of public fill in Penny's Bay Reclamation Stage 2 with a view to recovering the loss of the 3.6 million tonnes public filling capacity in PBR1 Contract;

(b) the CED had carefully assessed the use of Tuen Mun Area 38 as a fall-back option for supplying sorted public fill to the PBR1 Contractor mentioned in paragraph 2.26 above (Note 11). However, the CED considered that this option was not feasible because the reclamation in Tuen Mun Area 38 would be in progress and no land would be available for setting up the required sorting facility; and

(c) if conditions were imposed in the Land Grant of CT9 for the use of public fill, the cost of entrustment works borne by the Government might be increased.

Note 11: *In February 2002, the CED confirmed to Audit that this assessment had not been recorded.*

PART 3: IMPLEMENTATION OF THE LANDFILL CHARGING SCHEME

3.1 The purpose of introducing the landfill charging scheme is to provide an economic incentive for the waste producers to minimise C&D waste, or to carry out sorting of C&D waste to enable the inert C&D materials to be reused. Introduction of the charge is important to discourage indiscriminate use of the landfills, thereby extending their lifespan. This PART examines the progress of implementing the landfill charging scheme. The audit has revealed that there is a need to decide urgently the way forward on the implementation of the landfill charging scheme.

Background

3.2 The legislation of the original landfill charging scheme was made by the then Governor-in-Council on 9 May 1995 in the form of a regulation under Section 33 of the Waste Disposal Ordinance (Cap. 354). The scheme was devised to be simple to administer using pre-paid tickets. The fees were calculated on a per-tonne charging basis. However, the private-sector waste collectors (Note 12) objected strongly when the Government announced the intended implementation of the scheme. Subsequently, on 21 June 1995, LegCo passed a resolution (Legal Notice 265 of 1995) to amend the Waste Disposal (Charges for Waste Disposal) Regulation to allow the private-sector waste collectors to pay the landfill charges on either a per-tonne or a per-vehicle-load basis. Despite the amendment, in June 1995, the private-sector waste collectors blockaded the landfill sites in protest. After several meetings with them, the Government agreed that the implementation of the charging scheme would be deferred until there was agreement on the arrangements for charging. The landfill charging scheme has so far not been implemented.

3.3 The main points of objection to the original landfill charging scheme by the private-sector waste collectors are summarised below:

(a) they were not the waste producers and hence should not have to pay the landfill charges;

(b) they would be required by their clients (the waste producers) to pay the landfill charges in advance. This would make them face serious cashflow problems; and

(c) they would bear the risk of bad debts if their clients refused to reimburse them the landfill charges afterwards. They demanded that the Government should protect them from bad debts.

Note 12: *The private-sector waste collectors collect waste primarily from construction, industrial and commercial activities.*

3.4 ***PAC's recommendations.*** In Report No. 28 of the Director of Audit of February 1997, Audit invited attention to the need to implement the landfill charging scheme to provide an economic incentive for the waste producers to sort the inert C&D materials for reuse or to minimise C&D waste. In its Report No. 28 of June 1997, the PAC recommended that the Administration should seek to finalise an early agreement with the trade associations on the proposed charging arrangements, taking into account the trade's practice and concerns so that the landfill charging scheme could be implemented as soon as possible.

3.5 ***Administration's response.*** In the situation report on the landfill charging scheme of April 1997, the Administration informed the PAC that it had, after taking into account the trade associations' views, devised a charging proposal to address their concerns. The proposal consisted of three charging options, namely:

(a) a pre-paid ticket system for ad hoc landfill users;

(b) a chit-based account billing system for C&D waste. A draft WBTC was being prepared for the inclusion of a contract condition in government works contracts which would require all government works contractors to join the chit-based system. This arrangement would allow the Government to levy the landfill charges directly on the waste producers and would address part of the private-sector waste collectors' concerns; and

(c) a vehicle-registration-mark (VRM) based account billing system for commercial/industrial waste.

In addition, to reduce the cashflow problems of small private-sector waste collectors, the Government would consider further relaxing the requirement for a security deposit and allowing a longer payment period.

The 1998 revised landfill charging scheme

3.6 In late 1997 and early 1998, the Government put forward, for consultation, a revised landfill charging scheme with the following main features:

(a) ***Payment options.*** A pre-paid ticket system was designed for those occasional landfill users who might pay on either a per-tonne basis or a per-vehicle-load basis. In addition, there would be two account billing systems to suit the needs of different trades:

(i) ***Chit-based system.*** This chit-based system was designed to suit the need of construction contractors or other large waste producers who sub-contracted the removal of waste to waste contractors. An account would be opened for each waste producing site and the landfill charges would only be paid on a per-vehicle-load basis; and

(ii) ***VRM-based system.*** This VRM-based system was intended to suit the private-sector waste collectors who would be account holders. The VRM of their vehicles would be used as identification for the account. The landfill charges might be paid on either a per-tonne basis or per-vehicle-load basis;

(b) ***Extended credit period.*** Under the account billing systems, landfill users would be granted an extended credit period of 30 days. Since the invoice would be issued on a monthly basis, account users would in effect have a total credit period of two months; and

(c) ***Security deposit.*** Security deposit would normally not be required under the VRM-based system. The intention was to reduce the cashflow problems of the intended users of this system who were mainly small businesses.

3.7 The Advisory Council on the Environment, the then Provisional Municipal Councils and the Provisional LegCo Panel on Environmental Affairs in general supported the revised charging scheme. However, the private-sector waste collectors maintained that the Government had not met their demands fully on the detailed charging arrangements.

Requiring government contractors to use the chit-based payment method

3.8 The chit-based system, which allows the Government to levy the landfill charges directly on the waste producers, is a major step forward to address the private-sector waste collectors' concerns. In this connection, the EPD urged the Works Bureau to issue a WBTC to require all government works contractors to use the chit-based system as had been stated by the Administration in its response of April 1997 to the PAC (see para. 3.5(b) above). However, in January and again in December 1998, the Works Bureau informed the EPD that, after discussions by the Conditions of Contract Committee (Note 13), it was concluded that it would not be appropriate to require

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Note 13: *The role of the Conditions of Contract Committee is to advise the Secretary for Works and/or the Works Group Directors' Meeting on such amendments to and revision of the Conditions of Contract of the Government used by the works departments as may be found to be necessary. The Committee is chaired by a Principal Assistant Secretary of the Works Bureau and its members include representatives from the works departments.*

government contractors to use the chit-based system as a mandatory condition of government works contract. The reasons were as follows:

(a) the landfill charging had nothing to do with the contract;

(b) in public works projects, the General Conditions of Contract already obliged contractors to comply with the provision of all relevant enactment, regulations and by-laws. The contractors would have to pay the Government for the disposal of C&D waste generated in construction sites when the landfill charging scheme was introduced;

(c) since the proposed landfill charging scheme provided for a number of payment options, the contractors should be allowed the choice of the payment method. If the private-sector waste collectors were not paid for their work, market forces would soon bring the errant contractors into line; and

(d) if a mandatory specification clause in respect of the landfill charging scheme were to be introduced, the same would have to be introduced to cover the provisions of other Ordinances which required the payment of fees and charges by contractors.

Notwithstanding the above, the Works Bureau agreed to write to all approved contractors to inform them of the proposed charges when the implementation date of the landfill charging scheme was determined.

3.9 In mid-1999, the then Secretary for Planning, Environment and Lands requested the EPD to re-examine the feasibility of charging the waste producers direct. In early 2000, the EPD informed the EFB that:

(a) in places including Canada, Shenzhen of Mainland China, Singapore, Taiwan, the United Kingdom and the United States of America, the waste collectors were responsible for paying charges for using landfills and waste facilities;

(b) there were practicable difficulties in charging the waste producers directly because there were too many waste producers, many of whom were difficult to locate. For example, at any given time, there were thousands of renovation and improvement works being carried out in private premises; and

(c) having considered various alternative options, the 1998 revised charging scheme (see para. 3.6 above) remained the most viable option. To reduce the resistance in implementing the scheme, consideration could be given to measures which would minimise the risk to be borne by the private-sector waste collectors, such as identification of the major waste producers and requiring them to pay the landfill charges by the account billing system.

Thereafter, the EPD maintained close liaison with the private-sector waste collectors to develop a revised charging scheme based mainly on the waste-producer-pay approach.

The 2000 revised landfill charging scheme

3.10 From mid-2000 to late 2001, the EPD held several rounds of consultations with the relevant trades on a revised charging scheme with emphasis on the direct charging of the major waste producers. The main features of this revised charging scheme were as follows:

(a) large C&D waste producers, such as the contractors in the approved lists of the Works Bureau, the Buildings Department and quasi-government bodies such as the Housing Authority, would be required to pay landfill charges directly through the chit-based system;

(b) a waste credit system was specifically designed for commercial and industrial waste (Note 14); and

(c) for the small and ad hoc waste producers, the private-sector waste collectors would have to collect the landfill charges directly from them. However, the private-sector waste collectors might use the VRM-based system (see para. 3.6(a) above) to settle the landfill charges.

The EPD estimated that under the revised charging scheme, about 80% of the landfill charges would be paid directly by the major waste producers, and only the remaining 20% would have to be paid in advance by the private-sector waste collectors for the small waste producers. If the landfill charge rate was to be based on full-cost recovery, the EPD estimated that the unit rate at 2000-01 price level would be $125 per tonne (see Note 15 to para. 3.15 below).

Note 14: *Under the waste credit system, property management companies and other large waste producers such as factories and restaurants would purchase monthly "waste credit" from their accounts with the EPD. These account holders would then transfer the purchased credits to their designated waste haulers for waste disposal at the landfills. Invoices would be sent on a monthly basis to the account holders (the waste producers) for the amount of waste credits they had purchased.*

3.11 Nevertheless, the private-sector waste collectors continued to raise strong objections. Their main concerns are summarised below:

(a) they would still have to pay the landfill charges in advance for some of the waste producers. There would be great difficulties for them to collect the charges, causing them serious cashflow and bad debt problems. They wanted the Government to charge all the waste producers direct and, if this was not possible, to provide them guarantee against bad debts;

(b) large transportation companies would take the opportunity to drive the small ones out of business; and

(c) under the existing poor economic condition, the proposed charge of $125 per tonne was too high.

3.12 In addition, the construction industry association, which had all along supported the landfill charging scheme, raised concern over the works contracts they had entered into before the implementation of the landfill charging scheme because there would not be any provision in such contracts to recover the landfill charges from their clients.

Latest developments

3.13 The Government is considering suitable arrangements to address the concerns of all stakeholders. The Government has been planning to present the recommendations for landfill charging to LegCo and the public for further consultation, setting out the concerns of the private-sector waste collectors. This is to ensure that all issues and concerns would be fully considered before making the final arrangements.

Audit observations on implementation of the landfill charging scheme

3.14 Since 1995, the Government has been trying to implement the landfill charging scheme. However, objections continue to be raised by the trades. Furthermore, introducing new charges under the current economic climate is also considered a sensitive issue.

3.15 Audit appreciates that there is a need to conduct further consultations. **However, during the long time taken to implement the charging scheme, the scarce landfill space is being depleted. According to the projection in the 1998 Waste Reduction Framework Plan, the landfills would be depleted by 2015. Moreover, without a landfill charging scheme which**

would discourage waste producers to dispose of C&D waste at landfills, it is difficult to effectively implement other C&D material management measures (see para. 4.12(b) below). Therefore, the Administration should take positive action and decide the way forward as quickly as possible. It is important to provide all relevant costing information (such as the hidden subsidy to the waste producers for each tonne of C&D materials disposed of at the landfills – Note 15) to facilitate the concerned parties' deliberations of the landfill charging issues.

Audit recommendations on implementation of the landfill charging scheme

3.16 **Audit has *recommended* that the Secretary for the Environment and Food should, in conjunction with the Director of Environmental Protection:**

(a) **conduct further consultation with all stakeholders to reach a consensus for finalising the landfill charging arrangement as soon as possible; and**

(b) **in the consultation exercise, provide all relevant costing information to the parties concerned so as to facilitate their consideration of the way forward.**

Response from the Administration

3.17 The **Secretary for the Environment and Food** welcomes the audit recommendations.

3.18 The **Director of Environmental Protection** considers that the audit recommendations in paragraph 3.16 above are reasonable and re-affirm the importance of urgent implementation of the landfill charging scheme. He has said that landfill charging is an essential component of the waste management strategy as it provides an economic incentive for waste producers to reduce waste and to carry out sorting to facilitate reuse/recycling. Landfill charging also helps promote the growth and development of the recycling trade. This in turn will help extend the life of the existing landfills and reduce the cost of waste disposal.

Note 15: *At present, the landfill cost is met out of public revenue. In December 2000, the Government estimated that the full economic cost of landfill was $215 per tonne (i.e. $125 being the capital and recurrent cost of landfill, and $90 being the opportunity cost of the land set aside for landfill purposes).*

PART 4: IMPLEMENTATION OF MEASURES FOR RECYCLING C&D MATERIALS

4.1 Using public fill to build reclamation areas is a beneficial way of reusing C&D materials, provided that there is no shortage of such reclamation areas. It is not always possible to exactly match the supply and demand of suitable public fill. As mentioned in paragraph 2.7 above, there is an expected shortage of public filling capacity from mid-2002 onwards. In addition to identifying more works projects that will use public fill, there is a need to explore alternative uses of C&D materials. This PART examines the measures taken by the Government to promote the recycling and reuse of C&D materials. The audit has revealed that there is a need to promote the wider use of recycled C&D materials in government projects.

Alternative use of C&D materials

CED's consultancy study

4.2 In 1996, the CED commissioned a consultancy study to review the public filling strategy and programme. As part of the review, the consultant was also tasked to examine possible alternative uses of recycled C&D materials in Hong Kong. In early 1998, the consultant reported his findings, as follows:

(a) aggregates produced from recycled C&D materials had been used in other parts of the world. There was no technical reason why they should not be used in Hong Kong;

(b) the cost of natural aggregates was relatively cheaper than recycled aggregates produced from C&D materials. However, the saving in landfill cost should be taken into account when comparing the cost of natural and recycled aggregates;

(c) current regulations in Hong Kong were not conducive to the widespread use of recycled aggregates; and

(d) steps should be taken to ensure that the use of recycled aggregates would not be prevented by unnecessarily high specification requirements and building control regulations. Government departments should take the lead in this regard.

1998 Waste Reduction Framework Plan

4.3 It was stated in the 1998 Waste Reduction Framework Plan that one of the measures to stop the improper disposal of C&D materials at landfills was to recycle as much C&D materials as

possible for reuse in less demanding construction works. An example of such recycled C&D materials is aggregates.

CED's study on recycling of inert C&D materials

4.4 In 1999-2000, the CED considered opportunities for recycling inert C&D materials. The CED found that:

(a) about 25% by weight of C&D materials were inert, hard materials (e.g. rocks, concrete, mortar and bricks). They could be recycled for use as general bulk fill, drainage fill, sub-base for road works and as aggregates in the production of low grade concrete;

(b) if all the hard materials were recycled, about 2.3 million tonnes of recycled aggregates could be produced each year. Based on the past consumption of rock products, the construction industry could use up all the recycled aggregates if they were suitable for making concrete;

(c) the CED estimated that the cost of setting up and operating a recycling plant was high, thus making the production of recycled aggregates not profitable. The Government had to provide the recycling infrastructure to supply recycled aggregates; and

(d) the General Specification for Civil Engineering Works (Hong Kong Government, 1992 edition) generally prohibited the use of recycled inert C&D materials except their use as fill materials. A review of the General Specification used in building and civil engineering works was underway to enable the use of suitable recycled materials in government projects.

Latest developments

Government allows the use of recycled C&D materials

4.5 In January 2001, the Works Bureau issued WBTC No. 31/2000 which promulgated a corrigendum to the General Specification for Civil Engineering Works (Hong Kong Government, 1992 edition). By this amendment to the General Specification, the Government allows the use of recycled C&D materials:

(a) as aggregates for granular bed and granular fill in drainage works;

(b) for grade 20 (i.e. low-strength) concrete for use in concrete bed and drainage works; and

(c) as fill materials for earthworks and marine works.

4.6 WBTC No. 31/2000 also stated that further amendments to the General Specification would be considered, subject to satisfactory completion of tests on the use of recycled C&D materials for road sub-base, asphalt pavement and higher strength concrete. In mid-2001, the Highways Department used recycled C&D materials, on a trial basis, as the road sub-base in the Tolo Harbour road widening project. An interim report on the trial results would be available in mid-2002. In November 2001, the Works Bureau issued WBTC No. 23/2001 which gave a particular specification allowing the use of 100% recycled coarse aggregates for grade 20 prescribed mix concrete, provided that the strength of the concrete was not a critical factor in the design of the construction works.

Setting up of temporary recycling plants

4.7 The CED has plans to set up two temporary recycling plants:

(a) ***Recycling plant at Tuen Mun Area 38 reclamation.*** The plant is planned to produce 354,000 tonnes a year of recycled aggregates for use in government projects. It is expected to commence operation in mid-2002 until the end of the Tuen Mun Area 38 reclamation contract in end-2004. The estimated cost of the recycling plant is about $55 million; and

(b) ***Recycling plant in Kai Tak.*** The CED has employed a consultant to assess the technical and financial viability of operating a recycling plant in Kai Tak on a commercial basis. The tentative commissioning date of this plant is early 2003.

Selection of projects to use recycled aggregates from Tuen Mun Area 38 recycling plant

4.8 In August 2001, the Works Bureau invited works departments to select projects which could use the recycled aggregates produced by the Tuen Mun Area 38 recycling plant when it commences operation after mid-2002. In response, five works departments identified 10 projects for which recycled aggregates could be used.

4.9 In response to further requests from the Works Bureau and the CED, more suitable projects were found and, as at December 2001, the number increased from 10 to 15. The

estimated total demand for recycled aggregates for government projects has increased to about 677,000 tonnes (i.e. on average 104,000 tonnes a year) for the period mid-2002 to 2008.

Audit observations on implementation of measures for recycling C&D materials

Government should do more to use up the recycled aggregates

4.10 Based on the CED's study, about 25% of C&D materials generated are hard materials with potential for recycling. The recycling and reuse of C&D materials reduces the pressure on public filling areas (see PART 2 above) and landfills. It also helps conserve natural resources by reducing the demand on natural aggregates.

4.11 The Government has taken positive steps to allow the use of recycled C&D materials in some of its engineering works. **From mid-2002, the temporary recycling plant in Tuen Mun Area 38 reclamation is expected to produce annually about 354,000 tonnes of recycled aggregates for use of government projects. However, despite repeated appeals from the Works Bureau and the CED, the estimated total demand (i.e. 104,000 tonnes a year) for recycled aggregates by the works departments will only consume about one third of the planned output of this recycling plant (see para. 4.7(a) above). There is an urgent need for the Works Bureau and the CED to step up their efforts to promote the wider use of recycled C&D materials in government projects so as to enable all the recycled aggregates produced to be put into beneficial use.** It is also important for the Government to set a good example for the construction industry to follow, particularly bearing in mind that the Government intends to set up another recycling plant in Kai Tak in early 2003.

Experience of the European Union

4.12 Audit's research found that in February 1999, the European Commission published a report on its study of the C&D materials management practices and their economic impact throughout the European Union. The study found that the average rate of recycling C&D materials among the 15 member states was 28%. The study concluded that no single policy intervention could bring about a complete change in the C&D materials recycling practice. The recycling of C&D materials could be expected to reach the level at which it would be economically viable, provided that the following four conditions are met:

(a) landfills should be well managed and illegal disposal of C&D materials should be controlled and subject to sanction;

(b) **there should be a significant cost for the disposal of C&D materials at landfills** (see Audit's observations and recommendations on the implementation of the landfill charging scheme in paras. 3.14 to 3.16 above);

(c) there should be an opportunity to crush and sort the bulky inert C&D materials prior to recycling and reuse; and

(d) stakeholders should at least tacitly accept that suitably prepared recycled aggregates might be used.

Audit considers that it is necessary for the CED to draw on the experiences of advanced countries in developing practical measures to implement recycling of C&D materials in a sustainable and economically viable manner.

Audit recommendations on implementation of measures for recycling C&D materials

4.13 **Audit has *recommended* that the Secretary for Works, in conjunction with the Director of Civil Engineering, should:**

(a) **step up efforts to promote the wider use of recycled C&D materials in government projects so as to set an example for the construction industry to follow; and**

(b) **draw on the experiences of advanced countries to develop practical measures to implement the recycling and reuse of C&D materials in a sustainable and economically viable manner.**

Response from the Administration

4.14 The **Secretary for Works** and the **Director of Civil Engineering** in general welcome the audit recommendations.

PART 5: PROVISION OF OFF-SITE FACILITIES FOR SORTING C&D MATERIALS

5.1 The sorting of mixed C&D materials enables the inert materials to be reused and reduces the amount of C&D waste to be dumped at landfills. Since April 1998, the Government has required that, in all public works contracts which comprise solely demolition works, the contractor should carry out on-site sorting of C&D materials before disposal (see item I(b) of Appendix A). The Government recognises that site constraint is a major problem for some contractors to carry out on-site sorting. This PART examines the Government's efforts made in providing off-site sorting facilities. The audit has revealed that there is room for improvement in planning for sorting facilities.

Recycling facility for C&D waste at SENT landfill

5.2 In 1993, the Government and the construction industry agreed that the setting up of sorting plants could help solve the C&D materials disposal problems by providing an alternative solution to on-site sorting of C&D materials. In 1994, with the policy support of the PELB, the EPD instructed the SENT landfill operator to construct and operate a recycling facility for C&D waste at the SENT landfill for a term of 3 years. The recycling facility, costing $32 million to design and construct, came into operation in 1995. The recycling facility sorts out reusable inert materials such as aggregates for road construction in the SENT landfill.

Development of new sorting facilities for C&D materials

CED's consultancy study

5.3 As mentioned in paragraph 4.2 above, in 1996, the CED commissioned a consultant to review the public filling strategy and programme. In his report submitted to the CED in early 1998, the consultant said that:

(a) the primary objective of the sorting facilities was to process mixed C&D materials not acceptable to either landfills (because of their high inert content) or public filling areas (because of their high non-inert content). **Mixed C&D materials containing not more than 30% by weight (or 20% by volume) of inert materials (known as Type I C&D waste)** were acceptable at all landfills. The strategic landfill contracts stated that unless required by the EPD, the landfill operator should **not** accept **mixed C&D materials containing more than 30% by weight (or 20% by volume) of inert materials (known as Type II C&D waste).** On the other hand, the dumping licence (see para. 2.2 above)

required that public fill should be free from non-inert materials such as household refuse, marine mud and plastic but small quantities of timber would be allowed. The dumping licence did not define the percentage of non-inert materials which could be allowed in public fill. In practice, the amount of non-inert materials allowed was generally limited to 5% to 10% by weight;

(b) the sorted inert materials were then only used for reclamation. If there was a need to promote the recycling of C&D materials for other uses, the establishment of sorting facilities could also sort out suitable materials for other recycling uses;

(c) at that time, the recycling facility at the SENT landfill was the only facility that accepted Type II C&D waste for sorting. The actual quantities of C&D materials requiring sorting were difficult to estimate prior to the introduction of the landfill charging scheme (see PART 3 above). It was prudent to consider continuing the recycling facility at the SENT landfill when its 3-year contract ended in 1998 rather than to immediately construct new sorting facilities (Note 16);

(d) setting up new sorting facilities in public filling areas to sort the C&D materials, which satisfied the dumping licence requirement (i.e. the removal of plastic and wood), would only have marginal environmental benefit and might not be justified; and

(e) setting up new sorting facilities at landfills would provide materials for use in the landfills and reduce the amount of materials that might otherwise be deposited in the landfills. The recommended locations of new sorting facilities were in or close to the strategic landfills in the New Territories and the quarry site in Kowloon.

5.4 Following discussions in January 1998, the then PELB, the Works Bureau, the EPD and the CED agreed that a new sorting facility should be set up in a public filling area. The purpose was to receive mixed C&D materials which were not acceptable at either the landfills or the public filling areas. In June 1998, in view of the decreasing demand, the CED suggested to the PELB to establish only one sorting facility as a pilot scheme. The PELB agreed, and a C&D materials sorting facility was set up in Tseung Kwan O Area 137 in August 2000 (see para. 5.7 below).

Note 16: *After the expiry of the contract in 1998, the operation of the recycling facility at the SENT landfill was extended twice (i.e. in March 1999 for 30 months and in September 2001 for 6 months). Because of the heavy wear and tear on the existing recycling facility, the EPD is now planning for a replacement facility.*

1998 Waste Reduction Framework Plan

5.5 As mentioned in paragraph 1.5 above, in November 1998, the Government set out in the Waste Reduction Framework Plan a target for further reducing 20% of the C&D materials delivered to landfills. One of the measures to achieve this target is to provide off-site sorting facilities to separate the mixed C&D materials. The inert materials recovered will be used as public fill. The decomposable non-inert waste will be sent to the landfills.

Tseung Kwan O Area 137 sorting facility

5.6 In May 1999, the TDD invited the Public Works Subcommittee to recommend to the Finance Committee to upgrade part of the project entitled "Tseung Kwan O port development at Area 137, Stage 2 reclamation" to Category A of the Public Works Programme at an estimated cost of $507 million in money-of-the-day price. The proposed works under the management of the CED included the establishment of a C&D materials sorting facility in the Tseung Kwan O Area 137 reclamation. The Public Works Subcommittee was informed that, as the bulk of the waste collected at C&D sites was mostly inert materials and could be used as public fill, it was more economical to locate the sorting plant near reclamation sites rather than near landfills. The Government would consider setting up similar temporary sorting facilities in public filling areas which would operate for a reasonably long period. With the provision of the proposed sorting facilities, C&D materials delivered to public filling areas for reclamation would increase to about 84% within the next few years. In June 1999, the Finance Committee gave funding approval for the Tseung Kwan O port development at Area 137, Stage 2 reclamation project.

5.7 In May 2000, the CED informed the EFB that the Tseung Kwan O Area 137 sorting facility was expected to be operated for 30 months (i.e. from mid-2000 to early 2003). The expected throughput was 1,500 tonnes per day (tpd). In August 2000, the Tseung Kwan O Area 137 sorting facility (see photograph 1 below), constructed at a capital cost of $5.4 million (Note 17), commenced operation.

Note 17: *According to the Public Works Subcommittee paper for the upgrading of the Tseung Kwan O Area 137 reclamation project to Category A of the Public Works Programme, the cost estimate for the sorting facility for C&D materials was $25 million. However, as noted by the CED in its tender assessment, the contractor was able to offer a very competitive price because he had made use of the plants and equipment left over from previous projects which were still in working conditions for the sorting facility.*

Photograph 1

Tseung Kwan O Area 137 sorting facility

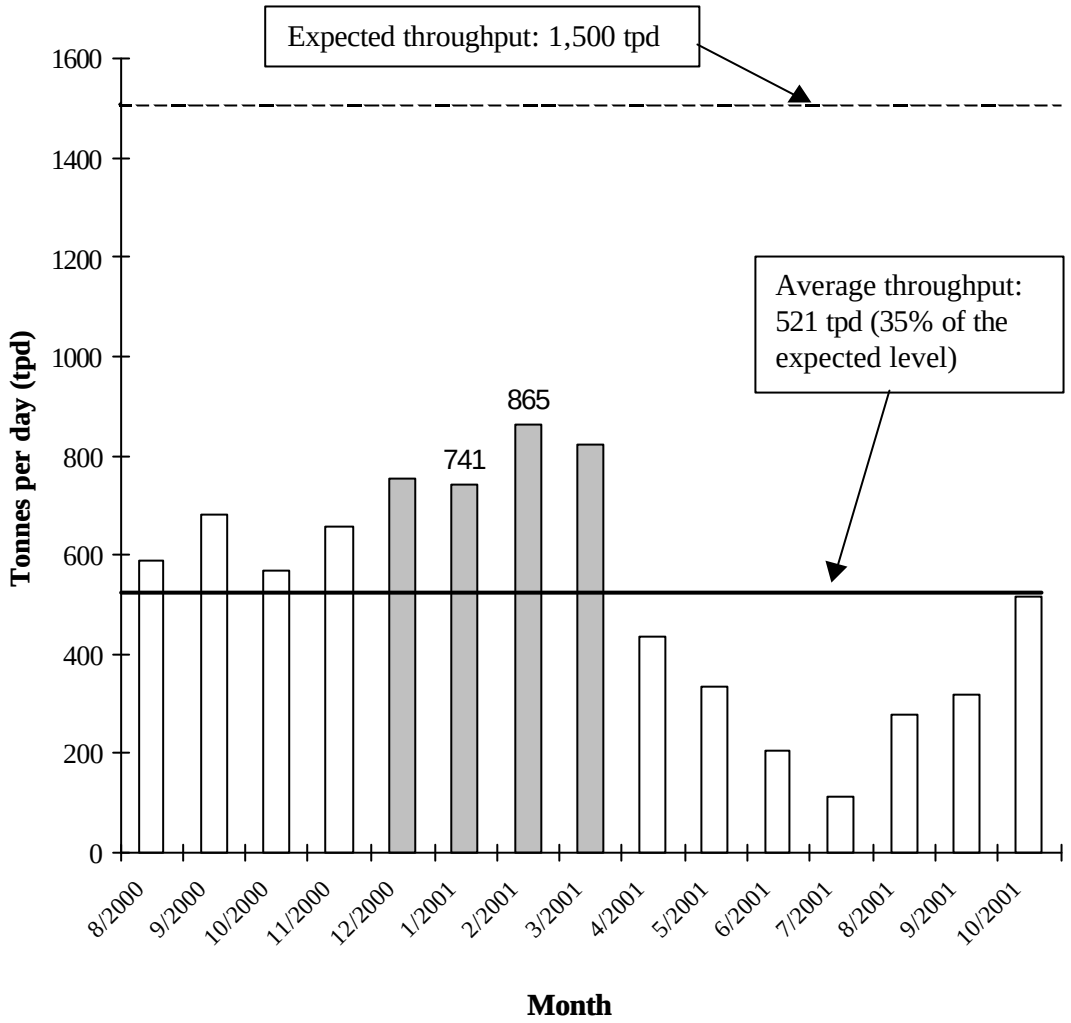
Source: CED's records

Low throughput of the Tseung Kwan O Area 137 sorting facility

5.8 During the first 4 months of operation from August to November 2000, the Tseung Kwan O Area 137 sorting facility only sorted the C&D materials received by the Tseung Kwan O Area 137 public filling area. The sorting process also produced public fill of suitable quality for use in the reclamation alongside Jordan Road in Kowloon. In December 2000, the CED and the EPD agreed that the Tseung Kwan O Area 137 sorting facility should also handle Type II C&D waste with high inert content diverted from the SENT landfill. The reason was to reduce the mixed C&D materials disposed of at landfills in line with the objective of the Waste Reduction Framework Plan (see para. 5.5 above). However, as shown in Figure 3 below, since its commissioning, the actual throughput of the Tseung Kwan O Area 137 sorting facility was only about 35% of its expected level of 1,500 tpd.

Figure 3

Actual throughput of the Tseung Kwan O Area 137 sorting facility for the period August 2000 to October 2001



Source: *CED's records*

Note 1: *Sorting of Type II C&D waste diverted from the SENT landfill commenced on 27 December 2000.*

Note 2: *The higher throughput ranging from 741 tpd to 865 tpd was observed for the period from December 2000 to March 2001 when the CED had provided additional plant resources. The provision of the additional plant resources was made under a provisional item of the TKO Contract and was limited to 10 weeks only. The throughput of the facility, for the other months operating at the contractual level, only averaged 415 tpd.*

C&D waste delivered to SENT landfill

5.9 As mentioned in paragraph 5.3(c) above, before the operation of the Tseung Kwan O Area 137 sorting facility, the recycling facility at the SENT landfill was the only facility to process C&D waste delivered to the SENT landfill. Therefore, the recycling facility only processed Type II C&D waste because more inert materials could be recovered for reuse. However, the Type II C&D waste processed by the recycling facility decreased from about 1,200 tpd in 2000 to about 800 tpd in 2001 (January to August) because:

(a) as can be seen from Table 1 below, the Type II C&D waste delivered to the SENT landfill had decreased after 1996; and

(b) some of the Type II C&D waste had been diverted to the Tseung Kwan O Area 137 sorting facility since December 2000 (see para. 5.8 above).

To increase the throughput of the recycling facility, since September 2001, the EPD has arranged for it to process Type I C&D waste in addition to Type II C&D waste.

Table 1

C&D waste delivered to SENT landfill from 1996 to 2001

Year	Type II C&D waste (tpd)	Type I C&D waste (tpd)
1996	1,738	3,421
1997	981	4,493
1998	1,056	4,343
1999	1,399	4,373
2000	1,164	4,384
2001 (January to October)	660	4,051

Source: EPD's records

Audit observations on low throughput of the Tseung Kwan O Area 137 sorting facility

5.10 According to the 1998 Waste Reduction Framework Plan, the objective of setting up off-site sorting facilities was to recover inert materials for reuse so as not to deplete landfill space. **However, the actual throughput of the sorting facility at Tseung Kwan O Area 137 public filling area only averaged 35% of the expected level since its commissioning in August 2000 (see para. 5.8 above). Therefore, this sorting facility had only made a limited contribution to the objective of saving landfill space.** Furthermore, the sorting operation was incorporated into the same TKO Contract as a public filling operation. Due to the early cessation of the public filling operation in early 2002, the CED considered that there would be contractual complications and financial implications in continuing the operation of the sorting facility up to the end of its expected life in early 2003. In other words, the useful life of the sorting facility may have to be shortened by almost one year.

5.11 Audit understands that this is the first time the CED has operated a sorting facility in a public filling area. However, there are lessons that could be learnt for improving the planning of similar facilities in future, as summarised below:

(a) the CED had underestimated the plant resources required for achieving the expected throughput level. This is evidenced by the higher throughput ranging from 741 tpd to 865 tpd for the period December 2000 to March 2001 (see Figure 3 in para. 5.8 above) when the CED had provided additional plant resources. The throughput of the sorting facility, for other months operating at the contractual level, only averaged 415 tpd;

(b) the sorting operation was incorporated into the same TKO Contract as a public filling operation. However, there was no provision in the TKO Contract to enable the sorting facility to operate alone in the event of early cessation of the public filling operation; and

(c) in mid-1998, the CED worked out that the handling capacity of a sorting facility operating in Tseung Kwan O should be about 1,700 tpd. In the TKO Contract awarded in October 1999, the CED specified that the expected throughput of the sorting facility was 1,500 tpd. However, if a cross-check with the then available waste statistics (see Table 1 above) had been carried out, it would have become apparent that Type II C&D waste had decreased after 1996. Bearing in mind that the recycling facility at the SENT landfill was already handling Type II C&D waste, the specified throughput of 1,500 tpd for the sorting facility of the TKO Contract was on the high side.

Audit recommendations on throughput of sorting facilities

5.12 **To improve the planning of similar facilities in future, Audit has *recommended* that the Director of Civil Engineering should draw on the experience of the Tseung Kwan O Area 137 sorting facility. In particular, the Director of Civil Engineering should:**

(a) **realistically assess the resources required for operating a sorting facility up to its expected throughput;**

(b) **critically review the validity of the planned handling capacity for a sorting facility against the latest available waste statistics before tendering for the setting up of the facility;**

(c) **if a sorting facility is to be operated in a public filling area, incorporate flexible provisions into the contract so that the sorting facility can continue to operate in the event of an early cessation of the public filling operation; and**

(d) **for the Tseung Kwan O Area 137 sorting facility, ascertain promptly the contractual complications and financial implications of continuing its operation up to the end of its expected life (i.e. in early 2003) so as to help save more landfill space.**

Response from the Administration

5.13 The **Director of Civil Engineering** welcomes the audit recommendations. He has said that the CED is considering the contractual complications and financial implications of continuing the operation of the Tseung Kwan O Area 137 sorting facility up to the end of its expected life in early 2003.

PART 6: MEASURES TO CONTROL THE DISPOSAL OF C&D MATERIALS IN PUBLIC WORKS CONTRACTS

6.1 It is the Government's policy that inert C&D materials generated in public works contracts should be disposed of at designated public filling facilities, and the C&D waste at designated landfills. The purpose of the trip-ticket system implemented with effect from 1 July 1999 (as promulgated in WBTC No. 5/99 – see item II(a) of Appendix A) is to ensure the proper disposal of C&D materials generated in government works projects. This PART examines the Government's implementation of the measures to control the disposal of C&D materials. The audit has revealed that there is a need to tighten the control over the disposal of C&D materials at sites provided by the contractors.

Trip-ticket system

Requirements of WBTC No. 5/99

6.2 ***Use of designated disposal sites.*** WBTC No. 5/99 requires that, at the planning stage of a public works contract, the project officer should seek confirmation with the CED and the EPD about the availability of designated public filling facilities for the disposal of inert C&D materials, and landfills for the disposal of C&D waste. Unless agreed by the CED and the EPD, the project officer should specify in the tender documents the use of designated public filling facilities and landfills throughout the construction period.

6.3 ***Particular specification for trip-ticket system.*** WBTC No. 5/99 also requires that the project officer should include in the particular specification the following clauses when preparing the tender documents for government projects:

(a) for every vehicular trip transporting C&D materials off site, the contractor should prepare a disposal delivery form in duplicate for stamping by the site supervisory staff. The site supervisory staff should keep a copy of the disposal delivery form; and

(b) for every vehicular trip, the contractor should obtain a receipt from the operator of the public filling facility or the landfill. Thereafter, the contractor should submit the receipt to the Engineer's/Architect's Representative within 5 working days.

WBTC No. 5/99 also states that the Engineer/Architect should check the disposal delivery forms and the receipts submitted by the contractors to ensure that they have complied with the disposal requirements. For documents prepared by the consultants of a works department, the duties of the project officers should be performed by the consultants' staff.

6.4 ***Exemptions.*** According to WBTC No. 5/99, contractors may be exempted from using the trip-ticket system:

(a) if the CED or the EPD has confirmed in writing that no public filling facility and landfill is available for the contract;

(b) if not more than 100,000 cubic metres of public fill are to be disposed of off site (Note 18);

(c) if an officer at D2 level or above gives approval for exemption in one of the following circumstances:

(i) the officer is satisfied that a confirmed alternative arrangement will be incorporated into the contract for the proper disposal of C&D materials at an equivalent or higher standard site (e.g. it is confirmed that a government site will accept all the public fill with proper controls); and

(ii) the officer is satisfied that no appreciable amount of C&D waste will be generated. In general, the threshold for the whole contract for C&D waste is 50 cubic metres; and

(d) if there are circumstances other than those described in items (a) to (c) above under which there is a genuine need for a contract to be exempted. Under such circumstances, an application with full details and justification should be submitted to the Secretary for Works for consideration.

6.5 ***Disposal plan required for exempted contracts.*** For public works contracts **exempted** from using designated public filling facilities and landfills, WBTC No. 5/99 requires the project officers to include in the Particular Specification of the tender documents a requirement that the contractor should submit, at the construction stage, a disposal plan for the Engineer's/Architect's approval. The disposal plan should include the following:

(a) identification of the disposal site;

Note 18: *According to WBTC No. 5/99, some contracts rely on the C&D materials generated from other sites to meet their fill requirements. In order not to eliminate such practice, the required use of designated public filling facility is exempted in such cases.*

(b) a written confirmation from the owner/operator of the disposal site indicating his consent to receive the C&D materials;

(c) submission of records; and

(d) a system enabling the Engineer's/Architect's Representative to check compliance.

6.6 Audit test checked four public works contracts and found that there was a case of non-compliance with the requirements of WBTC No. 5/99 (see paras. 6.7 to 6.16 below).

Disposal of C&D materials from Yuen Long Contract

6.7 In October 1999, the TDD awarded a contract (hereinafter referred to as the Yuen Long Contract) for the construction of roads, drains and a constructed wetland in Tin Shui Wai. The contract works were designed and supervised by a consulting engineer appointed by the TDD in August 1997.

Provisions of the Yuen Long Contract

6.8 In accordance with WBTC No. 5/99, the Particular Specification of the Yuen Long Contract included a specific clause requiring the contractor to use the trip-ticket system (see para. 6.3 above). However, the following requirements of WBTC No. 5/99 were not incorporated in the Yuen Long Contract:

(a) there was no provision in the contract for the use of designated public filling facilities and landfills for the disposal of C&D materials (see para. 6.2 above); and

(b) there was also no specific clause requiring the contractor to submit, at the construction stage, a disposal plan for C&D materials (see para. 6.5 above).

Illegal filling of fishponds in Tin Shui Wai Wetland Conservation Area

6.9 In March 2001, the Planning Department received a complaint from the public that there was illegal filling of two fishponds in Tin Shui Wai inside the Wetland Conservation Area (Note 19). The Planning Department found that the filling activities were carried out in the Wetland Conservation Area without the permission of the Town Planning Board. This was in

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Note 19: *The Wetland Conservation Area is for conserving the ecological value of fishponds which form an integral part of the wetland ecosystem and function as a source of food for birds.*

contravention of the Town Planning Ordinance (Cap. 131). In April 2001, the Planning Department issued a Stop Notice requiring the pond owner to stop the unauthorised filling activities and to remove the earth already dumped into the ponds.

6.10 Meanwhile, the Planning Department requested the TDD to further look into the complaint. After investigation, the TDD found that the materials used for filling the fishponds came from the Yuen Long Contract. The consulting engineer immediately requested the contractor to cease transporting C&D materials to the ponds. Such transportation, which commenced in February 2001, ceased in March 2001. The quantity of inert C&D materials disposed of at the fishponds was about 60,000 cubic metres. The consulting engineer explained to the TDD that:

(a) the transportation of inert C&D materials to the fishponds was made on the basis of a written agreement between the earthworks subcontractor of the Yuen Long Contract and the pond owner. According to the General Specification of the contract, earthworks materials should be disposed of in tips provided by the contractor. As no designated disposal site was specified in the contract, the contractor might identify his own disposal site. In the event, the contractor identified the fishponds as the disposal site;

(b) **based on an updated estimate during the construction stage, there would be some 200,000 cubic metres of C&D materials to be disposed of.** However, no designated public filling facilities and landfills were specified in the contract because during the pre-contract stage, it was anticipated that the quantity of C&D materials was not significant (i.e. the estimated quantity was only 14,000 cubic metres). According to WBTC No. 5/99, a project which generated less than 100,000 cubic metres of C&D materials was exempted from the requirement of disposing the C&D materials at public filling facilities (see para. 6.4(b) above). Hence, the CED and the EPD were not consulted for the availability of public filling facilities and landfills; and

(c) while there was an omission to include a specific clause in the Contract requiring the contractor to submit a disposal plan for the C&D materials, the consulting engineer had followed the guidelines of WBTC No. 5/99 (see para. 6.5 above) during the disposal of the C&D materials off site. A written agreement with the pond owner had been made and records of disposal had been kept.

Follow-up actions

6.11 To prevent recurrence of the improper disposal of the C&D materials from the Yuen Long Contract, in April 2001, the TDD introduced the following measures:

(a) the contractor was required to submit details about any proposed disposal activities one month in advance. A written consent on the use of the disposal site from the site owner/operator had to be submitted two weeks in advance;

(b) the site supervisory staff were required to check the legality of the proposed disposal site, and if in doubt, consult the departments concerned; and

(c) the site supervisory staff were required to visit the disposal site from time to time to ensure that the materials were in fact disposed of at the designated location.

6.12 In May 2001, the TDD expressed the following concerns to the consulting engineer:

(a) as revealed from the incident of illegal pond filling, the consulting engineer had not fully complied with the requirements of WBTC No. 5/99 to incorporate a clause in the contract requiring the contractor to submit a disposal plan;

(b) as regards the consulting engineer's explanation that only 14,000 cubic metres of C&D materials were estimated to be disposed of and hence the requirement stipulated in WBTC No. 5/99 did not apply, the TDD had observed that the Bills of Quantities of the Contract indicated that 460,000 cubic metres of C&D materials would be disposed of at the contractor's own tips; and

(c) the illegal pond filling incident could have been prevented if the resident site engineer had been more vigilant.

Audit observations on non-compliance with the trip-ticket system

6.13 The purpose of WBTC No. 5/99 of 1999 is to ensure that inert C&D materials generated in public works contracts will be disposed of at designated public filling facilities and the C&D waste at designated landfills. However, in early 2001, it came to light that some 60,000 cubic metres of C&D materials of the Yuen Long Contract were used for illegal filling of fishponds in the Tin Shui Wai Wetland Conservation Area.

6.14 **WBTC No. 5/99 requires that project officers should specify in the contract documents:**

(a) the use of designated public filling facilities and landfills for the disposal of C&D materials; or

(b) a requirement for the contractor to submit a disposal plan for the exempted project (see paras. 6.2 and 6.5 above).

However, as mentioned in paragraph 6.8 above, the contract documents of the Yuen Long Contract did not contain either of these requirements. After investigation, both the TDD and the consulting engineer of the contract admitted that the requirement of WBTC No. 5/99 had not been fully complied with. In the light of this incident, there is a need for the TDD to tighten its procedures of checking contract documents to ensure compliance with WBTC requirements.

6.15 To prevent recurrence, the TDD required the site supervisory staff of the Yuen Long Contract to check the legality of the disposal sites identified by the contractor beforehand and to check the actual disposal process afterwards (see para. 6.11 above). In Audit's view, the TDD's additional measures can help strengthen the existing requirements of WBTC No. 5/99 for works projects using disposal sites provided by the contractors.

Audit recommendations on the trip-ticket system

6.16 **Audit has *recommended* that:**

(a) **the Director of Territory Development should ensure that all relevant WBTC requirements for the proper disposal of inert C&D materials and C&D waste, such as those stated in WBTC No. 5/99, are included in contract documents and are complied with by the contractors during the execution of works; and**

(b) **the Secretary for Works should consider ways to strengthen the control over the disposal of C&D materials at sites provided by the contractors, such as by incorporating in WBTC No. 5/99 additional requirements that site supervisory staff should check beforehand the suitability of the disposal sites and should monitor the actual disposal of the C&D materials throughout the contractual period.**

Response from the Administration

6.17 The **Director of Territory Development** has said that the TDD will ensure all relevant WBTC requirements are included in contract documents and are complied with by its contractors during the execution of the works as recommended in paragraph 6.16(a) above.

6.18 The **Secretary for Works** welcomes the audit recommendation mentioned in paragraph 6.16(b) above.

PART 7: INFORMATION SYSTEM FOR MANAGEMENT OF C&D MATERIALS

7.1 This PART examines the adequacy of the existing information system for the management of C&D materials. The audit has revealed that there is room for improving the accuracy of management information on the quantity of C&D materials disposed of in public filling areas.

Performance measures of managing C&D materials

7.2 As mentioned in paragraph 1.5 above, the 1998 Waste Reduction Framework Plan aimed to reuse 84% of C&D materials in public filling areas so as to reduce disposal at landfills. The extent of achievement of this performance measure has been regularly reported in the Policy Objective booklet of the Chief Executive's Policy Address and in the Controlling Officer's Report of the CED in the Annual Estimates since 1999. The EPD is responsible for the compilation of statistics on the quantities of C&D materials received at landfills. The CED is responsible for producing similar statistics on public filling facilities.

7.3 Under the landfill contracts, the EPD has to pay the landfill operators monthly operation fees based on the tonnage of each type of wastes they have handled. All landfills are equipped with weigh-bridges and computer systems to record the tonnage of each type of waste intake for payment purpose. Based on these waste intake records, the EPD can readily compile statistics on the tonnage of C&D materials received at landfills.

Estimation of C&D materials used as public fill

7.4 C&D materials used as public fill are received in either public filling areas or barging points (for onward transportation to public filling areas). Public filling areas are usually situated inside the fill areas of reclamation contracts. The unit of measurement for the payment of public fill in reclamation contracts is cubic metre (Note 20). As for barging points, payments to the contractors are made on the basis of the number of truckloads of public fill handled. Unlike landfills, public filling areas and barging points are not normally provided with weigh-bridges for measuring the tonnage of C&D materials received.

7.5 In order to correlate the quantities of C&D materials used as public fill with those disposed of at landfills on a common basis, the CED has to estimate the tonnage of C&D materials

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Note 20: *According to the CED, the advantage of using cubic metre is that the effect of settlement in reclamation is included in the final measurement of works which is based on the initial and final topographic survey of the site carried out at the commencement and upon completion of a reclamation contract. This method is simple and straightforward.*

received in public filling areas and barging points. The CED's estimation is based on the number of dumping trucks delivering C&D materials, and an assumed average load of 11.7 tonnes per truck, irrespective of the vehicle's size (Note 21). According to the CED, this assumed average load was based on some site surveys in the past, but the details of the surveys could not be ascertained.

Audit test check of the assumed average load per dumping truck

7.6 Audit has tested checked the accuracy of the estimation made on the basis of the assumed average load of 11.7 tonnes for each dumping truck against the operational data of two public filling projects which have measured the tonnage of the C&D materials handled. The results are given in paragraphs 7.7 to 7.9 below.

Tseung Kwan O Landfill Stage I Extension Contract

7.7 The Tseung Kwan O Landfill Stage I Extension Contract was managed by the CED. The contract period was from 1992 to 1996. The works under this contract included the reclamation of about 5.6 hectares of land and the landfilling of waste. The contract terms required the contractor to install weigh-bridges to measure the waste intake of the landfill operation. The same weigh-bridges were also used to measure the tonnage of C&D materials received for reclamation purposes. Based on the weigh-bridge data, the total tonnage of C&D materials received for the period March 1993 to April 1994 was 1,120,021 tonnes. The public fill intake records showed that the number of dumping trucks delivering C&D materials for this contract during the same period was 101,124 (see Appendix C for details). If the CED's assumed average load of 11.7 tonnes per truck had been used, the estimated tonnage of C&D materials received would have been 1,183,151 tonnes (i.e. 11.7 tonnes × 101,124). This estimated tonnage was higher than the measured tonnage by 63,130 tonnes (i.e. 1,183,151 tonnes – 1,120,021 tonnes). The discrepancy was 5.6% (i.e. 63,130 ÷ 1,120,021 × 100%).

TKO Contract

7.8 As mentioned in paragraph 5.6 above, the TKO Contract included the establishment of a temporary sorting facility for C&D materials. Weigh-bridges were installed to measure the tonnage of inert C&D materials sorted there. The sorting facility commenced operation in August 2000. Based on the weigh-bridge data for the period from August 2000 to October 2001, the total tonnage of inert C&D materials sorted was 178,196 tonnes. The number of dumping trucks used for delivering the inert C&D materials for the same period was 16,771 (see Appendix D for details). If the CED's assumed average load of 11.7 tonnes per truck had been used, the estimated tonnage

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Note 21: *The CED has used this assumed average load of 11.7 tonnes per truck since the early 1990s. The assumed average load is derived from an assumed average volume of 6.5 cubic metres per truck and a bulk density of 1.8 tonnes per cubic metre (i.e. 1.8 tonnes ´ 6.5 m^3 = 11.7 tonnes).*

of the inert C&D materials would have been 196,221 tonnes (i.e. 11.7 tonnes × 16,771). This estimated tonnage was higher than the measured tonnage by 18,025 tonnes (i.e. 196,221 tonnes – 178,196 tonnes). The discrepancy was 10.1% (i.e. 18,025 ÷ 178,196 × 100%).

7.9 Audit noted that the dumping trucks used for delivering the sorted C&D materials in the TKO Contract were all medium-sized. To confirm that the results of the audit analysis in paragraph 7.8 above, which were based on the weight of C&D materials delivered by medium-sized vehicles, would be representative of the position of other public filling facilities in the territory, Audit analysed the profile of the licensed dumping trucks, and the actual delivery of C&D materials by different classes of the trucks. As can be seen from Table 2 below, 88% of the licensed dumping trucks in 2001 were in fact medium-sized. Based on a sample check of the records of the public filling facilities, 97% of the dumping trucks which delivered C&D materials to these facilities were medium-sized vehicles (see Appendix E).

Table 2

Profile of licensed dumping trucks

Vehicle class	Number of licensed dumping trucks in 2001	Percentage
Heavy	106	4%
Medium	2,302	**88%**
Light	208	8%
Total	2,616	100%

Source: CED's dumping licence records and Transport Department's vehicle records

Note: The normal gross weight of a heavy dumping truck is 30 tonnes, a medium dumping truck 24 tonnes, and a light dumping truck less than 5.5 tonnes.

Audit observations on the need to review the assumed average load

7.10 The percentage of C&D materials diverted from landfills to public filling areas for reclamation is a key performance indicator of the CED's management of C&D materials (see para. 7.2 above). The CED needs to estimate accurately the tonnage of C&D materials received at public filling facilities for management purposes. **As public filling facilities are not normally**

provided with weigh-bridges, the CED has to estimate the tonnage of C&D materials received at these facilities based on the CED's assumed average load of 11.7 tonnes per dumping truck.

7.11 This assumed average load per dumping truck has been used by the CED for more than 10 years. Over this period, there could be changes in the circumstances under which this assumed average load was derived. In the two audit test checks mentioned in paragraphs 7.7 to 7.9 above, **Audit found that the estimates made on the basis of the CED's assumed average load were higher than the measured tonnage of C&D materials. The discrepancy ranged between 5.6% and 10.1%. In the light of Audit's findings, there is a need for the CED to review the assumed average load per dumping truck so as to arrive at a more accurate estimate of the tonnage of C&D materials received at public filling facilities for management reporting purposes.**

Audit recommendation on the need to review the assumed average load

7.12 **Audit has *recommended* that the Director of Civil Engineering should carry out a review to reassess the average load per dumping truck so as to enable the CED to estimate accurately the tonnage of C&D materials received at public filling facilities for management reporting purposes.**

C&D materials used as surcharge materials in public filling projects

7.13 In reclamation works, additional loading materials (which the industry calls "surcharge materials") may be used to accelerate the rate of consolidation of the marine deposit so that the settlement will have been substantially completed before the reclamation is used for development. Upon completion of consolidation, the surcharge materials may be used elsewhere in the reclamation. Otherwise, it will be disposed of off site.

7.14 For reclamation projects operating as public filling areas, the C&D materials received may also be used as surcharge materials. For the purpose of compiling annual statistics on the quantities of C&D materials used for reclamation, the CED includes all C&D materials received by the public filling areas in that year, irrespective of whether they are used as filling materials or as surcharge materials. Audit test checked four public filling projects which used C&D materials as surcharge materials and found that the control over the subsequent disposal of the surcharge materials in one of the projects warranted attention. The results are reported in paragraphs 7.15 to 7.20 below.

Tung Chung Development Phase 3A Reclamation

7.15 In March 1999, the TDD awarded a contract for Tung Chung Development Phase 3A Reclamation (hereinafter referred to as the Tung Chung Reclamation Contract) with the completion

date scheduled in end-2002. Under the terms of the contract, the Tung Chung Reclamation Contractor would receive C&D materials for use as filling materials and as surcharge materials for his reclamation works. The Contractor was required to dispose of the surcharge materials and the Government would bear the cost of disposal. By October 2001, when the Tung Chung Reclamation Contract ceased its public filling operation, about 1.8 million tonnes of C&D materials had been deposited on site as surcharge materials. The TDD's intention was that the surcharge materials would be disposed of in 2002.

Disposal arrangement for surcharge materials

7.16 In June 2001, the Tung Chung Reclamation Contractor sought advice from the Public Fill Committee Secretariat on the disposal arrangement for the surcharge materials because he could not identify a suitable private disposal site. In reply, the Public Fill Committee Secretariat advised him that he might consider delivering the surcharge materials by trucks to the public filling area at Tuen Mun Area 38. Thereafter, there were some further discussions among the TDD, the CED and the Tung Chung Reclamation Contractor about other disposal options. Up to the end of December 2001, the Contractor was still considering various disposal options.

Audit observations on disposal arrangement for surcharge materials and for stockpiled materials

7.17 As part of its public filling operation, the Tung Chung Reclamation Contract had received about 1.8 million tonnes of C&D materials for temporary use as surcharge materials on site. The terms of the contract required the Tung Chung Reclamation Contractor to dispose of the surcharge materials off site.

7.18 Bearing in mind that the surcharge materials had been included in the CED's prior year's statistics of C&D materials as if they had been used for reclamation, there should be adequate safeguard to ensure that they would be actually used for reclamation after removal from the Tung Chung site. **However, as the Tung Chung Reclamation Contract was awarded in March 1999 (i.e. before WBTC No. 5/99 took effect in July 1999 – see paras. 6.1 and 6.3 above), there was no contract provision requiring the Contractor to account for how he would dispose of the surcharge materials off the Tung Chung site. In Audit's view, there is an urgent need to work out a suitable control mechanism to monitor how the Contractor would dispose of the surcharge materials in 2002.** Furthermore, in the event the surcharge materials would be transferred to a public filling area (e.g. Tuen Mun Area 38), the department responsible for receiving them should ensure that such quantities would be excluded from the reported quantity of C&D materials used for future reclamation. This is to ensure that the surcharge materials, which have already been accounted for in a prior year's statistics of C&D materials used for reclamation, will not be double counted as such because they have been moved from one reclamation site to another.

7.19 As mentioned in paragraph 2.8 above, to tackle the impending problem of shortage of public filling areas until new reclamation projects are available, the Government has planned to establish temporary fill banks to stockpile about 14.8 million tonnes of C&D materials. In Audit's view, there should also be adequate control over the final disposal of the stockpiled C&D materials from these fill banks.

Audit recommendations on disposal arrangement for surcharge materials and for stockpiled materials

7.20 **Audit has *recommended* that:**

(a) **the Director of Civil Engineering should:**

(i) **ensure that there is no double counting of filling materials in the annual statistics of C&D materials used for reclamation when surcharge materials, which have been used in a public filling facility, are transferred to another public filling facility; and**

(ii) **implement suitable control measures to monitor the disposal of stockpiled C&D materials from the fill banks to ensure that the stockpiled C&D materials are actually disposed of at public filling facilities; and**

(b) **the Director of Territory Development should implement suitable control measures to monitor the disposal of the surcharge materials used in the Tung Chung Reclamation Contract to ensure that the surcharge materials are actually disposed of at public filling facilities.**

Response from the Administration

7.21 The **Director of Civil Engineering** welcomes the audit recommendations mentioned in paragraphs 7.12 and 7.20 above. He has said that the CED will reassess the average load used for estimating the tonnage of C&D materials received in public filling areas.

7.22 The **Director of Territory Development** has said that the TDD will devise measures similar to the trip-ticket system for monitoring the disposal of the surcharge materials used in the Tung Chung Reclamation Contract as recommended in paragraph 7.20 above.

Summary of the Government's initiatives in the management of C&D materials

I. Measures taken to address the PAC's concerns

PAC's concerns	Measures taken
(a) There should be better coordination among the works departments and with the Public Filling Subcommittee (see para. 2.3(a)) in order: (i) to ensure that programme changes would not significantly delay the provision of public filling facilities; and (ii) to identify more public filling outlets from the development programmes to meet both the current and future public filling needs;	In March 1998, the Works Bureau promulgated WBTC No. 4/98 requiring project proponents to notify the Public Filling Subcommittee of any reclamation or earth filling projects with an imported fill requirement of 300,000 cubic metres or more. The CED is better placed to perform a coordinating role in order to secure more public filling capacity in both existing and planned development projects. Up to December 2001, three temporary public filling barging points, established at Sai Ying Pun, Quarry Bay and Sha Tin Area 47B, had been providing convenient outlets for public fill to minimise its disposal at landfills.
(b) No target date for the provision of on-site sorting requirements in government works contracts;	In March 1998, the Works Bureau promulgated WBTC No. 5/98 requiring all public works contracts comprising solely demolition works to carry out on-site sorting of C&D materials.
(c) The Government should identify, as a matter of priority, off-site sorting facilities to ensure that the Waste Disposal Plan would be implemented fully and effectively; and	**A temporary sorting facility was established in August 2000 at Tseung Kwan O Area 137 to recover suitable materials for reuse (see PART 5 for Audit's findings).**
(d) The Government should seek to finalise an early agreement with the trade associations on the proposed charging arrangement so that the landfill charging scheme could be implemented as soon as possible.	**The Government has been reviewing the landfill charging scheme in consultation with relevant parties (see PART 3 for Audit's findings).**

II. Additional measures taken to improve C&D materials management

	Measures	Effective date	Reference
(a)	***Trip–ticket system*.** A trip-ticket system is implemented to control the proper disposal of C&D materials in public filling areas and landfills as appropriate for all public works contracts.	July 1999	WBTC No. 5/99 (Note 1)
(b)	***Metallic site hoardings and signboards*.** Metallic site hoardings and signboards are used so as to reduce the use of timber in construction sites.	November 1999	WBTC No. 19/99 (Note 2)
(c)	***C&D materials management information*.** Information on measures taken in the planning and design stage and those to be taken in the construction stage of public works projects to reduce the generation of C&D materials should be included in Public Works Subcommittee papers.	December 1999	WBTC No. 25/99
(d)	***Waste management plan*.** Contractors are required to prepare and implement waste management plans to ensure that solid steps are taken to minimise C&D materials generation during construction of public works projects.	January 2001	WBTC No. 29/2000 (Note 1)

Note 1: In June 2000, the Buildings Department issued a Practice Note for Authorised Persons and Registered Structural Engineers advising them to implement a similar trip-ticket system and waste management plans in private sites.

Note 2: In September 2001, WBTC No. 19/99 was replaced by WBTC No. 19/2001 which further requires the use of the bolts-and-nuts jointing method for site hoardings and signboards.

Note 3: The Housing Authority has adopted similar waste management measures mentioned above.

Appendix B
(para. 2.7 refers)

Approved reclamation projects and their public filling capacity as of October 2000

Public filling Programme items	**Estimated public filling capacity (million tonnes) (Note)**	**Expected period for accepting public fill**
Tuen Mun Area 38 Reclamation Stage 2	6.66	July 2001 to October 2003
Penny's Bay Reclamation Stage 1 (see para. 2.9)	**3.60**	**August 2001 to June 2002**
Pak Shek Kok Reclamation remaining works	3.42	Till March 2002
Tseung Kwan O Town Centre Reclamation Phase 3, Stage 2	1.98	March 2001 to August 2001
Tung Chung Development Phase 3A Reclamation	1.15	Till December 2000
Jordan Road Reclamation Phase 3	0.61	Till October 2001
Pak Shek Kok Reclamation Stage 3	0.58	Till February 2001
Tseung Kwan O Area 137 Reclamation Stage 2	0.04	Till February 2001
	18.04	

Source: Annex B of LegCo Paper No. CB(2)181/00-01(04)

Note: One cubic metre of pub1ic fill on average weighs 1.8 tonnes.

Appendix C
(para. 7.7 refers)

C&D materials delivered by dumping trucks to Tseung Kwan O Landfill Stage 1 Extension Reclamation from March 1993 to April 1994

Year/Month	No. of truckloads	Weigh-bridge measured weight (tonnes)
1993		
March	14,106	160,416
April	8,806	103,366
May	8,722	99,940
June	11,500	127,607
July	17,955	198,208
August	12,750	147,136
September	726	8,314
October	7,096	81,197
November	5,572	60,909
December	3,455	36,428
1994		
January	3,535	35,108
February	1,547	14,338
March	3,680	32,696
April	1,674	14,358
(a) Total	101,124	1,120,021
(b) Estimated tonnage of C&D materials if CED's assumed average truckload of 11.7 tonnes per truck is applied (i.e. 11.7 tonnes × 101,124)		1,183,151
(c) Discrepancy (tonnage) (i.e. (b) – (a))		**63,130**
(d) Discrepancy (percentage) (i.e. (c)/(a) × 100%)		**5.6%**

Source: CED's monthly public fill intake records

Note 1: The data for August and September 1993 exclude truckloads not directly measured by weigh-bridges.

Note 2: The Tseung Kwan O Landfill Stage 1 Extension Contract was a reclamation cum landfilling-of-waste contract. C&D materials received and solid waste disposed of were weighed by the weigh-bridges installed under the contract.

Appendix D
(para. 7.8 refers)

Inert C&D materials sorted by the Tseung Kwan O Area 137 sorting facility from August 2000 to October 2001

Year/Month	No. of truckloads	Weigh-bridge measured weight (tonnes)
2000		
August	526	5,871
September	1,615	17,044
October	1,330	14,064
November	1,572	17,060
December	1,711	18,610
2001		
January	1,534	16,224
February	1,840	19,707
March	2,057	22,114
April	820	8,640
May	797	8,302
June	499	4,993
July	148	1,396
August	651	6,357
September	641	6,731
October	1,030	11,083
(a) Total	16,771	178,196
(b) Estimated tonnage of C&D materials if CED's assumed average truckload of 11.7 tonnes per truck is applied (i.e. 11.7 tonnes × 16,771)		196,221
(c) Discrepancy (tonnage) (i.e. (b) – (a))		**18,025**
(d) Discrepancy (percentage) (i.e. (c)/(a) × 100%)		**10.1%**

Source: CED's monthly public fill intake records

Note: The Tseung Kwan O sorting facility commenced operation on 21 August 2000.

Appendix E
(para. 7.9 refers)

Deliveries of C&D materials to public filling facilities by different classes of dumping trucks for three months selected by Audit

		Class of dumping trucks							
		Heavy-sized		Medium-sized		Light-sized		Total	
Location (Note 1)	Month/ Year	No. of deliveries		No. of deliveries		No. of deliveries		No. of deliveries (Note 2)	
		(a)		(b)		(c)		(d) = (a)+ (b)+ (c)	
TKO137	Sep-00	677	2%	35,327	96%	600	2%	36,604	100%
	Mar-01	810	4%	21,799	93%	751	3%	23,360	100%
	Sep-01	29	0%	12,536	94%	759	6%	13,324	100%
	Sub-total:	1,516	2%	69,662	95%	2,110	3%	73,288	100%
TKOTC	Mar-01	296	5%	6,158	95%	7	0%	6,461	100%
	Sep-01	176	1%	17,382	99%	29	0%	17,587	100%
	Sub-total:	472	2%	23,540	98%	36	0%	24,048	100%
SYP	Mar-01	0	0%	10,582	100%	0	0%	10,582	100%
	Sep-01	0	0%	7,921	100%	0	0%	7,921	100%
	Sub-total:	0	0%	18,503	100%	0	0%	18,503	100%
QB	Mar-01	0	0%	10,174	100%	0	0%	10,174	100%
	Sep-01	0	0%	7,253	100%	0	0%	7,253	100%
	Sub-total:	0	0%	17,427	100%	0	0%	17,427	100%
	Total:	**1,988**	**1%**	**129,132**	**97%**	**2,146**	**2%**	**133,266**	**100%**

Source: *CED's trip-ticket system data*

Note 1: *TKO137 = Tseung Kwan O Area 137 Public Filling Area*
TKOTC = Tseung Kwan O Town Centre Public Filling Area; operation commenced in March 2001.
SYP = Sai Ying Pun Public Filling Barging Point; data not available for September 2000.
QB = Quarry Bay Public Filling Barging Point; data not available for September 2000.

This analysis did not cover the following public filling facilities because data were not available:
(a) Tuen Mun Public Filling Barging Point;
(b) Pak Shek Kok Public Filling Barging Point; and
(c) Tung Chung Phase 3A Public Filling Area.

Note 2: *The number of deliveries made by trucks not clearly classified in the CED's records was very small. Excluding such deliveries from this analysis does not affect the overall result.*

Chronology of key events

June 1989	The Government issued the White Paper "Pollution in Hong Kong – A time to act" setting out its objective to conserve the scarce landfill capacity by means of waste reduction, reuse and recycling.
December 1989	The Waste Disposal Plan called for the beneficial use of suitable C&D materials for reclamation purposes as far as practicable.
July 1992	The Finance Committee approved the upgrading of a project for the provision of back-up area and infrastructure for CT9 to Category A of the Public Works Programme. The related works, including detailed design and supervision, would be entrusted to the CT9 developer.
May 1995	A scheme for the charging of waste delivered to landfills by private-sector waste collectors was enacted.
June 1995	The private-sector waste collectors blockaded the landfill sites in protest and the Government agreed to defer the implementation of the landfill charging scheme.
Late 1997	The Government consulted relevant parties on a revised landfill charging scheme.
March 1998	The Works Bureau promulgated in WBTC No. 4/98 a policy requiring all reclamation and earth filling projects having imported fill requirement of 300,000 cubic metres or more to consider using public fill for works.
November 1998	The Government launched a Waste Reduction Framework Plan which aimed to increase the rate of reuse of C&D materials to 84%.
December 1998	The Land Grant of CT9 was executed.
February 1999	The Works Bureau promulgated in WBTC No. 5/99 a policy to implement a trip-ticket system in public works contracts for the proper disposal of C&D materials at public filling facilities or landfills with effect from 1 July 1999.

March 1999	The TDD awarded the Tung Chung Reclamation Contract. The terms of the contract required the Contractor to dispose of the surcharge materials off site.
October 1999	The TDD awarded the Yuen Long Contract without specifying the requirements for the use of designated public filling facilities/landfills for the disposal of C&D materials or the submission of a disposal plan by the Contractor.
October 1999	The CED awarded the TKO Contract without any provision for the completion of Area W30 by 1 July 2001 and the delivery of 3.6 million tonnes of public fill to Area W30.
Early 2000	The CED found that about 25% of C&D materials were inert hard materials with recycling potential.
February 2000	The TDD approved the CT9 developer's dredging and reclamation schemes which would use marine sand from South Tsing Yi marine borrow area to reclaim the back-up area of CT9.
April 2000	The CED awarded the PBR1 Contract which committed the TKO Contractor to deliver 3.6 million tonnes of public fill to Area W30 of his site for the PBR1 Contractor's use from 1 July 2001.
August 2000	The Tseung Kwan O Area 137 sorting facility commenced operation.
November 2000	The Administration informed the LegCo Panel on Environmental Affairs that there would be a shortage of public filling areas from mid-2002 onwards.
December 2000	The Tseung Kwan O Area 137 sorting facility commenced to handle Type II C&D waste with high inert content diverted from the SENT landfill.
December 2000	The CED sought the Secretary for the Treasury's approval to execute a supplementary agreement for the acceleration of works under the TKO Contract in order to meet the target completion of Area W30 by 1 July 2001.

January 2001	The Works Bureau promulgated WBTC No. 31/2000 allowing the use of recycled C&D materials in public works projects.
February 2001	The CED entered into a supplementary agreement with the TKO Contractor providing for the completion of Area W30 by 1 July 2001.
March 2001	After investigation of a complaint that there was illegal filling of two fishponds at Tin Shui Wai inside Wetland Conservation Area, the TDD found that the materials used for filling the fishponds came from the Yuen Long Contract.
May 2001	The Lands D obtained legal advice that there was no provision in the Land Grant of CT9 that empowered the Government to require the CT9 developer to use any particular kind of fill material.
June 2001	The Administration informed the LegCo Panel on Environmental Affairs that there would be a shortfall of public filling capacity of about 14.8 million tonnes by end-2005 and the Government planned to establish temporary fill banks to stockpile the surplus C&D materials.
July 2001	On 1 July 2001, Area W30 of the TKO Contract site was not substantially completed as specified in the supplementary agreement. On 3 July 2001, a seawall of the TKO reclamation collapsed, submerging the reclaimed land within Area W30.
August 2001	The Works Bureau invited works departments to select projects to use recycled aggregates to be produced from Tuen Mun Area 38 recycling plant from mid-2002.
September 2001	The C&D waste recycling facility at the SENT landfill started to process both Type I and Type II C&D waste.
October 2001	The CED allowed the PBR1 Contractor to import 3.6 million tonnes of marine sand in place of public fill in order not to delay the completion of the works of the PBR1 Contract.

Appendix G

Acronyms and abbreviations

C&D	Construction and demolition
CED	Civil Engineering Department
CT9	Container Terminal No. 9
EFB	Environment and Food Bureau
EPD	Environmental Protection Department
HKD	Hong Kong Disneyland
Lands D	Lands Department
LegCo	Legislative Council
NENT	North East New Territories
PAC	Public Accounts Committee
PBR1	Penny's Bay Reclamation Stage 1
PELB	Planning, Environment and Lands Bureau
SENT	South East New Territories
TDD	Territory Development Department
TKO	Tseung Kwan O
tpd	tonnes per day
VRM	Vehicle-registration-mark
WBTC	Works Bureau Technical Circular
WENT	West New Territories