5 SOLID WASTE MANAGEMENT

5.1 INTRODUCTION

The construction and operation of the Eastern MDC will result in generation of a variety of solid wastes which require suitable handling and disposal. This Section presents the findings of a detailed assessment of the potential environmental impacts associated with the handling and disposal of the solid wastes arising from the Eastern MDC. Mitigation measures are recommended, where appropriate, to minimise the potential impacts.

5.2 ENVIRONMENTAL LEGISLATION AND NON-STATUTORY GUIDELINES

5.2.1 *Legislation*

The following legislation covers or has some bearing upon the storage, collection, treatment and disposal of the wastes arising from the proposed Eastern MDC works:

- *Waste Disposal Ordinance (Cap 354);*
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354);*
- *Land (Miscellaneous Provisions) Ordinance (Cap 28);*
- *Public Health and Municipal Services Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws;* and
- *Dumping At Sea Ordinance (Cap 466).*

5.2.2 *Guidelines*

Other 'guideline' documents which detail how the Contractor should comply with the regulations of the Hong Kong SAR are as follows:

- *Waste Reduction Framework Plan, 1998 - 2007* , Planning, Environment and Lands Bureau, Government Secretariat (5 November 1998);
- *Environmental Guidelines for Planning In Hong Kong (1990), Hong Kong Planning and Standards Guidelines,* Hong Kong Government;
- *New Disposal Arrangements for Construction Waste (1992),* Environmental Protection Department & Civil Engineering Department;
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992),* Environmental Protection Department;
- *Works Branch Technical Circular No. 2/93, Public Dumps;*
- *Works Branch Technical Circular No. 16/96, Wet Soil in Public Dumps;*

- *Works Bureau Technical Circular No. 5-98, On-site Sorting of Construction Waste on demolition site;*

- *Environmental Protection Department Technical Circular (TC) No. 1-1-92, Classification of Dredged Sediments for Marine Disposal;* and

- *Works Branch Technical Circular No. 6/92, Fill Management;* and

- *Works Branch Technical Circular (WBTC) No. 22/92, Marine Disposal of Dredged Mud.*

Marine Dredged Material

Dredged sediments destined for marine disposal are classified according to their level of contamination by seven toxic metals as stipulated in the *EPDTC No. 1-1-92, Classification of Dredged Sediments for Marine Disposal.* The seven criteria metals are cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), and zinc (Zn). The contamination levels presented in the *EPDTC 1-1-92* serve as criteria for determining the disposal requirements of marine dredged sediments. Definition of the classification is as follows:

Class A — Uncontaminated material, for which no special dredging, transport or disposal methods are required beyond those which would normally be applied for the purpose of ensuring compliance with EPD's Water Quality Objectives (WQO), or for protection of sensitive receptors near the dredging or disposal areas.

Class B — Moderately contaminated material, which requires special care during dredging and transport, and which must be disposed of in a manner which minimizes the loss of pollutants either into solution or by resuspension.

Class C — Seriously contaminated material, which must be dredged and transported with great care, which cannot be dumped in the gazetted marine disposal grounds and which must be effectively isolated from the environment upon final disposal.

Since the implementation of the *EPD TC 1-1-92* in November 1992, the classification system has been simplified into two disposal classes:

Open Sea Disposal — Uncontaminated (Class A) or moderately (Class B) contaminated material suitable for open sea disposal; and

Confined Disposal — Seriously (Class C) contaminated material which must be effectively isolated from the environment upon final disposal via confined disposal in seabed pits followed by capping.

The criteria for the classification of dredged sediments destined for marine disposal based on the simplified classification scheme are shown below in *Table 5.2a.*

Table 5.2a *Classification of Sediments by Metal Content (mg kg^{-1} dry weight)*

	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Open sea disposal[a]	< 1.5	< 80	< 65	< 1.0	< 40	< 75	< 200
Confined disposal[b] (for sediments of Class C)	≥ 1.5	≥ 80	≥ 65	≥ 1.0	≥ 40	≥ 75	≥ 200

Notes:
(a) Metal contents in sediments must be below the levels for all seven heavy metals
(b) Includes sediments for which the metal content exceeds the level for any of the seven heavy metals.

5.3 ASSESSMENT METHODOLOGY

5.3.1 *General*

The potential environmental impacts due to the management of the wastes arising from the Eastern MDC will be assessed in accordance with the criteria presented in *Annexes 7* and *15* of the TMEIA and are summarized as follows:

- estimation of the types and quantities of the wastes to be generated;
- assessment of the potential impacts from the management of solid waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges and transport; and
- assessment of the potential impacts on the capacity of waste collection, transfer and disposal facilities.

5.4 CONSTRUCTION PHASE

5.4.1 *Introduction*

The construction work is scheduled to start in June 2001 and will be completed in December 2003. Major construction activities to be carried out for the Eastern MDC that are related to solid waste management include:

- site clearance;
- dredging or excavation of river channels or fish ponds;
- construction of channel's embankment; and
- maintenance of construction equipment.

These activities will involve the handling and disposal of solid waste which have the potential to cause pollution to environment if not properly managed.

5.4.2 *Potential Sources of Impact*

General

Construction activities to be carried out for the Project will result in the generation of a variety of wastes which may include:

- site clearance waste;
- demolition waste;
- general construction waste;
- chemical waste;
- general refuse; and
- excavated materials including river and fish pond sediment.

The nature and the potential environmental impacts due to handling and disposal of these wastes are discussed in the following sections.

Site Clearance Waste

As the Eastern MDC will be constructed in the fish pond areas, the site clearance work will mainly involve the removal of low-graded vegetation and general refuse.

Construction and Demolition Waste

Construction and demolition (C&D) material[4] will comprise unwanted or surplus materials generated during demolition and construction activities, which include rejected structures and materials, materials which have been over-ordered and materials which have been used and discarded. These materials may be further differentiated to:

- wood from formwork and falsework;
- materials and equipment wrappings;
- unusable/surplus concrete/grouting mixes; and
- damaged/contaminated/surplus construction materials.

As the Eastern MDC will be constructed in the fish pond area and existing river course, no major demolition works are anticipated.

Chemical Waste

Chemical wastes likely to be generated from construction activities will, for the most part, arise from the maintenance of equipments. These may include, but need not be limited to the following:

- scrap batteries or spent acid/alkali from their maintenance;
- used engine oils, hydraulic fluids and waste fuel;
- spent mineral oils/cleaning fluids from mechanical machinery; and
- spent solvents/solutions, some of which may be halogenated, from equipment cleaning activities.

4) "C&D material" contains a mixture of inert and non-inert material. The inert portion is the "public fill" and the non-inert portion is the "C&D waste".

Chemical waste may pose serious environmental and health and safety hazards if it is not properly managed. These hazards include:

- toxic effects to workers;
- adverse effects on water quality from spills; and
- fire hazards.

General Refuse

General refuse will be generated from construction work sites. The storage of general refuse has the potential to give rise to adverse environmental impacts. These include odour if waste is not collected frequently, windblown litter, water quality impacts if waste enters water bodies, and visual impact. The site may also attract pests and vermin if the waste storage area is not well maintained and cleaned regularly. In addition, disposal of wastes at sites other than approved waste transfer or disposal facilities, can also lead to similar adverse impacts at those sites.

Excavated Materials/Sediment

Construction of the Eastern MDC will involve dredging or excavation of the existing stream channel and fish pond. The excavated materials/sediment to be generated from the construction of the Eastern MDC will consist of soil, small poldered rocks and the river and pond sediment. Unlike the materials excavated from dry land, the dredged sediment from river channels and fish ponds has a high water content (about 44%, refer to *Table 5.4a*). Excavated materials/sediments will be the major component of the total solid waste to be generated from the proposed Eastern MDC works.

Some of the dredged sediment from the existing stream channel would likely be seriously contaminated (Class C) and the handling and disposal of the sediment may pose environmental problems if they are not properly managed.

Information on the quality of fish pond sediment in the area is not currently available. Due to the high cost and toxicity to fish, metal based algaecides including copper-based algaecides, are not commonly used for fresh water fish farming in Hong Kong. Calcium oxide, which is a cheaper, non-toxic to fish and more readily available chemical, is more commonly used to control algae and suspended solids in fish pond. It is therefore considered unlikely that fish pond sediment will be contaminated with heavy metals unless they are situated close to contaminated watercourses which have the potential of flooding. The sediment is, however, likely to have a high organic content. The handling and disposal of this mud may cause odour nuisance and water quality impacts if not properly managed.

5.4.3 *Evaluation of Impact*

Site Clearance Waste

As the site clearance works will only involve minor clearance of vegetation and refuse, the amount of site clearance waste is expected to be small. Provided that the waste is removed from the site as soon as practicable and disposed of at licensed landfills, the environmental impact due to the storage, handling and disposal of the site clearance waste will be negligible.

Construction and Demolition Waste

As no major demolition works are required, the amount of demolition waste to be generated from the construction of the Eastern MDC will be negligible. The handling and disposal of demolition waste are not considered to be a key issue and no adverse environmental impacts are anticipated.

The quantity of C&D material arising from the construction of the proposed route cannot be determined at this stage as it will be highly dependent on the operating procedures and site practices. As the construction of the Eastern MDC will mainly involve earthworks and concreting works, it is expected that the amount of C&D material to be generated will be small. It is recommended that steel formworks should be used as far as practicable so that they could be reused throughout the contract and avoid the need for disposal of wooden formworks.

C&D material should be removed from site to avoid adverse environmental impacts due to on-site storage of the material. C&D material should be sorted at construction sites. Inert material (clean soil and rocks) should be removed on-site as fill material. Any surplus inert material could be delivered to public filling areas and putrescible material such as wood, paper and plastic (ie C&D waste) should be disposed of at landfills. With respect to the scale of the construction of the Eastern MDC, and the condition of the site, it is likely that space will be available for on-site sorting and separation of inert and non-inert materials.

To conserve void space at landfill sites, C&D waste with more than 20% (by volume) inert material (dust, dirt, soil, brick, concrete, etc) should not be disposed of at landfills.

Chemical Waste

It is difficult to quantify the amount of chemical waste which will arise from the construction activities as it will be highly dependent on the Contractor's on-site maintenance intentions and the numbers of plant and vehicles utilised. However, with respect to the nature of the works it is anticipated that the quantity of chemical waste, such as lubricating oils and solvent, produced from plant maintenance will be small. These chemical wastes will be readily accepted at the Chemical Waste Treatment Facility at Tsing Yi. The lubricating oil may also be delivered to the oil recycling plant at Yuen Long Industrial Estate for recycling.

Under *Waste Disposal (Chemical Waste) (General) Regulation*, all chemical wastes producers are required to be registered as Chemical Waste Producers. The Contractor should refer to the *Guide to Registration of Chemical Waste Producers* published by the EPD. Provided that the storage, handling, transport and disposal of chemical waste are arranged in accordance with the *Code of Practice on the Packaging, Handling and Storage of Chemical Wastes* published by the EPD, and the chemical wastes are disposed of at a licensed facility, the environmental impacts arising from the storage, handling and disposal of a small amount of chemical waste generated from the construction activities will be minimal.

General Refuse

It is estimated that there will be about 90 workers working site during the peak combustion period. Assuming each construction worker would generate approximately 0.6 kg general refuse per day, it is estimated that the amount of general refuse to be generated during the peak working period will be in the order of 54 kg per day. Provided that the mitigation measures recommended in *Section 5.4.5* are adopted, the environmental impacts caused by storage, handling and disposal of the small amount of general refuse are expected to be minimal.

Excavated Materials

It is advised by the DSD that about 115 000 m^3 [5] materials/sediment will be excavated from the Eastern MDC. Some of the excavated river and pond sediment could be contaminated by heavy metals. Chemical analysis of the sediment from the proposed San Tin MDC has not been carried out under this EIA study. Assessment of sediment quality and hence the quantity of contaminated sediment is therefore based on the best available information, it is expected that the estimated contaminated sediment volume (approximately 10,000m^3) is a conservative number. Reference has been made to the sediment quality data obtained from the *Territorial Land Drainage & Flood Control Strategy Study - Phase III* (TELA-3) *Sedimentation Study*[6]. Under the TELA-3 study, sediment core samples were taken in vicinity of the proposed Eastern MDC. The sampling locations are shown in *Figure 5.4a*, and analysis results of the relevant core samples are presented in *Tables 5.4a* and *5.4b*. These results provide a good indication of the sediment quality of the proposed MDC works.

[5] Drainage Services Department, (1998). *Request of Information on the Quality of Excavated Sediment/Material.* Ref: ( ) in DP/8/7073CD/17, dated 2 April 1998.

[6] Hyder Consulting Ltd., 1997. *Final Report - Task 6 Environmental Impact Assessment (Volume B).* Territorial Land Drainage & Flood Control Strategy Study - Phase III Sedimentation Study. May Drainage Services Department.

Table 5.4a *Heavy Metal Content of the Sediment from San Tin Eastern Main Drainage Channel*

Station	Depth (mm)	Cd	Cr	Cu	Hg	Ni	Pb	Zn	Class
G1/D	0-310	0.2	4.6	32.3	0.1	3.1	45.5	172[b]	B
	310-620	0.3	4.3	70.4[c]	0.1	3.6	42.2	211[c]	C
G2/D	0-250	1.7[c]	22.5	334[c]	0.2	24.1	216[c]	1150[c]	C
	250-500	0.4	23.5	49.3	0.1	16.1	66.5[b]	245[c]	C
	500-750	0.1	27.4	15	0.1	15.9	50.3	73	A
	750-990	0.1	18.9	10.9	0.1	9.5	58.2	47	A
G3/D	0-270	0.3	27.2	17.8	0.1	13.6	116[c]	66	C
	270-540	0.1	25.6	15.2	0.1	12.7	56.1	59	A
	540-810	0.5	23.2	13.2	0.1	11.6	59.2	53	A
	810-1070	0.1	19.3	13.2	0.1	8.9	41	47	A
G4/D	0-250	0.1	22.3	15.4	0.1	13.2	37.4	63	A
	250-500	0.2	25.3	16.5	0.1	15.8	38.8	66	A
	500-750	0.1	24.9	12.1	0.1	14.7	51.4	59	A
	750-990	0.1	17	9.1	0.1	8.1	36.2	39	A
G5/D	0-250	0.5	49.7[b]	129[c]	0.1	24.2	81.6[c]	294[c]	C
	250-500	0.6	51[b]	67.7[c]	0.1	40.1[c]	67.6[b]	331[c]	C
	500-760	0.2	28.9	26.2	0.1	18.6	52.7	111	A
G6/D	0-290	1.2[b]	46.3	147[c]	0.2	34.1[b]	83[c]	539[c]	C
	290-580	0.2	35.5	33.2	0.1	17.1	58.2	137	A
	580-890	0.1	29.6	42.4	0.1	15.3	50.8	63	A
G7/D	0-240	0.2	29.5	45.3	0.1	21.1	54.5	181[b]	B
	240-480	0.2	30.7	19.1	0.1	17.4	56.5	83	A
	480-720	0.2	28.4	15	0.1	16.4	56.8	72	A
	720-940	0.1	26.3	17	0.1	17.5	54.6	79	A

Note :
(a) All units for heavy metals are in mg kg^{-1} dry weight.
(b) denotes Class B - moderately contaminated material.
(c) denotes Class C - seriously contaminated material.
(d) For sampling locations, see *Figure 5.4a.*
(e) Data from Territorial Land Drainage & Flood Control Strategy Study - Phase III Sedimentation Study

Table 5.4b *Water and Organic Contents of Sediment from San Tin Eastern Main Drainage Channel*

Station	Depth(mm)	Moisture(%)	NH_3	TN	TP	TOC	TIC(%)	TC(%)
G1/D	0-310	15.2	71	920	2960	1.1	0.25	1.1
	310-620	17.8	88	1480	4150	1.3	0.25	1.3
G2/D	0-250	83.9	776	12	5240	13	0.25	13
	250-500	52.5	274	2340	1080	2.3	0.25	2.3
	500-750	46.7	85	1300	422	1.7	0.25	1.7
	750-990	38.4	13	584	175	0.7	0.7	1.5
G3/D	0-270	48.1	128	1430	343	1.6	0.25	1.6
	270-540	46.3	96	1300	451	1.3	0.25	1.6
	540-810	45.7	67	1120	396	1.3	0.25	1.4
	810-1070	41.6	39	428	173	0.9	0.25	0.9
G4/D	0-250	40.9	250	1220	389	1.8	0.25	1.8
	250-500	41.8	148	1010	210	1.7	0.25	1.7
	500-750	39.8	31	930	282	2.7	0.25	2.7
	750-990	34.8	2.5	491	193	1.1	0.25	1.1
G5/D	0-250	51.9	241	3140	1940	3.2	0.25	3.2
	250-500	46.4	113	2090	2120	2.1	0.25	2.1
	500-760	37.2	23	971	403	1.3	0.25	1.3
G6/D	0-290	57.8	303	2630	1440	2.3	0.25	2.3
	290-580	39.7	138	1460	706	1.4	0.25	1.4
	580-890	38.4	86	1090	414	0.9	0.25	1.2
G7/D	0-240	54.5	181	2640	1490	3.6	0.25	3.6
	240-480	47.9	105	1730	893	2	0.25	2
	480-720	42.5	36	1170	228	1.2	0.25	1.2
	720-940	39.7	16	1080	363	2	0.25	2

Notes :
(a) Units of NH_3, TN, TP and TOC are in $mgkg^{-1}$ dry weight.
(b) For sampling locations, see *Figure 5.4a.*

The followings are noted from the above core sediment analysis results:

- the sediments in Eastern MDC are generally contaminated with heavy metals, (commonly with copper, lead and zinc);
- contaminated sediment are generally limited to the top 500 mm;
- the organic contents of the channel sediments are generally low (an average of 2.2 $mgkg^{-1}$), although the variation between sampling locations is high; and
- the water content of the channel sediments varied from 15.2% at G1/D to as high as 83.9% at G2/D, with an average water content of 43.7%.

Since the fish pond sediment is not expected to be seriously contaminated (see Section 5.4.2), contaminated sediment is likely to be concentrated in the vicinity of the existing channel, which covers approximately one-third of the proposed channel. Based on the assumption that the contaminated sediment is limited to the top 500mm and an average depth of sediment to be dredged is 2m, the quantity of seriously contaminated sediment to be dredged will be about 9% of

the total excavated material of 115,000 m^3, which is equivalent to approximately 10,000 m^3. This is a conservative estimation as it assumes that seriously contaminated material would be present to a depth of 500 mm below surface throughout the whole channel and all the excavated materials are sediment.

DSD has contacted FMC and provided an initial indication of the arising of the contaminated sediment earmarked in FMC's programme. In order to accurately determined the quantity of seriously contaminated sediment, it is recommended that a detailed sediment quality investigation should be carried out prior to the commencement of the construction works. The sediment quality investigation should be conducted in accordance with the requirement of *WBTC No. 22/92*. A *Sediment Sampling Plan* (STP) should be submitted and agreed with EPD prior to the commencement of the sampling and testing works. The results of the investigation should be presented in a *Sediment Quality Report* (SQR) which should be submitted to EPD and FMC prior to the commencement of construction phase. DSD will conduct the sediment quality investigation and provide relevant submissions prior to starting of construction works.

5.4.4 *Management and Disposal of Excavated Materials/Sediment*

This *Section* provides an overview on the suitable management practices and procedures required for the proper handling and disposal of excavated materials and dredged sediments. Further mitigation measures are suggested in *Section 5.4.5*. The handling and disposal methods of the excavated materials will depend on the nature and quality of the materials, that is, whether it is poldered rocks, soil, mud or sandy material; contaminated (in accordance with EPD's sediment classification system[7]) or uncontaminated.

Although information related to seriously contaminated sediment will not be available until the sediment quality investigation mentioned in *Section 5.4.3* is conducted the following, measures ensure the proper management of the sediment.

The uncontaminated excavated materials can be reused or disposed of as follows:

- stockpiling on site and reuse for the construction of embankment; and
- beneficially reuse for reclamation at public filling areas or other land formation sites.

As the construction of embankment requires importation of fill material, it is recommended that the excavated materials should be reused on site if it meets the necessary engineering requirements. The excavated materials could be stockpiled at a designated area to allow it to dry off for subsequent reuse. This option is preferred as it conserves natural resource and avoiding the need for off-site disposal of the material.

If the excavated material cannot be reused on site, it could be delivered to public filling areas or reclamation projects which require fill materials. With respect to the relatively small quantity in the order of 200m^3d^{-1}[8] of excavated material to be delivered to public filling areas, it is not expected to cause significant pressure on

[7] Environmental Protection Department Technical Circular No. (TC) 1-1-92, Classification of Dredged Sediments for Marine Disposal

[8] Assuming the material will be excavated within a 18 months period

the demand of public filling space and the daily operations of the public filling areas. The closest public filling area is Tuen Mun Area 38 Phase 2 which is scheduled to commence its operation in 2001. The excavated material could also be sent to other public filling area via public filling barging point at Tuen Mun Area 38 if public filling at there is not possible. DSD will contact FMC to inform the volume and availability of public fill arising when such information is available during detailed stage design. The traffic generated from the off-site disposal of the excavated materials will be small in the order of 30 truck trips per day (or 3 truck trips per hour). It is therefore considered that the off-disposal (if required) of the excavated material will not cause any adverse traffic impacts.

Dredged sediment which are not classified as contaminated sediment under the *EPDTC No 1-1-92* but contain abnormally high organic matters should be treated as uncontaminated sediment and be disposed of accordingly. Those seriously contaminated (Class C) dredged sediments requiring marine disposal can be disposed at the containment pits at East Sha Chau (confined disposal), and those uncontaminated sediment can be disposed at or marine borrow areas (MBAs), for example, North Lantau and South Tsing Yi MBAs, subject to the allocation of Fill Management Committee (FMC). The contractor should consult the EPD for the final disposal site at the time of construction. Provided mitigation measures recommended for handling, delivery and disposal of sediment are fully implemented, and sediment are disposed to allocated controlled areas, no unacceptable impacts are anticipated during marine disposal.

Due to inadequate water depth of the channel, it will not be possible to load the dredged sediment directly onto a shallow draft barge. The dredged materials have to be transported to an off-site barging point at a place agreed with District Land Office for transfer to a dumping barge. Stockpiling of the high organic content sediment on site may cause odour problems. Stockpiling of Class C contaminated sediment should not be allowed on-site. It is recommended that these sediments should be discharged to water- tight trucks and removed from site as soon as practical.

When the river sediment is disturbed by dredging, the potential exists for increasing the suspended solids and turbidity of the stream water, if it is not properly mitigated. Details of recommended mitigated measures are discussed in *Section 5.4.5*. The potential water quality impact during dredging are discussed in *Section 4.4.3*.

5.4.5 *Mitigation Measures*

Introduction

5.4.5.1 This section sets out the recycling, storage, transportation and disposal measures which are recommended to avoid or minimise potential adverse impacts associated with waste arising from the construction phase of the Eastern MDC.

5.4.5.2 Training and instruction of construction staff should be given at the site to increase awareness and draw attention to waste management issues and the need to minimise waste generation. The training requirements should be included in the on-site waste management plan.

Upon appointment of the contract, the Contractor should prepare a comprehensive on-site waste management plan of the construction works which should take into account the recommended mitigation measures in the EIA report. Such a management plan should incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials.

Storage, Collection and Transport of Waste

5.4.5.3 Permitted waste hauliers should be used to collect and transport wastes to the appropriate disposal points. The following measures to minimise adverse impacts including windblown litter and dust from the transportation of wastes should be instigated:

- handle and store wastes in a manner which ensures that they are held securely without loss or leakage, thereby minimising the potential for pollution;
- use waste hauliers authorised or licensed to collect the specific category of waste;
- remove wastes in a timely manner and general refuse should be removed on a daily basis;
- maintain and clean the waste storage areas on a daily basis;
- minimise windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers;
- obtain the necessary waste disposal permits from the appropriate authorities, if they are required, in accordance with the *Waste Disposal Ordinance)(Cap 354)*, *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)*, the *Land (Miscellaneous Provisions) Ordinance (Cap 28)*, *Dumping At Sea Ordinance (Cap 466)* and *Works Branch Technical Circular No. 22/92, Marine Disposal of Dredged Mud.*
- dispose of waste at approved sites;
- develop procedures such as a ticketing system to facilitate tracking of loads, particularly for chemical waste, and to ensure that illegal disposal of wastes does not occur; and
- maintain records of the quantities of wastes generated, recycled and disposed.

Construction and Demolition Waste

5.4.5.4 In order to minimise waste arisings and keep environmental impacts within acceptable levels, the mitigation measures described below should be adopted.

5.4.5.5 Careful design, planning and good site management can minimise over ordering and waste of materials such as concrete, mortars and cement grouts. The design of formwork should maximise the use of standard wooden panels so that high reuse levels can be achieved. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse.

5.4.5.6 The Contractor should recycle as much as possible of the C&D materials on-site. Proper segregation of wastes on site will increase the feasibility of recycling certain components of the waste stream by recycling contractors. Surplus or rejected concrete can be broken down and used as general fill and steel reinforcement bar can be recycled by scrap steel mills. Different areas should be designated for such segregation and storage wherever site conditions permit.

5.4.5.7 The handling and disposal of bentonite slurries should be undertaken in accordance with the *Practice Note For Professional Persons, Construction Site Drainage, Professional Persons Consultative Committee, 1994 (ProPECC PN 1/94).*

5.4.5.8 Open stockpiles of construction and demolition material, and temporarily exposed slope should be covered by trapulin or similar fabric, particularly during rainy season.

5.4.5.9 In order to maximise landfill life, Government policy restricts the disposal of C&D wastes with more than 20% (by volume) inert material at landfills. Public filling areas will only accept inert construction and demolition materials (i.e. earth, building debris, and broken rock and concrete) which is free from marine mud, household refuse, plastic, metal, industrial and chemical waste, animal and vegetable matter. Government plans to establish a number of sorting facilities at strategic locations to process mixed construction and demolition material, however it is unlikely that these facilities will be available during the early stage of the Eastern MDC construction. It is therefore desirable for Eastern MDC works to adopt on-site segregation of waste so that the inert portion can either be recycled and reused at areas of reclamation or land formation or to public filling area, and non-inert portion can be disposed at landfills.

5.4.5.10 Government has established a charging scheme for the disposal of waste to landfill. When it is implemented, it will provide additional incentive to reduce the volume of waste generated.

Chemical Waste

5.4.5.11 For those processes which generate chemical waste, it may be possible to find alternatives which generate reduced quantities or even no chemical waste, or less dangerous types of chemical waste.

5.4.5.12 Chemical waste that is produced, as defined by *Schedule 1* of the *Waste Disposal (Chemical Waste) (General) Regulation*, should be handled in accordance with the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* as follows:

5.4.5.13 Containers used for the storage of chemical wastes should:

- be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed;
- have a capacity of less than 450 litres unless the specifications have been approved by the EPD; and
- display a label in English and Chinese in accordance with instructions prescribed in *Schedule 2* of the *Regulations*.

5.4.5.14 The storage area for chemical wastes should:

- be clearly labelled and used solely for the storage of chemical waste;
- be enclosed on at least 3 sides;
- have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% of the total volume of waste stored in that area, whichever is the greatest;
- have adequate ventilation;
- be covered to prevent rainfall entering (water collected within the bund must be tested and disposed as chemical waste if necessary); and
- be arranged so that incompatible materials are separated.

5.4.5.15 Disposal of chemical waste should be:

- via a licensed waste collector; and
- to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers; or
- to a reuser of the waste, under approval from the EPD.

5.4.5.16 The Centre for Environmental Technology operates a Waste Exchange Scheme which can assist in finding receivers or buyers for the chemical wastes.

General Refuse

5.4.5.17 General refuse generated on-site should be stored in enclosed bins separate from construction and chemical wastes. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimise odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law. Rubbish should not be dumped into the river.

5.4.5.18 General refuse will be generated largely by food service activities on site, so reusable rather than disposable dishware should be used if feasible. Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible; separate, labelled bins for their deposit should be provided if feasible.

5.4.5.19 Office wastes can be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered if one is available.

Excavated Materials/Sediment

5.4.5.20 The excavated material may have to be temporarily stockpiled on-site for subsequent re-use. Control measures should be taken at the stockpiling area to prevent the generation of dust and pollution of stormwater channels. Details of

environmental control measures for dust and water pollution are discussed in *Sections 4* and *8*. Key control measures are highlight below:

Dust:

- wetting the surface of the stockpiled soil with water when necessary especially during the dry season;
- covering the stockpiled soil with sheets;
- minimising disturbance of the stockpiled soil; and
- enclosure of the stockpiling area.

Water Quality:

- separating surface water drainage system for the stockpiling area;
- installation of silt traps for the surface water drainage system; and
- covering stockpiled material with tarpaulin during heavy rainstorm.

5.4.5.21 Special precautions will have to be taken for the handling and transportation of contaminated material. Potential impacts associated with the exposure to and disposal of contaminated sediments could be mitigated by adopting the following measures:

- sampling and analysis of the sediment to confirm the level of contamination so that specific disposal requirements and precautionary handling procedures can be determined;
- the use of bulk earth-moving equipment to minimise the contact of contaminated material with construction workers;
- minimising exposure to any contaminated material by the wearing of protective gear such as gloves, providing adequate hygiene and washing facilities and preventing eating during excavation;
- any contaminated mud or sediment excavated should not be allowed to stockpile on site and should be immediately removed from site once excavated;
- excavated sediment should be transported by water-tight trucks to potential marine barging points, then to sea going barges for transfer to designated marine disposal grounds;
- permitted waste hauliers should be used to collect and transport contaminated sediments for disposal;
- all vessels for marine transportation of excavated sediment should be fitted with tight fitting seals to their bottom openings to prevent leakage of materials; and

- loading of barges and hoppers should be controlled to prevent splashing of excavated material to the surrounding water, and barges or hoppers should under no circumstances to be filled to a level which will cause the overflowing of materials or polluted water during loading or transportation.

- the decks of any off-site barges (for disposal to marine dumping grounds) and floating pontoons should be kept tidy and free of oil or any other substances or articles which might be accidentally or otherwise washed overboard.

5.5 OPERATIONAL PHASE

5.5.1 *Introduction*

During the operation of the Eastern MDC, solid wastes will be generated from:

- maintenance dredging, in which sediment deposit at the river beds will be excavated; and

- maintenance and screening of pumping station which may produce chemical wastes.

5.5.2 *Evaluation of Impact*

The requirements for maintenance dredging will depend on the settlement rates of the channel. With reference to the operational experience of similar drainage channels in the north-east New Territories, it is expected that dredging will be carried out by a land-based dredger on a need basis. The quantity of material to be dredged is expected to be small. Small volumes of oily material will arise from the maintenance of the pumping station. Provided that this waste is disposed of at the Chemical Waste Treatment Centre or other EPD approved facilities, the environmental impact will be negligible.

5.5.3 *Mitigation Measures*

5.5.3.1 Desilting of the channel should be conducted during the dry season whenever possible in order to minimise mobilisation of sediment into the water column. Other recommended mitigation measures for the handling and disposal of solid wastes generated from the operational phase will be similar to that recommended for the construction phase in *Section 5.4.5.20-21*. Chemical waste produced should follow recommendations in *Section 5.4.5.12*.

5.6 REQUIREMENT FOR FURTHER STUDY

5.6.1 *Construction Phase*

Given the nature and scale of the works, the key environmental impacts arising from solid waste handling and disposal are related to dredged or excavated river, in particular, the dredging of seriously contaminated sediment. The detailed design for the Eastern MDC should include the collection of river sediment samples in compliance with *WBTC 22/92* requirements to determine the extent of heavy metal contamination of the sediment, and submit a Sediment Quality Report to EPD and FMC prior to the commissioning of the construction works.

5.6.2 *Operational Phase*

It is not anticipated that there will be any significant environmental impacts associated with the handling and disposal of solid wastes arising from the operation of the Eastern MDC and no further study is recommended.

5.7 CONCLUSION

The construction and operation of the Eastern MDC will result in generation of a variety of solid wastes. These wastes will require suitable handling and disposal to avoid pollution to the environment. The potential environmental impacts due to the handling and disposal of solid waste from the construction and operation of all the proposed works has been evaluated. The key issue is the dredging and disposal of river sediment during the construction phase.

The total amount of excavated materials to be produced from the Eastern MDC works will be about 115,000 m^3, of which about 10,000 m^3 could be classified as seriously contaminated sediment in accordance with EPD's guidelines. It is recommended that a sediment quality investigation should be carried out prior to the commencement of the construction works to confirm quantity of the contaminated sediment. The results of the investigation should be presented in a *Sediment Quality Report* to be submitted to EPD and FMC. Special dredging and disposal procedures as recommended in the report will be required to minimise potential environmental impacts.

Provided that the measures recommended in *Section 5.4.5* and *Section 5.5.3* are properly implemented and the sediments are disposed of at approved disposal sites, it is anticipated that the environmental impacts associated with the handling and disposal of sediment will be within the acceptable standards. The assessment has concluded that the potential environmental impacts associated with the handling, storage, transport and disposal of wastes arising from the construction of the Eastern MDC meet the guidelines presented in the TMEIA.

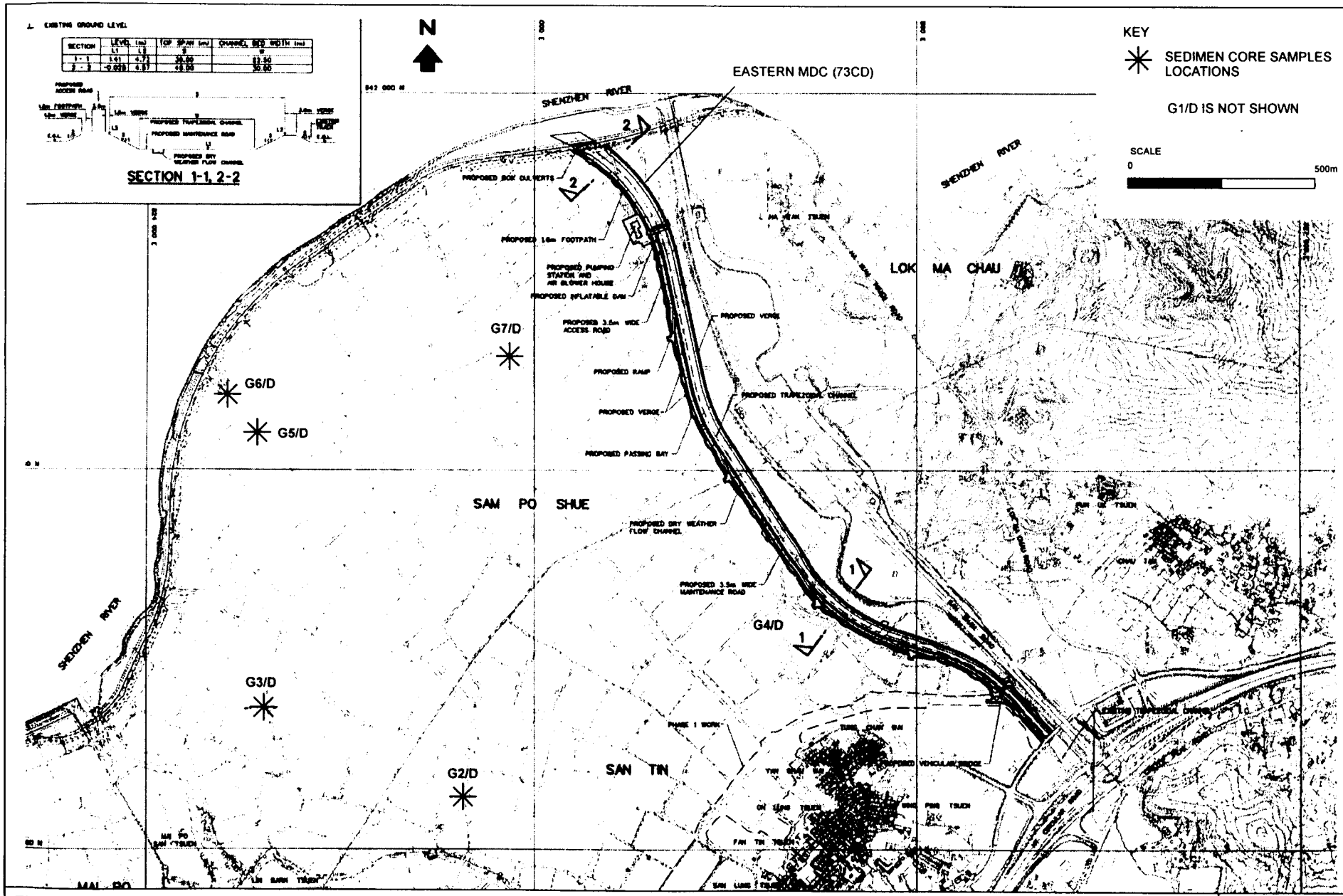

FIGURE 5.4a

SAMPLING LOCATION FOR SEDIMENT CORE ANALYSIS

FILE: C1618z84
DATE: 03/03/99

Environmental Resources Management

ERM