8 WASTE MANAGEMENT

8.1 Introduction

8.1.1 This section identifies the types of waste which are likely to be generated during the construction and operation phases of the Project, and evaluates the potential environmental impacts that may result from the waste generation.

8.1.2 Mitigation measures and good site practices, including waste handling, storage and disposal, have been recommended with reference to relevant waste legislation and management guidelines. Treatment of contaminated sediments has also been discussed.

8.2 Environmental Legislation and Guidelines

8.2.1 The criteria and guidelines for assessing waste management implications are outlined in Annex 7 and Annex 15 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), respectively

8.2.2 The following legislation also covers the handling, treatment and disposal of waste in Hong Kong:

- Waste Disposal Ordinance (Cap. 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C);
- Land (Miscellaneous Provisions) Ordinance (Cap. 28);
- Public Health and Municipal Services Ordinance (Cap. 132) - Public Cleansing and Prevention of Nuisances Regulation;
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N); and
- Dumping at Sea Ordinance (Cap. 466).

Waste Disposal Ordinance (Cap. 354)

8.2.3 The *Waste Disposal Ordinance* (WDO) prohibits any unauthorized disposal of waste. Construction waste, defined under Cap. 354N of the WDO, refers to a substance, matter or thing which is generated from construction works. It includes all abandoned materials, whether processed or stockpiled or not, before being abandoned, but does not include sludge, screenings or matter removed or generated from desludging, desilting or dredging works. Under the WDO, waste can be disposed of only at designated waste disposal facilities licensed by the Environmental Protection Department (EPD).

Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C)

8.2.4 Under the WDO, the *Chemical Waste (General) Regulation* provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical waste. EPD has also issued the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992)*, which details how the chemical waste producers should comply with the regulations on chemical waste.

Land (Miscellaneous Provisions) Ordinance (Cap. 28)

8.2.5 The inert portion of Construction and Demolition (C&D) materials (including rocks, soil, broken concrete, building debris, etc.) may be taken to Public Fill Reception Facilities (PFRFs). PFRFs usually form part of land reclamation schemes and are operated by the Civil Engineering and Development Department (CEDD) and others. The *Land (Miscellaneous Provisions) Ordinance* requires that individuals or companies who deliver public fill to the public fill reception facilities are required to obtain Dumping Licences. The licences are issued by CEDD under delegated authority from the Director of Lands.

8.2.6 Individual licences and windscreen stickers are issued for each vehicle involved. Under the licence conditions, public fill reception facilities will only accept soil, sand, rubble, brick, tile, rock, boulder, concrete, asphalt, masonry or used bentonite. In addition, in accordance with paragraph 12 of the *Development Bureau Technical Circular (Works) No.6/2010*, Public Fill Committee will advise on the acceptance criteria. The material will, however, be free from marine mud, household refuse, plastic, metal, industrial and chemical wastes, animal and vegetable matter and any other materials considered unsuitable by the public fill reception facility supervisor.

Public Health and Municipal Services Ordinance (Cap. 132)

8.2.7 The *Public Cleansing and Prevention of Nuisances Regulation* provides control on illegal tipping of waste on unauthorized (unlicensed) sites.

Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)

8.2.8 Under the *Waste Disposal (Charges for Disposal of Construction Waste) Regulation* enacted in January 2006, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a PFRF for disposal must consist entirely of inert material.

Dumping at Sea Ordinance (Cap. 466) (DASO)

8.2.9 This Ordinance came into operation in April 1995 and empowers the Director of Environmental Protection (DEP) to control the disposal and incineration of substances and particles at sea for the protection of the marine environment. Under the Ordinance, a dumping permit from the DEP is required for the disposal of regulated substances within and outside the waters of Hong Kong. The permit contains terms and conditions which include the following specifications:

- Type and quantity of substances permitted to be dumped;
- Location of the disposal grounds;
- Requirement of equipment for monitoring the disposal operations; and
- Environmental monitoring requirements.

8.2.10 Marine disposal of any dredged/excavated sediment is subject to control under the *Dumping at Sea Ordinance*. Dredged/excavated sediment destined for marine disposal is classified based on its contaminant levels with reference to the *Environment, Transport and Works Bureau Technical Circular (Works) No. 34/2002 - Management of Dredged/Excavated Sediment* (ETWB TC(W) No. 34/2002). The ETWB TC(W) No. 34/2002 stipulated a set of sediment quality criteria or Chemical Exceedance Levels (CEL) for contaminants including

metals, metalloid and organic pollutants. Details of ETWB TC(W) No. 34/2002 are discussed in the section below.

8.2.11 Other guidelines which detail how the Contractor should comply with are as follow:

- A Guide to the Registration of Chemical Waste Producers, Environmental Protection Department, Hong Kong;
- A Guide to the Chemical Waste Control Scheme, Environmental Protection Department, Hong Kong;
- Code of Practice on Package, Labelling and Storage of Chemical Wastes (1992), Environmental Protection Department, Hong Kong;
- Works Branch Technical Circular (WBTC) No. 2/93, Public Dumps;
- Works Branch Technical Circular No. 2/93B, Public Filling Facilities;
- Section 4.1.3, Chapter 4 of Project Administration Handbook for Civil Engineering Works Management of Construction/Demolition Materials including Rocks;
- ETWB TC(W) No. 34/2002 - the Environment, Transport and Works Bureau Technical Circular (Works) No. 34/2002 - Management of Dredged/Excavated Sediment;
- DEVB TC(W) No. 6/2010, Trip-ticket System for Disposal of Construction and Demolition Materials; and
- ETWB TC(W) No. 19/2005, Environmental Management on Construction Sites.

8.2.12 Current policy related to the disposal of C&D materials is documented in the *WBTC No. 2/93, 'Public Dumps'*. C&D materials that are wholly inert, namely public fill, should not be disposed of at landfill, but be taken to PFRFs, which usually form part of reclamation schemes. The *Land (Miscellaneous Provisions) Ordinance* requires the dumping licenses to be obtained by individuals or companies who deliver public fill to PFRFs. The CEDD issues the licenses under delegated powers from the Director of Lands.

8.2.13 In accordance with the DEVB TC(W) No.6/2010 '*Trip Ticket System for Disposal of Construction and Demolition Materials*', all contracts that are expected to generate inert C&D materials (e.g. soil, broken rock, broken concrete and building debris, etc) requiring disposal from site, the project office shall write to the Public Fill Committee (PFC) through Secretary of the PFC to request a designated disposal ground for incorporation into the tender documents. For contracts where the estimated amount of non-inert C&D materials requiring disposal at landfill facilities equal or exceed $50m^3$, the project office shall seek confirmation from the DEP in terms of the availability of landfill facilities for disposal of such materials. The DEP will designate landfill facilities, if available, for the contract. Where the estimated amount of non-inert C&D materials to be generated from the contract is less than $50m^3$, the project office is not required to apply to DEP for designated landfill facilities. However, the project office should still specify in the tender documents of the appropriate landfill facilities (e.g. SENT Landfill at Tseung Kwan O, NENT Landfill at Ta Kwu Ling and WENT Landfill at Nim Wan) for disposal.

8.2.14 Further measures are introduced under *Section 4.1.3, Chapter 4 of Project Administration Handbook for Civil Engineering Works*, that management of C&D materials, including rocks are strengthened and their generation at sources are minimized. The enhancement measures include: (i) drafting of a Construction and Demolition Material Management Plan (C&DMMP) at an early design stage to minimize C&D materials generation and encourage proper management of such materials; (ii) vetting of the C&DMMP prior to upgrading of the project to Category A in the Public Works Programme; and (iii) providing the contractor with

information from the C&DMMP in order to facilitate the preparation of the Waste Management Plan (WMP) and to minimize C&D materials generation during construction. Projects generating C&D materials or importing fill material less than 50,000m^3 are exempted from the C&DMMP.

8.2.15 The ETWB TC(W) No. 34/2002 sets out the procedure for seeking approval to and the management framework for marine disposal of dredged/ excavated sediment. This practice note outlines the requirements to be followed in assessing and classifying the sediment and explains the marine disposal arrangement for the classified material. The sediment quality criteria for the classification of sediment were referred as the *Lower Chemical Exceedance Level* (LCEL) and *Upper Chemical Exceedance Level* (UCEL). The LCEL and UCEL are presented in Appendix A of ETWB TC(W) No. 34/2002. Subject to the results of the chemical screening, biological screening may be required to determine the disposal requirement of the sediment.

8.2.16 The final determination of the appropriate disposal options, routing and the allocation of a permit to dispose of material at a designated site shall be determined in accordance with ETWB TC(W) No. 34/2002. Three types of disposal options for dredged/ excavated sediments were stipulated in the ETWB TC(W) No. 34/2002: Type 1 – Open Sea Disposal or Open Sea Disposal in Dedicated Sites, Type 2 – Confined Marine Disposal and Type 3 – Special Treatment / Disposal. For Type 3 disposal, the Project Proponent shall be responsible for identifying and agreeing with the DEP the most appropriate treatment and/or disposal arrangement. The determination of the appropriate disposal options shall be based on the sediment classification and if necessary, the biological screening results.

8.3 Assessment Methodology

8.3.1 The methodology for assessing the potential waste management impacts during the construction and operation phases of the Project includes the following tasks:

- Estimation of types and quantities of the wastes generated;
- Assessment of potential impacts from the management of the waste with respect to potential hazards, air and odour emissions, noise, wastewater discharge and public transport;
- Evaluation of the opportunities for reducing waste generation;
- Identification of disposal options for each type of waste; and
- Assessment of impacts on the capacity of waste collection, transfer and disposal facilities.

8.4 Identification of Waste Sources

8.4.1 The construction of the Project is tentatively scheduled to commence in early 2016 for completion in end 2020. The types of waste generated and their respective sources during the construction and operation phases are tabulated in **Table 8.1**.

Table 8.1 Identification of Waste Types and Sources in the Construction and Operation Phases of the Project

Waste Types	Sources of Waste Identified	Examples
Construction Phase		
Construction and Demolition (C&D) Materials	• Excavated materials from site formation works like tunnel blasting and mechanical excavation	Inert C&D materials (i) Rocks (ii) Soft materials (fill, etc.) Non – inert C&D materials (i) Timbers, papers and plastic etc.
Sediments	• Excavation of depressed Road at Road P2 • Piling of Road P2 and Interchange to CBL	Marine deposits
Chemical waste	• Plant operations and maintenance • Maintenance of mechanical equipments	Oil and grease; scrap batteries; used paint and cleaners etc.
General refuse	Construction works and site-based staff and workers	Food waste, containers, cans and waste papers etc.
Operation Phase		
Chemical waste	Maintenance of facilities and equipments	Used paint, lubricants and used batteries etc.
General refuse	Staff and office activities	Food waste, containers, cans and waste papers etc.

8.5 Predication and Evaluation of Environmental Impacts

Construction Phase

8.5.1 The types of waste generated during the construction phase include:

- C&D Materials generated from demolition, excavation and site formation works;
- Sediments;
- Chemical Waste; and
- General Refuse.

Construction and Demolition Materials

8.5.2 The following measures have been taken to minimize quantity of C&D materials:

- Constant design reviews in striving to optimise the scheme proposals;
- Minimal interference with existing structures to reduce the quantity of demolition materials;
- Proposed use of prefabricated materials where possible; and

- Reuse of existing structures in the design where possible.

8.5.3 Excavated materials, which include rocks and soft materials, would be generated from site formation works like tunnel blasting and mechanical excavation. It is estimated that the total excavated C&D materials would be approximately 4,170,420 m^3 (sum of rock and soft materials).

8.5.4 The following non-inert C&D materials would also be generated during the construction phase:

- Timber from formwork;
- Vegetation from site formation; and
- Papers & plastics.

8.5.5 About 83,000 m^3 of non-inert C&D materials would be generated, which would be reused and recycled as much as possible before disposal of at landfill site. In the preliminary design stage, the non-inert C&D materials will be disposed off at Tseung Kwan O South East New Territories (SENT) Landfill. It is the Contractor's responsibility to separate the inert and non-inert C&D materials on site.

8.5.6 The total volume of inert C&D materials generated from demolition, excavation and site formation works is estimated to be about 4,170,420 m^3. It is estimated that about 190,000 m^3 of rock and 621,600 m^3 of soft material would be reused in the reclamation. All other excavated materials have, therefore, to be exported off-site. The inert C&D materials generated would be recycled as far as practicable at any quarry in operation during construction stage. A summary of inert C&D materials generated during the construction phase is shown in **Table 8.2**. Detailed yearly waste breakdown was provided in **Appendix 8.1**.

Table 8.2 Summary of Inert Construction and Demolition Materials Quantities Generated

Works Area	Rock (Grade I to III) (m^3)	Inert Material (Broken Concrete) (m^3)	Soft Material (Fill, etc.) (m^3)	Off Site Disposal (m^3)	Reuse in Reclamation (m^3)	Disposal Site
TKO Section	381,250	-	160,950	397,900	144,300	Surplus rock (Grade II or above Granite) would be recycled in Lam Tei Quarry subject to the operation period of the Quarry. Surplus soft material will be delivered to PFRFs.
Tunnel (Main Section)	1,398,750	-	-	1,398,750	-	
Lam Tin Interchange	1,125,120	2,380	477,300	964,580	640,220	
CKLV Section	294,380	620	-	264,920	30,080	
Removal of surcharge and construction of depressed road	-	-	329,670	329,670	-	
Total	**3,199,500**	**3,000**	**967,920**	**3,355,820**	**814,600**	

Note: This quantity of soft C&D material includes the removal of surcharge for preloading of reclamation and excavation from the reclaimed land for the construction of the depressed road covered by landscape deck. It has been counted as part of the reused material in reclamation.

8.5.7 Surplus rock generated from the Project is proposed to be recycled into aggregates and other rock products in the Lam Tei Quarry subject to the operation period of the Quarry. Surplus soft material is proposed to be delivered to PFRFs operated by CEDD such as Tseung Kwan O Area 137 Fill Bank for later use by other projects. A C&DMMP will be prepared and submitted to PFC for endorsement and allocation of disposal site. The Project Proponent should be responsible for obtaining confirmation and approval from PFC on the allocation of the disposal site before commencement of the Project works. No construction work is allowed to proceed until all issues on management of C&D materials have been resolved with all relevant authorities including PFC and EPD.

8.5.8 Non-inert C&D materials, is proposed to be disposed in public landfills (e.g. SENT Landfill at Tseung Kwan O, NENT Landfill at Ta Kwu Ling and WENT Landfill at Nim Wan).

Sediment

8.5.9 Steel cellular caisson with stone column is recommended as the non-dredged method for seawall foundation. This method will significantly reduce sediment volume to be removed. Sediment will be mainly generated from piling works and excavation of depressed road at Road P2. The pile caps of the piers of the mainline will be above seabed and construction of pile caps will not induce sediment removal. The current sediment volume only accounts for the boring of piles.

Sediment Sampling and Testing Plan

8.5.10 The classification of the sediments and the determination of the corresponding disposal options were based on the findings of the site investigation works conducted under this EIA Study. A Sediment Sampling and Testing Plan (SSTP) was prepared, making reference to ETWB TC(W) No. 34/2002 and under Clause 3.4.4.2 (iii)(a) of the Study Brief, to present the sampling and testing requirements/methodologies of the site investigation for EPD agreement. The SSTP should be referred to for detailed methodology for sediment sampling and testing. The SSTP was submitted to EPD on September 2009 and no further major comment was received afterwards. The SSTP is attached in **Appendix 8.2**.

8.5.11 The site investigation (SI) works was commenced in November 2009 and completed in January 2010. The sampling works were conducted by Lam Geotechnics Limited and the laboratory testing was carried out by ALS Technichem (HK) Pty. Ltd., an HOKLAS accredited laboratory.

8.5.12 Based on the SSTP, a total of 37 sampling locations (TKO-VC501 to TKO-VC526 and TKO-VCC501 to TKO-VCC511) were proposed within Junk Bay. Sediment sub-samples would be collected by vibrocore for chemical testing and/or biological testing. Sediment samples at each sampling location were generally taken at 0 – 0.9m below top level of marine deposit, 0.9m down, 1.9m down, 2.9m down and then every 3m down to the bottom of sediment layer or at 1m below the alluvium layer.

8.5.13 However, after the commencement of SI works, the alignment and construction method have been revised. No major dredging works will be undertaken. Only 13 sampling locations remained relevant in the sediment assessment. The relevant as-built sampling locations are TKO-VC501 to TKO-VC504, TKO-VC506, TKO-VC507, TKO-VC508, TKO-VC510, TKO-VC511, TKO-VC519, TKO-VC520, TKO-VCC502 and TKO-VCC503.

8.5.14 Due to site constraints, the following sampling locations were slightly shifted from the original position as proposed in the SSTP or replaced by rotary drilling:

- TKO-VC501 – due to encountering hard material at 0.4m below seabed, the vibrocore sampling was replaced by rotary drilling to reach alluvium. The location ID is changed to TKO-EBH501.
- TKO-VC502 – due to encountering hard material at 0.35m below seabed, the vibrocore sampling was replaced by rotary drilling to reach alluvium. The location ID is changed to TKO-EBH502.
- TKO-VC504 – due to encountering of hard materials at 0.2m below seabed and insufficient sample recovery, the vibrocore sampling was relocated from the proposed location resulting in large deviation from proposed locations. The location ID is changed to TKO-VC504c.
- TKO-VCC503 – due to encountering hard material at 2.80 m below seabed, the vibrocore sampling was relocated. The location ID is changed to TKO-VCC503a.

8.5.15 Two vibrocore samplings did not reach the alluvium layer. The alluvium layers at these locations were confirmed by old or additional borehole.

- TKO-VC504c – The alluvium layer at this location was confirmed by borehole records TKO-EBH504 and nearby borehole records VC3 from Agreement No. CE 42/2008(CE) Tseung Kwan O – Lam Tin Tunnel and Associated Works – First Stage of G. I. Request for Geophysical Survey at West Coast of Tseung Kwan O.
- TKO-VCC502 – The alluvium layer at this location was confirmed by nearby borehole records D32 from Agreement No. CE 42/2008(CE) Tseung Kwan O – Lam Tin Tunnel and Associated Works – First Stage of G. I. Request for Geophysical Survey at West Coast of Tseung Kwan O.
- TKO-VCC503a – The alluvium layer at this location was confirmed by borehole records TKO-EBHC503.

8.5.16 The location IDs of relevant as-built sampling locations are TKO-EBH501, TKO-EBH502, TKO-VC503, TKO-VC504c, TKO-VC506a, TKO-VC507, TKO-VC508, TKO-VC510, TKO-VC511, TKO-VC519, TKO-VC520, TKO-VCC502 and TKO-VCC503a,. The sediment extent and relevant sampling locations are shown in **Figure No. 8.1**.

8.5.17 In addition, grab samples were also collected from EPD's routine marine sediment monitoring station PS6 at Port Shelter (850434E, 820057N) on 15 January 2010 as the reference sediment samples.

Chemical and Biological Screening

8.5.18 Chemical and biological screening of sediment samples were carried out according to the SSTP with reference to ETWB TC(W) No. 34/2002. Each sample was tested for chemical screening with parameters as stated in ETWB TC(W) No. 34/2002.

8.5.19 A total of 60 samples (excluding reference sample) had been collected and tested and sediments were encountered in all of the sampling locations.

8.5.20 The chemical screening results is presented in **Appendix 8.3 and 8.5** whereas a summary of the results is shown in **Table 8.3**.

8.5.21 It should be noted that there were insufficient amount of interstitial water available from most of the sediment samples for analysis and as a result, TBT testing was only conducted on TKO-VC503 0-0.9m, TKO-VC526 5.5-6.5m and TKO-VCC501 0.5-0.9m in the chemical screening exercise under this EIA Study.

8.5.22 Based on the site investigation results, 1 sample (TKO-EBH501 3-3.95m) was classified to be Category H (>10 x LCEL) with Zn exceeded 10 times the LCEL. This sample required biological screening test with dilution. 6 Category H (≤ 10 x LCEL) sediment samples were identified at 5 sampling locations (TKO-EBH501 4-4.95m & 5-5.9m; TKO-EBH502 1-1.45m; TKO-VC503 0-0.9m TKO-VC507 0-0.9m; TKO-VC520 0.75-0.9), with contaminants Cd, Cu, Pb, and Zn exceeded the UCEL. On the other hand, 3 Category M sediment samples were encountered at 4 sampling location (TKO-EBH502 0.15-0.95m & 2-2.45m; TKO-VC506a 0-0.3m, TKO-VC508 8.9-9.9m, TKO-VCC503a 0.5-0.9), with contaminants As, Pb or Zn exceeded the LCEL but equal to or below the UCEL. These sample required biological screening test. Ni, Low molecular weight and high molecular weight PAHs concentrations of all samples were below detection limits whereas no LCEL exceedance was identified for contaminants TBT.

Table 8.3 Summary of Chemical Screening Results

Category	No. of Samples under each Category	Percentage of Total Number of Samples
Category L (at or below LCEL)	48	80.0%
Category M (above LCEL but at or below UCEL)	5	8.3%
Category H (above UCEL but at or below 10 x LCEL)	6	10.0%
Category H (above UCEL with contaminant/s levels exceeding 10 times the LCEL)	1	1.7%
Total:	**60 (excluding reference sample)**	**100%**

8.5.23 Based on the chemical screening results above, Tier III biological screening was conducted for the Category M sediment samples and a Category H sediment sample with contaminant level exceeded 10 times the LCEL. The results of the biological screening are attached in **Appendix 8.4** and summarized in **Table 8.4**.

Table 8.4 Summary of Biological Screening Results

Sampling ID (Depth)	Classification of Sediment	Biological Screening Results
TKO-EBH501 (3-3.95m)	Category H (>10 x LCEL)	Fail
TKO-EBH502 (0.15-0.95m)	Category M	Pass
TKO-EBH502 (2.0-2.45m)	Category M	Pass
TKO-VC506a (0-0.3m)	Category M	Pass
TKO-VC508 (8.9-9.9m)	Category M	Fail
TKO-VCC503a (0.5-0.9m)	Category M	Fail

Sediment Quality and Quantities

8.5.24 The sediment quality is compared again Risk-Based Remediation Goals (RBRGs) as the encountered sediment is proposed to reuse on site after cement stabilization. Only one sample (TKO-EBH501 3-3.95m) shows exceedance in RBRG for lead. All other sediment samples do not exceed most stringent RBRGs. The reuse of cement stabilized sediment and adoption of RBRGs to assess stabilized sediment have been proposed in the current C&DMMP. MFC has no adverse comment on the current C&DMMP. It should be noted that stabilized sediment will be reuse in project only and will not dispose in public fill.

8.5.25 The quantities of sediments is estimated with consideration of (i) the sediment profiles for the depressed road and piling works, (ii) depths and thickness of underlying marine deposits and (iii) sediment quality at each sampling locations and corresponding depths as based on the chemical screening results under this EIA Study.

Table 8.5 Estimate Quality and Quantity for Marine Sediment Reuse

Sediment Sample	Sediment Quality	Estimate Quantity (m^3)
All sediment sample except TKO-EBH501 3-3.95m	do not exceed most stringent RBRGs	17,450 (depressed road at Road P2 – 8,950, piling works – 8,500)
TKO-EBH501 3-3.95m	exceedance in RBRG for lead	1,910 (depressed road at Road P2 – 1690, piling works – 220)
	Total	**19,360**

8.5.26 Approximately 17,450 m^3 of sediment is considered to have no exceedance in RBRGs of heavy metals, TBT, PCBs and PAHs. It is anticipated that the reuse of these sediments will not lead to land contamination.

8.5.27 For 1,910m^3 of sediment under the sample (TKO-EBH501 3-3.95m), this portion of sediment exceed the RBRG for lead. However, since cement stabilization will immobilize metal contaminants, it is capable to treat the exceedance on lead. According to *Practice Guide for Investigation and Remediation of Contaminated Land*, the stabilized material should comply with universal treatment standards (UTS) of Lead and unconfined compressive strength (UCS). If the treated material do not comply with UTS or UCS, re-stabilization have to be undertaken to meet compliance of UTS and UCS before reusing the treated sediment as filling material. However, further agreement on final treatment on this portion of sediment has to be sought from DEP.

8.5.28 In case cement stabilization is not a practical treatment for the sediment, the sediment may be disposed according to ETWB TC(W) No. 34/2002. Based on the chemical and biological screening results, the disposal options for each of the sediment samples were determined in accordance with the ETWB TC(W) No. 34/2002 and summarized in **Appendix 8.3**.

8.5.29 The quantities of sediments under each disposal type is estimated with consideration of (i) the sediment profiles for the depressed road and piling works, (ii) depths and thickness of underlying marine deposits and (iii) disposal options at each sampling locations and corresponding depths as based on the chemical and biological screening results under this EIA Study. The estimated quantities for each disposal type are presented in **Table 8.6**. The total volume of sediment generated is estimated to be approximately 19,360 m^3.

Table 8.6 Disposal Quantity for Marine Sediment

Disposal Options	Corresponding Category	Estimate Quantity (m^3)
Type 1 – Open Sea Disposal	Category L Sediment	9,600 (depressed road at Road P2 – 2,430, piling works – 7,170)
Type 1 – Open Sea Disposal (Dedicated Sites) at disposal site(s) allocated by MFC	Category M Sediment (passed the biological screening)	60 (all from piling works)
Type 2 – Confined Marine Disposal at disposal site(s) allocated by MFC	Category M Sediment (failed the biological screening) and Category H Sediment (does not require biological screening or passed in biological screening)	7,790 (depressed road at Road P2 – 6,520, piling works – 1,270)
Type 3 – Special Treatment / Disposal	Category H Sediment (failed in biological screening)	1,910 (depressed road at Road P2 – 1,690, piling works – 220)
	Total	**19,360**

8.5.30 The estimated volume of sediments suitable for Type 1 open sea disposal is approximately 9,600 m^3, the estimated volume of sediments for Type 1 open sea disposal (dedicated sites) is approximately 60m^3 and the estimated volume of sediments requiring Type 2 confined marine disposal is approximately 7,790m^3. The volume of sediments requiring Type 3 special treatment/disposal is estimated to be approximate 1,910m^3.

8.5.31 The above volumes are likely to be conservative estimations given that the marine deposits would consolidate after reclamation and the actual volume of sediment to be excavated would be significantly reduced.

Excavation, Transportation and Disposal

8.5.32 To minimise any potential adverse impacts arising from the removal of marine sediment, the sediment should be bored, excavated, transported and treated in a manner that would minimise adverse impacts to air quality, noise and water quality. Mitigation measures to minimise potential environmental impacts are recommended in **Sections 8.6.14** to **8.6.29**.

8.5.33 Based on the findings of the air quality, noise and water impact assessments (refer to **Sections 3, 4** and **5** of the Report), adverse air quality, noise and water impacts associated with sediment removal activities are not anticipated. No adverse environmental impacts are anticipated if mitigation measures as proposed in **Sections 8.6.14** to **8.6.29** are properly implemented.

8.5.34 Based on the above and with the implementation of the recommended mitigation measures, no unacceptable impacts would be expected from the removal, excavation, transportation and treatment of the sediment.

Chemical Waste

8.5.35 The maintenance and servicing of construction plant, equipment and vehicles involve the use of a variety of chemicals and generate chemical wastes. The possible chemical waste that would be generated during the course of construction works includes:

- Oil and grease associated with plant maintenance;

- Hydraulic fluid from plant machinery;
- Scrap batteries from vehicle maintenance; and
- Used paint, cleaners, solvents used in maintaining mechanical equipments.

8.5.36 It is difficult to quantify the amount of chemical waste that would arise from the construction activities since it would depend on the Contractor's on-site maintenance requirements and the amount of plant utilized. However, it is anticipated that the quantity of chemical waste, such as lubrication oil and solvent produced from plant maintenance, would be small and in the order of a few cubic metres per month. The amount of chemical waste to be generated would be quantified in the WMP to be prepared by the Contractors.

8.5.37 As stipulated in the *Waste Disposal (Chemical Waste) (General) Regulations*, chemical wastes arisen during the construction phase may pose environmental, health and safety hazards if not stored and disposed of appropriately. These hazards may include:

- Toxic effects to workers;
- Adverse impacts on water quality from spills; and
- Fire hazard.

8.5.38 Chemical waste will be collected by licensed collectors and disposed of at the Chemical Waste Treatment Centre (CWTC) at Tsing Yi. Wherever possible opportunities should be taken to reuse and recycle materials. Mitigation and control requirements for chemical wastes are detailed in **Section 8.6.30**.

8.5.39 The handling, storage and disposal of chemical waste would follow the *Code of Practice on Packaging, Labelling and Storage of Chemical Wastes* published by EPD and the anticipated adverse environmental impacts would be negligible.

General Refuse

8.5.40 Throughout construction, the workforce would generate refuse comprising food scraps, waste paper, empty containers, etc. Release of general refuse into marine waters should not be permitted, as introduction of these wastes is likely to have detrimental effects on water quality in the area. Rapid and effective collection of site wastes would be required to prevent waste materials being blown around by wind, flushed or leached into the marine environment, and odour nuisance. The work sites may also attract pests and vermin if the waste storage area is not well maintained and cleaned regularly. Disposal of refuse at sites other than approved waste transfer or disposal facilities can also result in similar impacts. With the implementation of good waste management practices at the site, adverse environmental impacts would not be expected to arise from the storage, handling and transportation of workforce wastes.

Operation Phase

8.5.41 During the operation phase, it is anticipated that the volume of waste generation would be insignificant and the waste to be generated including:

- Chemical waste; and
- General refuse.

Chemical Waste

8.5.42 Chemical wastes such as paints, lubricants and used batteries may be generated during maintenance activities. This waste may pose environmental, health and safety hazards. Measures as stipulated in the *Waste Disposal (Chemical Waste) (general) Regulation* and the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* would be strictly followed for the handling and disposal of chemical waste.

8.5.43 Should any chemical waste be generated, the operator must register with EPD as a chemical waste producer. The chemical waste would be readily accepted for disposal of at the CWTC at Tsing Yi. This chemical waste should be collected periodically in drum-type containers by licensed chemical waste collectors. With proper storage, handling and disposal of this waste, no adverse environmental impact is anticipated.

General Refuse

8.5.44 During the operation phase, general refuse would be generated by staff and office activities. This waste includes food waste, paper, wood, plastic, office wastes etc. Plastics, papers and other recyclable wastes should be separated from general refuse and recycled as far as possible. The remaining refuse would be collected by licensed collectors and disposed of at landfills.

8.5.45 **Table 8.7** provides a summary on the recommended disposal methods of different wastes generated from the operation phase of the Project.

Table 8.7 Summary of Waste Disposal for Operation Phase

Type of Waste	Proposed Disposal Methods
Chemical Waste	Recycled by licensed facility or disposal of at CWTC
General Refuse	Reuse, recycle as much as possible before disposal of at landfills

8.5.46 The anticipated potential environmental impacts arisen from the handling, storage and disposal of waste in operation phase would be insignificant provided that the mitigation measures stated in **Sections 8.6.34** to **8.6.37** are strictly followed.

8.6 Mitigation of Adverse Environmental Impacts

Waste Management Hierarchy

8.6.1 The waste management hierarchy has been applied in the assessment and development of mitigation measures for waste which aims at evaluating the desirability of waste management methods and includes the followings in descending preference:

- Avoidance and reduction of waste generation;
- Reuse of materials as far as practicable;
- Recovery and recycling of residual materials where possible; and
- Treatment and disposal according to relevant laws, guidelines and good practices.

8.6.2 Based on the waste management hierarchy, waste reduction measures are recommended as follow to reduce impacts and costs arisen from the Project. Recommendations of good site practices and waste reduction measures would be stated in order to achieve avoidance and minimization of waste generation in the hierarchy. Environmental Management Plan (EMP) and trip-ticket system are recommended for monitoring management of waste. Specific

measures targeting the mitigation of impacts in works areas and the transportation of spoil off-site would be provided to minimize the potential impacts to the surrounding environment together with recommendations on sediments management.

Good Site Practices and Waste Reduction Measures

8.6.3 Adverse impacts related to waste management are not expected to arise, provided that good site practices are strictly followed. Recommendations for good site practices during the construction phase include:

- Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site;
- Training of site personnel in site cleanliness, proper waste management and chemical handling procedures;
- Provision of sufficient waste disposal points and regular collection of waste;
- Appropriate measures to minimize windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers; and
- Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors.

8.6.4 Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- Use of steel formwork instead of timber formwork to reduce the generation of timber waste;
- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Encourage collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the workforce;
- Proper storage and site practices to minimize the potential for damage or contamination of construction materials; and
- Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste.

8.6.5 The Contractor shall prepare and implement a WMP as part of the EMP in accordance with ETWB TCW No. 19/2005 which describes the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities. 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. The EMP should be submitted to the Engineer for approval. The Contractor should implement the waste management practices in the EMP throughout the construction stage of the Project. The EMP should be reviewed regularly and updated by the Contractor.

8.6.6 In addition to the above good site practices and waste reduction measures, possibilities of reusing the C&D materials have been stated in **Section 8.5.6**.

Storage, Collection and Transportation of Waste

8.6.7 Storage of materials on site may induce adverse environmental impacts if not properly managed. About 814,600 m^3 of C&D materials will be stockpiled for later use in the reclamation. The recommendations to minimize the impacts include:

- Waste, such as soil, should be handled and stored well to ensure secure containment, thus minimizing the potential of pollution;
- Maintain and clean storage areas routinely;
- Stockpiling area should be provided with covers and water spraying system to prevent materials from wind-blown or being washed away; and
- Different locations should be designated to stockpile each material to enhance reuse.

8.6.8 Waste haulier with appropriate permits should be employed by the Contractor for the collection and transportation of waste from works areas to respective disposal outlets. The following suggestions should be enforced to minimise the potential adverse impacts:

- Remove waste in timely manner;
- Waste collectors should only collect wastes prescribed by their permits;
- Impacts during transportation, such as dust and odour, should be mitigated by the use of covered trucks or in enclosed containers;
- Obtain relevant waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 345) and the Land (Miscellaneous Provisions) Ordinance (Cap. 28);
- Waste should be disposed of at licensed waste disposal facilities; and
- Maintain records of quantities of waste generated, recycled and disposed.

8.6.9 Implementation of trip ticket system with reference to DEVB TC(W) No. 6/2010, *Trip Ticket System for Disposal of Construction & Demolition Materials*, to monitor disposal of waste and to control fly-tipping at PFRFs or landfills. A recording system for the amount of waste generated, recycled and disposed (including disposal sites) should be proposed.

8.6.10 In addition to the above measures, other specific mitigation measures on handling the C&D materials, sediments and materials generated from site formation and demolition work are recommended as follow.

Sorting of C&D Materials

8.6.11 Concerning the necessity of maximising reuse for the Project, it is paramount for sorting to be performed to recover the inert materials, reusable and recyclable materials before disposal off-site. All surplus C&D materials arising from or in connection with the works shall become the property of the Contractor when it is removed unless otherwise stated. The Contractor will be responsible for devising a system to work for sorting of C&D materials and promptly removing all sorted and processed materials arising from the construction activities. The system should be included in the EMP, identifying the source of generation, estimated quantity, arrangement for sorting, collection, temporary storage areas (if any) and frequency of collection by recycling Contractors or frequency of off-site removal.

8.6.12 It is recommended that specific areas should be provided by the Contractors for sorting and to provide temporary storage areas (if required) for the sorted materials. The materials could be segregated according to the categories as shown below:

- Excavated materials suitable for reuse in reclamation;
- Excavated materials for delivery to PFRFs;
- Surplus rock to be recycled into aggregates and other rock products in the Lam Tei Quarry;
- Sediments for delivery to sea disposal; and
- Non-inert C&D materials for delivery to landfills.

8.6.13 The C&D materials should at least be segregated into inert and non-inert materials, in which the inert portion could be reused and recycled in the reclamation as far as practicable before delivery to PFRFs. While opportunities for reusing the non-inert portion should be investigated before disposal of at designated landfills.

Sediment

8.6.14 As discussed in **Section 8.5** above, by adopting the non-dredged method for seawall foundation, the amount of sediment generated will be significantly reduced. Sediment generated from the Project will be restricted to piling works and excavation of depressed road at Road P2.

8.6.15 Sediment encountered may be reused as filling material on-site after cement stabilization. Cement-stabilization process is undertaken by mixing sediment and cement and will convert sediment to earth filling material. The treated sediment has to comply with Risk-Based Remediation Goals (RBRGs) before being reused in order not to raise any land contamination issue. The adoption of RBRGs to assess stabilized sediment has been proposed in the current C&DMMP. MFC has no adverse comment on the current C&DMMP. The sediment quality indicates that all sediments comply with most stringent RBRGs except for one sediment sample (TKO-EBH501 3-3.95m) with lead exceeding the RBRG. Except for the sediment sample (TKO-EBH501 3-3.95m), the chemical screening results do not indicate sediment as contaminated soil. It is anticipated that reuse of sediment except sediment sample (TKO-EBH501 3-3.95m) will not lead to land contamination.

8.6.16 Despite exceedance of RBRG, onsite reuse of sediment under sample (TKO-EBH501 3-3.95m) as filling material after cement stabilization is also a suitable treatment. Sediment quality indicates the sediment sample (TKO-EBH501 3-3.95m) exceed RBRG for lead. While cement stabilization will immobilize metal contaminants, it is capable to treat the exceedance on lead. The stabilized material should comply with UTS of Lead and UCS. If the treated material do not comply with UTS or UCS, re-stabilization have to be undertaken to meet compliance of UTS and UCS before reusing the treated sediment as filling material. However, further agreement on final disposal/treatment on sediment under sample (TKO-EBH501 3-3.95m) has to be sought from DEP.

8.6.17 Requirements of the *Air Pollution Control (Construction Dust) Regulation*, where relevant, shall be adhered to during boring, excavation, transportation and disposal of sediments or cement stabilization of sediment.

8.6.18 A treatment area should be confined for carrying out the cement stabilization mixing and temporary stockpile. The area should be designed to prevent leachate from entering the

ground. Leachate, if any, should be collected and discharged according to the *Water Pollution Control Ordinance* (WPCO).

8.6.19 In order to minimise the potential odour / dust emissions during boring, excavation and transportation of the sediment, the excavated sediments should be kept wet during excavation/boring and should be properly covered when placed on barges/trucks. Loading of the excavated sediment to the barge should be controlled to avoid splashing and overflowing of the sediment slurry to the surrounding water.

8.6.20 In order to minimise the exposure to contaminated materials, workers should, when necessary, wear appropriate personal protective equipments (PPE) when handling contaminated sediments. Adequate washing and cleaning facilities should also be provided on site.

8.6.21 Alternatively, excavated sediment can be treated with marine disposal. The basic requirements and procedures for excavated sediment disposal specified under ETWB TC(W) No. 34/2002 shall be followed. MFC is responsible for the provision and management of disposal capacity and facilities for the excavated sediment, while the permit of marine dumping is required under the *Dumping at Sea Ordinance* and is the responsibility of the DEP.

8.6.22 The Project Proponent should agree in advance with MFC of CEDD on the site allocation. Subject to the final decision by MFC, Type 1 sediments are typically disposed to South Cheung Chau and/or East of Ninepin as open sea disposal while Type 2 sediments are disposed to East Sha Chau as confined marine disposal. For disposal of type 3 sediments, further agreement has to be sought from DEP.

8.6.23 For allocation of sediment disposal sites and application of marine dumping permit, separate SSTP has to be submitted to EPD for agreement under DASO. Additional site investigation, based on the SSTP, maybe carried out in order to confirm the disposal arrangements for the proposed sediments removal. A Sediment Quality Report (SQR) shall then be required for EPD agreement under DASO prior to the tendering of the construction contract, discussing in details the site investigation, testing results as well as the delineation of each of the categories of excavated materials and the corresponding types of disposal.

8.6.24 The excavated sediments is expected to be loaded onto the barge and transported to the designated disposal sites allocated by the MFC. The excavated sediment would be disposed of according to its determined disposal options and ETWB TC(W) No. 34/2002.

8.6.25 Stockpiling of contaminated sediments should be avoided as far as possible. If temporary stockpiling of contaminated sediments is necessary, the excavated sediment should be covered by tarpaulin and the area should be placed within earth bunds or sand bags to prevent leachate from entering the ground, nearby drains and surrounding water bodies. The stockpiling areas should be completely paved or covered by linings in order to avoid contamination to underlying soil or groundwater. Separate and clearly defined areas should be provided for stockpiling of contaminated and uncontaminated materials. Leachate, if any, should be collected and discharged according to the WPCO.

8.6.26 In order to minimise the potential odour / dust emissions during boring, excavation and transportation of the sediment, the excavated sediments should be kept wet during excavation/boring and should be properly covered when placed on barges/trucks. Loading of the excavated sediment to the barge should be controlled to avoid splashing and overflowing of the sediment slurry to the surrounding water.

8.6.27 The barge transporting the sediments to the designated disposal sites should be equipped with tight fitting seals to prevent leakage and should not be filled to a level that would cause overflow of materials or laden water during loading or transportation. In addition, monitoring of the barge loading shall be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels shall be equipped with automatic self-monitoring devices as specified by the DEP.

8.6.28 Another possible arrangement for Type 3 disposal is by geosynthetic containment. A geosynthetic containment method is a method whereby the sediments are sealed in geosynthetic containers and, at the disposal site, the containers would be dropped into the designated contaminated mud pit where they would be covered by further mud disposal and later by the mud pit capping, thereby meeting the requirements for fully confined mud disposal. The technology is currently adopted as disposal arrangement for Type 3 sediment under *Wan Chai Development Phase II and Central-Wan Chai Bypass* Project.

8.6.29 The adopted arrangement generally followed the field trial conducted during the EIA stage in which a report on the field trials concluded that disposal by sealing the sediments in geosynthetic containers and dropping these containers into the contaminated mud pits at East Sha Chau has been shown to be a successful and viable disposal method. The use of a geosynthetic container system for special disposal was considered to be an effective system with negligible loss of contaminants to the marine environment during disposal. Given that the sediments requiring Type 3 disposal under this Project is marine-based, the geosynthetic container system recommended in the field trials is considered to be appropriate for this Project.

Chemical Wastes

8.6.30 If chemical wastes are produced at the construction site, the Contractor would be required to register with the EPD as a Chemical Waste Producer and to follow the guidelines stated in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes, to either the Chemical Waste Treatment Centre at Tsing Yi, or other licensed facility, in accordance with the *Waste Disposal (Chemical Waste) (General) Regulation*.

General Refuse

8.6.31 General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.

8.6.32 **Table 8.8** provides a summary of the various waste types likely to be generated during the construction activities for the Project, together with the recommended handling and disposal methods.

Table 8.8 Summary of Waste Generation and Recommended Disposal Methods for Construction and Demolition Works

Waste Materials Type	Generation from work items	Materials Generated	Disposal Quantity	Handling methods/Reuse	Destinations
C&D Materials	Excavated materials from site formation works like tunnel blasting and mechanical excavation	Inert C&D materials –Rock and Soft Materials	4,170,420 m^3	• Segregation from non-inert C&D materials during stockpiling and transportation • Stockpile area (if required) should be well managed with covers and water spraying system • Reused in reclamation of the Project, delivered to PFRFs for beneficial use in other projects or to Lam Tei Quarry for recycle	• Lam Tei Quarry • PFRFs
		Non-inert C&D materials – Timber, Papers and Plastics	83,000 m^3	• Segregation from inert C&D materials during stockpiling and transportation • Reusable materials should be separated and recycled as far as practicable	• Landfills
Sediment	Excavation of marine sediment for construction of depressed Road at Road P2 and piling works of Road P2 and Interchange to CBL	Sediment do not exceed most stringent RBRGs	17,450 m^3	• Reuse as filling material after cement stabilization • Alternative, marine disposal at disposal site(s) allocated by MFC • Mitigation measures as per **Sections 8.6.14** to **8.6.29**.	Filling on site or alternatively marine disposal as determined by MFC.
		Sediment with exceedance in RBRG for lead	1910 m^3	• Reuse as filling material after cement stabilization • Alternative, marine disposal at disposal site(s) allocated by MFC • Mitigation measures as per **Sections 8.6.14** to **8.6.29**.	Filling on site or alternatively marine disposal as determined by MFC.
Chemical Waste	Maintenance and Operation of Equipments and Machineries	Oils and grease hydraulic fluids, paints, solvents, cleaners etc.	Unknown at this stage	• Store in compatible containers in designated area on site • To be collected and recycled by licensed collectors	Chemical Waste Treatment Centre at Tsing Yi

Waste Materials Type	Generation from work items	Materials Generated	Disposal Quantity	Handling methods/Reuse	Destinations
General Refuse	Resident Workers	Food waste, plastic, aluminium cans, waste papers etc.	Unknown at this stage	• Provide on-site collection points together with recycling bins • Collected by licensed collectors	Landfills

Operation Phase

8.6.33 As mentioned in **Section 0**, the anticipated volume of waste generation in operation phase is insignificant. Nevertheless, mitigation measures are recommended for the identified waste types in order to minimise the potential impacts to the environment.

Chemical Waste

8.6.34 The requirements given in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* would be followed in handling of chemical waste as in construction phase. A trip-ticket system would be adopted by the operator to monitor disposal of chemical waste.

8.6.35 Non-recyclable chemical waste should be disposed of at appropriate facility like CWTC by licensed collectors. Recyclable chemical waste should be collected and transported off-site by licensed collectors.

General Refuse

8.6.36 Recycling of waste paper, aluminium cans and plastic bottles should be encouraged, it is recommended to place clearly labelled recycling bins at designated locations which could be accessed conveniently. Other general refuse should be separated from chemical and industrial waste by providing separated bins for storage to maximize the recyclable volume.

8.6.37 A reputable licensed waste collector should be employed to remove general refuse on a daily basis to minimize odour, pest and litter impacts.

Impacts Caused by Handling, Collection and Disposal of Waste

8.6.38 The assessment has covered the following area: potential hazard, air and odour emission, noise and wastewater discharge. With the implementation of mitigation measures recommended in the **Sections 8.6.1** to **8.6.37**, impacts from the above mentioned issue is expected to be minimal. The issue would be addressed in other relevant sections of this EIA report.

8.7 Evaluation of Residual Impacts

8.7.1 With the implementation of the recommended mitigation measures for the handling, transportation and disposal of the identified waste arising, no residual impact is expected during both construction and operation phases.

8.8 Environmental Monitoring and Audit Requirements

Construction Phase

8.8.1 During the construction period, it is the Contractor's responsibility to ensure that all the waste produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices, relevant legislation and waste management guidelines.

8.8.2 Waste materials generated during construction activities, such as C&D materials, are recommended to be audited at regular intervals to ensure that proper storage, transportation and disposal practices are implemented. This measure ensures the proper disposal of waste. The Contractor would be responsible for the implementation of any mitigation measures to minimize waste or mitigate problems arisen from waste materials.

8.8.3 A WMP, as part of the EMP should be prepared in accordance with ETWB TC(W) No.19/2005 and submitted to the Engineer for approval. The recommended mitigation measures should form the basis of the WMP. The monitoring and auditing requirement stated in ETWB TC(W) No.19/2005 should be followed with regard to the management of C&D materials.

Operation Phase

8.8.4 It is expected that limited quantities of waste would be generated from the operation of the Project and adverse environmental impacts would not be anticipated with the implementation of good waste management practices. Waste monitoring and audit programme for the operation phase of the Project is not required.

8.9 Conclusion

8.9.1 C&D materials (from site formation works), sediment, general refuse (from workforce) and chemical waste (from maintenance of equipment) would be generated during the construction phase. Provided that these wastes are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be expected.

8.9.2 Reduction measures have been recommended to minimise the amount of materials generated in the Project. Approximately 4,170,420 m^3 of inert materials and 83,000 m^3 of non-inert materials would be generated during the construction phase of the Project. 814,600 m^3 of inert material would be reused in the reclamation while the remaining would be recycled or disposed off-site. Non-inert waste will be recycled as far as possible before disposed to landfill. Opportunities in minimisation of generation and maximisation of reuse would be continually investigated during the detailed design and construction phases. The other materials would be disposed of to designated outlets.

8.9.3 The main waste types generated during the operation of the Project would be general refuse (from staff and office activities) and chemical waste (from maintenance activities). Adverse impacts would not be anticipated if the mitigation measures are strictly followed.

8.9.4 The total volume of excavated sediment generated from the Project is estimated to be approximately 19,360 m^3. Approximately 17,450 m^3 of sediment is considered below the RBRGs. It is anticipated that the reuse of these sediments will not lead to land contamination. 1,910m^3 of sediment exceeds the RBRG for lead. However, since cement stabilization will immobilize metal contaminants, it is capable to treat the exceedance on lead.

8.9.5 All sediment can be reused as filling material on-site after cement stabilization. However, stabilized materials from 1910m^3 of sediment with lead RBRG exceedance have to comply with UTS and UCS. Final disposal/treatment on the 1910m^3 sediment has to be agreed with DEP.

8.9.6 Alternatively, excavated sediment can be treated with marine disposal. For allocation of sediment disposal sites and application of marine dumping permit under DASO, separate SSTP had to be submitted to EPD. A Sediment Quality Report (SQR), presenting findings of the sampling and testing works and in accordance with ETWB TC(W) No. 34/2002, will also be required for EPD approval under DASO. The final disposal sites for the sediment will be determined by the MFC prior to the commencement of the excavation activities.

8.9.7 With the implementation of the recommended mitigation measures detailed in **Sections 8.6.14** to **8.6.29** and in accordance with the requirements of ETWB TC(W) No. 34/2002, no

adverse environment impacts would be expected from boring, excavation, transportation and treatment of marine sediment or disposal.

8.9.8 It is concluded that the waste management implications from the Project are evaluated, assessed and complied with the criteria and guidelines as stated in Annexes 7 and 15 of the EIAO-TM.