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6. WASTE MANAGEMENT

6.1 Introduction

6.1.1 This *Section* identifies the potential waste arising from the construction and operation of the Project and assesses the potential environmental impacts associated with waste handling and disposal. No excavated/dredged sediment is anticipated from the Project works. The main issues include the following:

- Management of excavated materials;
- Handling and disposal of construction and demolition (C&D) materials arising from river modification and road drainage improvement works, excavation and construction works; and
- Management of chemical waste and general refuse.

6.1.2 Waste avoidance, minimisation, reuse and recycling, storage, collection, transport and disposal schemes have been examined and appropriate measures for waste reduction and management have been proposed.

6.2 Relevant Legislation, Policies, Standards and Criteria

6.2.1 The following discussion on legislative requirements and evaluation criteria applies to both the construction and operation phases of the Project. The criteria and guidelines for evaluating potential waste management implications are laid out in *Annexes 7 and 15* of the *EIAO-TM* under the *EIAO (Cap 499)*. The following legislation covers, or has some bearing upon the handling, treatment and disposal of the wastes generated from the construction and operation of the Project.

- *Waste Disposal Ordinance (Cap 354)*;
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C)*;
- *Land (Miscellaneous Provisions) Ordinance (Cap 28)*; and
- *Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances Regulation*.

Waste Disposal Ordinance (Cap 354)

6.2.2 The *Waste Disposal Ordinance (WDO)* prohibits the unauthorised disposal of wastes, with waste defined as any substance or article, which is abandoned. Construction waste is defined as any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screenings or matter removed in or generated from any desludging, desilting or dredging works.

6.2.3 Under the WDO, wastes can only be disposed of at a licensed site. It should be noted that under the WDO, the authority may by license permit any person to provide services for the collection or removal of chemical waste or clinical waste but not for general refuse. In addition, the *Land (Miscellaneous Provisions)*

Ordinance (Cap 28) requires that individuals or company who deliver inert C&D materials to the public fill reception facilities to obtain Dumping Licenses. For general refuse there is no charge and this will need to be disposed of in a licensed facility.

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

- 6.2.4 The *Waste Disposal (Charges for Disposal of Construction Waste) Regulation* defined construction waste as any substance, matters or things that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned. It does not include any sludge, screening or matter removed in or generated from any desludging, desilting or dredging works.
- 6.2.5 The *Construction Waste Disposal Charging Scheme* entered into operation on 1 December 2005. Starting from 1 December 2005, the main contractor who undertakes construction work under a contract with value of HK\$1 million or above is required to open a billing account solely for the contract for waste disposal. Application shall be made within 21 days after the contract is awarded.
- 6.2.6 Depending on the percentage of inert materials in the construction waste, inert construction materials can be disposed of at public fill reception facilities. However mixed construction waste can be disposed of at construction waste sorting facilities, landfills and Outlying Islands Transfer Facilities which have different disposal costs. The scheme encourages reducing, reusing and sorting of construction waste such that the waste producer can reduce their disposal fee. **Table 6.1** summarises the government construction waste disposal facilities, types of waste accepted and disposal cost.

Table 6.1
Government Facilities for Disposal of C&D Materials

Government Waste Disposal Facilities	Type of Construction Waste Accepted	Charge (HK\$/Tonne)
Public fill reception facilities	Consisting entirely of inert construction waste ⁺⁺	\$71
Sorting facilities	Containing more than 50% by weight of inert construction waste ⁺⁺	\$175
Landfills [@]	Containing not more than 50% by weight of inert construction waste ⁺⁺	\$200
Transfer Facilities [@]	Containing any percentage of inert construction waste ⁺⁺	\$200
<p># Except for the Outlying Islands Transfer Facilities, the minimum charge load is 1 tonne, i.e. if a load of waste weighs 1 tonne or less, it will be charged as 1 tonne. A load of waste weighing more than 1 tonne will be charged at 0.1 tonne increment. For Outlying Islands Transfer Facilities, the charge is \$20 per 0.1 tonne and the minimum charge load is 0.1 tonne.</p> <p>++ Inert construction waste means rock, rubble, boulder, earth, soil, sand, concrete, asphalt, brick, tile, masonry or used bentonite.</p> <p>@ If a load of waste contains construction waste and other waste, that load will be regarded as consisting entirely of construction waste for the purpose of calculating the applicable charge.</p>		

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

- 6.2.7 Chemical waste as defined under the *Waste Disposal (Chemical Waste) (General) Regulation* includes any substance being scrap material, or unwanted substances specified under *Schedule 1* of the Regulation, if the specified substance or chemical occurs in such a form, quantity or concentration so as to cause pollution or constitute a danger to health or risk of pollution to the environment.
- 6.2.8 A person should not produce, or cause to be produced, chemical wastes without registration with the Environmental Protection Department (EPD). Chemical wastes must either be treated using on-site facility licensed by EPD or be collected by a licensed collector for off-site treatment at a licensed facility. Under EPD Regulation, the waste producer, collector and disposal facility must sign all relevant parts of a computerised trip ticket for each consignment of waste. The computerized system is designed to allow the transfer of wastes to be traced from cradle-to-grave.
- 6.2.9 The EPD Regulation prescribes storage facilities to be provided on-site which include labelling and warning signs. To reduce the risks of pollution and danger to human health or life, the waste producer is required to prepare and make available written emergency procedures for spillage, leakage or accidents arising from the storage of chemical wastes. They must also provide their employees with training on such procedures.

Land (Miscellaneous Provisions) Ordinance (Cap 28)

- 6.2.10 The inert C&D materials (also called public fill) may be taken to public fill reception facilities. Public fill reception facilities 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 inert C&D materials to the public fill reception facilities to obtain Dumping Licences. The licences are issued by CEDD under delegated authority from the Director of Lands.
- 6.2.11 Individual licences and windscreen stickers are issued for each vehicle involved. Under the licence conditions, public fill reception facilities will only accept earth, soil, sand, rubble, brick, tile, rock, boulder, concrete, asphalt, masonry or used bentonite. In addition, in accordance with paragraph 11 of *DEVB TC(W) No. 6/2010 “Trip Ticket System for Disposal of Construction and Demolition Materials”*, the Public Fill Committee will advise on the acceptance criteria (e.g. no mixing of construction waste, nominal size of the materials less than 250mm, etc). 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) – Public Cleansing

and Prevention of Nuisances Regulation

- 6.2.12 This Regulation provides a further control on the illegal dumping of wastes on unauthorised (unlicensed) sites.

Other Relevant Guidance

- 6.2.13 Other guideline documents which detail how the Contractor will comply with the WDO and its associated regulations include:

- *Waste Disposal Plan for Hong Kong (December 1989), Planning, Environment and Lands Branch Government Secretariat, Hong Kong Government;*
- *Chapter 9 - Environment (2014), Hong Kong Planning Standards and Guidelines, Hong Kong Government;*
- *New Disposal Arrangements for Construction Waste (1992), EPD & CED, Hong Kong SAR Government;*
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), EPD, Hong Kong Government;*
- *WBTC No. 2/93, Public Dumps, Works Branch, Hong Kong Government;*
- *WBTC No. 2/93B, Public Filling Facilities, Works Branch, Hong Kong Government;*
- *WBTC No. 16/96, Wet Soil in Public Dumps, Works Branch, Hong Kong Government;*
- *WBTC Nos. 4/98 and 4/98A, Use of Public Fill in Reclamation and Earth Filling Projects, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 12/2000, Fill Management; Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 19/2001, Metallic Site Hoardings and Signboards, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 12/2002, Specification Facilitating the Use of Recycled Aggregates. Works Bureau, Hong Kong SAR Government;*
- *ETWB TC(W) No. 19/2005 Environmental Management on Construction Site; Environment, Transport and Works Bureau, Hong Kong SAR Government.*
- *DEVB TC(W) No. 6/2010, Trip Ticket for Disposal of Construction and Demolition Materials;*
- *DEVB TC(W) No. 8/2010, Enhanced Specification for Site Cleanliness and Tidiness;*
- *DEVB TC(W) No.2/2011, Encouraging the Use of Recycled and Other Green Materials in Public Works Projects;*
- *DEVB TC(W) No. 9/2011, Enhanced Control Measures for Management of Public Fill; and*
- *Hong Kong Blueprint for Sustainable Use of Resources 2013-2022, Environment Bureau, May 2013;*
- *Project Administration Handbook for Civil Engineering Works (2020 Edition) – Section 4.1.3 relating to construction and demolition materials; Section 4.13(a) & Appendix 4.14 relating to the use of tropical hard wood on construction site.*

6.3 Assessment Methodology

6.3.1 The potential environmental impacts associated with the handling and disposal of waste arising from the construction and operation of the Project were assessed in accordance with the criteria presented in *Annexes 7 and 15 of EIAO-TM* and summarised as follows:

- Estimation of the types and quantities of the wastes to be generated based on information provided by the Engineering Design Team and the relevant research and studies on waste arisings;
- Assessment of the secondary environmental impacts due to the management of waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges and traffic; and
- Assessment of the potential impacts on the capacity of waste collection, transfer and disposal facilities.

6.4 Expected Waste Sources

Introduction

6.4.1 The proposed drainage improvement works is adopted in a manner of optimizing land resumption and balancing different design constraints. The proposed alignment is designed to follow the original river as far as practicable in order to minimize the generation of inert C&D materials. The proposed drainage improvement works include the following construction activities:

- (i) Site clearance including demolition of existing structures in the works area;
- (ii) Construction and demolition of temporary structures;
- (iii) Demolition and re-provision of vehicular and footway crossing;
- (iv) Excavation and formation of channels;
- (v) Construction of channels by concrete lining;
- (vi) Construction of maintenance / access roads, box culverts and other ancillary structures;
- (vii) Laying of u-channels and drainpipes along carriageway and rural road; and
- (viii) Planting and landscaping works.

6.4.2 Construction activities will result in the generation of a variety of Construction and Demolition (C&D) materials. The C&D materials are usually mixed consisting of inert C&D materials (public fill) such as soil, rock, concrete, brick, and asphalt etc and non-inert C&D materials comprising metal, timber, paper and plastic. Chemical waste and general refuse may also arise as a result of construction activities. The likely waste generated from the construction of the proposed drainage channels can be classified into the following categories:

Table 6.2 Waste Type Classification

Category	Related Construction Activities
Site clearance / demolition materials (Composes 20% non-	I. Site clearance including demolition of existing structures in the works area
	II. Construction and demolition of temporary structures

Category	Related Construction Activities
inert C&D materials)	III. Demolition and re-provision of vehicular and footway crossing
C&D materials during construction (Composes 5% non-inert C&D materials)	IV. Excavation and formation of channels
	V. Construction of channels by concrete lining
	VI. Construction of maintenance / access roads, box culverts and other ancillary structures
	VII. Laying of u-channels and drainpipes along carriageway and rural road
	VIII. Planting and landscaping works
Chemical waste	All above activities
General refuse	All above activities

6.4.3 Stream bed material will be excavated, and then taken up for temporary storage. After formation of the river channel, the stream bed material will be restored to form the natural riverbed.

6.4.4 During operation period, only a small amount of excess silty material and vegetation will be generated from the maintenance of the channels. Also, small amount of general refuse will be generated from the maintenance of manhole of u-channel and road drain.

6.4.5 Handling and disposal of the above-mentioned wastes may cause environmental impacts and nuisance if it is not properly managed.

6.5 Waste Management Assessment

Construction Phase

Site Clearance / Demolition Materials

6.5.1 Site clearance and demolition works will be required and thus generating waste material during construction.

6.5.2 The proposed 2 km long Drainage Channel TKL05 and 1.3 km long Drainage Channel TKL04 pass through some villages, agricultural land, bare ground, open storage and temporary structures. Site clearance / demolition works will involve the removal of vegetation (mainly grasses and shrubs) and some trees, demolition of structures (a few abandoned village houses and potentially some temporary structures) and removal of topsoil.

6.5.3 Demolition of temporary structures and abandoned houses will generate concrete rubble, plastics, metals, glasses, asphalts, wood and refuse. Potential for reuse of such materials on site is very limited.

6.5.4 Some good quality reusable topsoil is anticipated to be generated from site clearance works across agricultural land. This can be stockpiled and used later in final landscaping works, thus saving costs for such works and transportation and environmental impacts of disposal. Some suitable material may also be

generated from excavation of the streams. This material can be mixed with the soil for landscaping use, including tree waste (approximately 81.3 m³⁽¹⁾), which can be chipped and reused for planting and landscaping.

- 6.5.5 The proposed road drainage works at Ping Che Road and drainage improvement works at Ping Yeung Village will be carried out mainly in carriageway and rural road. Waste of this nature will be generated mainly during the site erection process. The amount of waste is expected to be small (about 1-2m³ per month).
- 6.5.6 Estimated quantities of C&D materials generated during site clearance in TKL04 and TKL05 are tabulated in **Tables 6.3**⁽²⁾.

Table 6.3
Estimated Quantities of C&D Materials generated during Site Clearance of TKL04 &TKL05

Section	Chainage	Amount of C&D Materials (m ³)		
		Inert C&D Materials	Non-inert C&D Materials	Total C&D Materials
TKL04	CH1200-CH1400	920	230	1,150
TKL04	CH0-CH1200	7,120	1,780	8,900
TKL05	CH1800-CH2100	1,915	479	2,394
TKL05	CH1100-CH1800	1,200	300	1,500
TKL05	CH0-CH1100	8,360	2,090	10,450
<i>Total</i>		<i>19,515</i>	<i>4,879</i>	<i>24,394</i>

- 6.5.7 The re-provision of the pedestrian and vehicle crossings would generate a negligible amount of C&D material (about 2-3m³ per month) consisting mainly inert C&D materials such as broken concrete, rubbles, asphalt and the like. A very small quantity of non-inert C&D materials such as metal railings, vegetation will be generated. Potential for reuse of these materials on-site is also limited.
- 6.5.8 The surplus inert C&D materials (public fill) and non-inert C&D materials generated from the site clearance works will be disposed of at public fill reception facilities and landfill in Hong Kong, respectively. It is estimated that a total of 15 truck trips per days (about 12 truck trips per day for inert C&D materials and 3 truck trips per day for non-inert C&D materials) will be required to dispose the materials/waste off-site, respectively⁽³⁾. With proper implementation of good site practices and mitigation measures presented in **Section 6.6**, potential water quality, dust and noise impacts associated with on-

¹ Tree calculation assumes same volume of tree crown and tree.

² The waste types mentioned in section 6.5.4, 6.5.5, and 6.5.7 are included as inert and non-inert C&D materials, respectively, in Table 6.3.

³ Assuming a capacity of 5.6 m³ per truck, bulk factor of 1.4 and 25 working days a month. The duration of construction works for site clearance is 14 months.

site handling and transportation of the inert C&D materials and non-inert C&D materials to disposal sites are not expected.

C&D Materials during Construction

- 6.5.9 The major C&D materials generated from the Project will arise during the formation of the 3.2 km long drainage channel and pipelaying of 2 km long road drains. It is expected that most of this material will be muddy deposits, topsoil, sand, gravel, artificial hard materials and some underlying rock. A preliminary estimate of the C&D materials generated during channel excavation and construction of road drains and the breakdown is shown in **Table 6.4**.
- 6.5.10 Some suitable material for reuse may be generated from excavation of the streams and road. These materials can be mixed with topsoil and stockpiled for later landscaping use. Rocks, cobbles and other suitable material from existing stream beds should be stockpiled for later reused for backfilling or as stream bed materials subject to the size requirement. **Table 6.6** provides an estimate of the amount of excavated material that can be recycled and reused for the Project, which is equivalent to 56% of the total C&D materials generated during channel excavation and construction. Non-recyclable non-inert C&D materials will be sent to NENT landfill. The remaining 86,292 m³ of surplus inert C&D materials will be disposed to the designated public fill reception facility.
- 6.5.11 The surplus inert C&D materials (public fill) and non-inert C&D materials generated from the excavated works will be disposed of at public fill reception facilities and landfill in Hong Kong, respectively. It is estimated that a total of 24 truck trips per day (about 21 truck trips per day for inert C&D materials and 3 truck trips per day for non-inert C&D materials) will be required to dispose the materials/waste off-site, respectively⁽¹⁾. No construction work will be commenced until all issues on management of C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including Public Fill Committee and EPD. With proper implementation of good site practices and mitigation measures presented in **Section 6.6**, potential water quality, dust and noise impacts associated with on-site handling and transportation of the inert C&D materials and non-inert C&D materials to disposal sites are not expected.

Table 6.4
Estimated Quantities of C&D Materials generated during Channel Excavation and Construction of TKL04 and TKL05

Section	Chainage	Amount of C&D Materials (m ³)		
		Inert C&D Materials	Non-inert C&D Materials	Total C&D Materials

¹ Assuming a capacity of 5.6 m³ per truck, bulk factor of 1.4 and 25 working days a month. The duration of civil works for river construction is 49 months and road drainage works are 18 months. It is also assumed that two areas are working simultaneously.

TKL04	CH 1200-CH1400	8,037	423	8,460
TKL04	CH0-CH1200	30,894	1,626	32,520
TKL05	CH1800-CH2100	42,323	2,228	44,550
TKL05	CH1100-CH1800	60,515	3,185	63,700
TKL05	CH0-CH1100	60,515	3,185	63,700
Total				212,930

Table 6.5
Estimated Quantities of C&D Materials generated during Excavation and Construction of Road Drainage in Ping Che Road and Ping Yeung Village

Section	Amount of C&D Materials (m ³)		
	Inert C&D Materials	Non-inert C&D Materials	Total C&D Materials
Ping Che Road	1,323	252	1,575
Ping Yeung Village	2,204	420	2,624
Total			4,199

Table 6.6
Estimated Quantity of Inert C&D Materials to be Reused on Site

Section	Chainage	Amount of Inert C&D Materials (m ³) to be Reused on Site		
		Inert Soft C&D Materials	Inert Hard C&D Materials	Total Inert C&D Materials
TKL04	CH1200-CH1400	1,944	216	2,160
TKL04	CH0-CH1200	9,288	1,032	10,320
TKL05	CH1800-CH2100	27,540	3,060	30,600
TKL05	CH1100-CH1800	36,855	4,095	40,950
TKL05	CH0-CH1100	31,941	3,549	35,490
Total			119,520	

Chemical Waste

6.5.12 Wastes classified as chemical waste are listed in the *Waste Disposal (Chemical Waste) (General) Regulation*. Where the construction processes produce chemical waste, the contractor must register with EPD as a chemical waste producer. In general, chemical waste would mainly arise from maintenance of construction equipment. These may include the following items:

- 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 from equipment cleaning activities.

- 6.5.13 Chemical wastes pose serious environmental and health and safety hazards if not stored and disposed of in an appropriate manner as outlined in the Chemical Waste Regulation. These hazards include:
- Toxic effects to workers;
 - Adverse effects on water quality from spills; and
 - Fire hazards.
- 6.5.14 The amount of chemical waste cannot be accurately predicted at this stage since it largely depends on the contractor's housekeeping measure. The amount is anticipated to be small (about 50 litres per month) and it is recommended that good housekeeping measures such as formulating a good planning on use of chemical products, should be implemented to reduce the amount of chemical waste generated. The chemical wastes will be collected by licensed collector for the disposal of at licensed treatment facilities (e.g. Chemical Waste Treatment Centre (CWTC) at Tsing Yi) in accordance with relevant regulation and guideline.
- 6.5.15 With the incorporation of suitable arrangements for the storage, handling, transportation and disposal of chemical wastes under the requirements stated in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste*, it is expected that no adverse environmental and health impacts and hazards will result from the handling, transportation and disposal of chemical waste arising from the Project.

General Refuse

- 6.5.16 The presence of a construction site with workers and associated site office will result in the generation of general refuse (mainly consist of food waste, aluminium cans and waste paper) which requires off-site disposal. The storage of general refuse has the potential to give rise to adverse environmental impacts. These include odour if the waste is not collected frequently, windblown litter, water quality impacts if waste enters water bodies, and visual impact.
- 6.5.17 Assuming up to 60 construction workers will be working on site at any one time, with a general refuse generation rate of 0.65 kg per worker per day ⁽¹⁾, the amount of general refuse to be generated will be about 39 kg per day.
- 6.5.18 Recyclable materials such as paper and aluminium cans will be separated and delivered to the local specialised recycling companies. An adequate number of waste containers will be provided to avoid spillage of waste. The non-recyclable waste will be collected and disposed of at the NENT landfill (during the advanced works) on a regular basis. With respect to the small quantity of general refuse to be transferred it is not anticipated that it will cause adverse operational impacts to these facilities.

1 This is considered as a conservative estimate based on the number reported in a number of EIA reports approved under this EIAO.

Summary

6.5.19 A summary of the main C&D materials and construction wastes expected to arise from the Project and the estimated quantities for each type of C&D materials is presented in **Tables 6.7** and **6.8** respectively.

Table 6.7
Types of C&D Materials and Construction Wastes Generated by the Proposed Works

Area	Major Activities	C&D Materials/ Construction Waste Type
Temporary and permanent works area of all drainage channel	<ul style="list-style-type: none"> • Site clearance including demolition of existing structures in the works area • Construction and demolition of temporary structures • Demolition and re-provision of vehicular and footway crossing 	Vegetation, garbage, topsoil, concrete and other inert materials
Permanent works area not part of existing streams	<ul style="list-style-type: none"> • Construction of maintenance / access roads, box culverts and other ancillary structures • Construction of channels by concrete lining 	Soil, rock and other inert materials
Permanent works area that are part of existing streams	<ul style="list-style-type: none"> • Excavation and formation of channels 	Soil, rock and other inert materials
Public road	<ul style="list-style-type: none"> • Laying of u-channels and drainpipes along carriageway and rural road 	Artificial hard materials, soil, rock and other inert materials
All	<ul style="list-style-type: none"> • Construction of channel structures / general site activities • Planting and landscaping works 	Chemical waste, vegetation, concrete waste, scrap metal, general refuse, wood and other non-inert waste

Table 6.8
Summary of the Quantities of C&D Materials and Construction Wastes Arising from the Proposed Channels

Scope Works (See note 1)	C&D Materials				Chemical Wastes	General Refuse
	Inert C&D Materials		Non-inert C&D Materials			
	Reuse on-site (m ³)	Off-site Disposal (m ³)	Recyclable (m ³)	Non-recyclable (m ³)		
Site Clearance/Demolition Works (Works scope items (i) to (iii))	0	19,515	250	4,629	50 litres per month (See note 2)	39 kg per day (See note 3)
Channel Construction TKL04 (Works scope items (iv) to (vi))	12,480	26,451	100	1,949		
Channel Construction TKL05 (Works scope items (iv) to (vi))	107,040	56,313	400	8,198		

Road Drainage at Ping Che Road (Works scope items (vii))	0	1,323	10	242		
Road Drainage at Ping Yeung Village (Works scope items (vii))	0	2,204	15	405		
Total	119,520	105,806	775	15,423		

Notes:

1. The scope works items refer to section 6.4.1.
2. The amount of chemical waste will be dependent on the contractor’s on-site maintenance programme and the number of equipment and vehicles used on-site. Chemical waste should be collected by licensed contractor and properly disposed of at approved chemical waste treatment facilities. Chemical waste will be generated throughout the construction period.
3. The amount of general works waste will dependent on the contractor’s operating procedures and housekeeping practices as well as the size of the workforce on-site. All such wastes should be sorted, reused and recycled before disposal at designated outlets. General works waste will be generated throughout the construction period.

6.5.20 A summary of the estimated C&D materials and waste and their disposal routes are tabulated in **Table 6.9**.

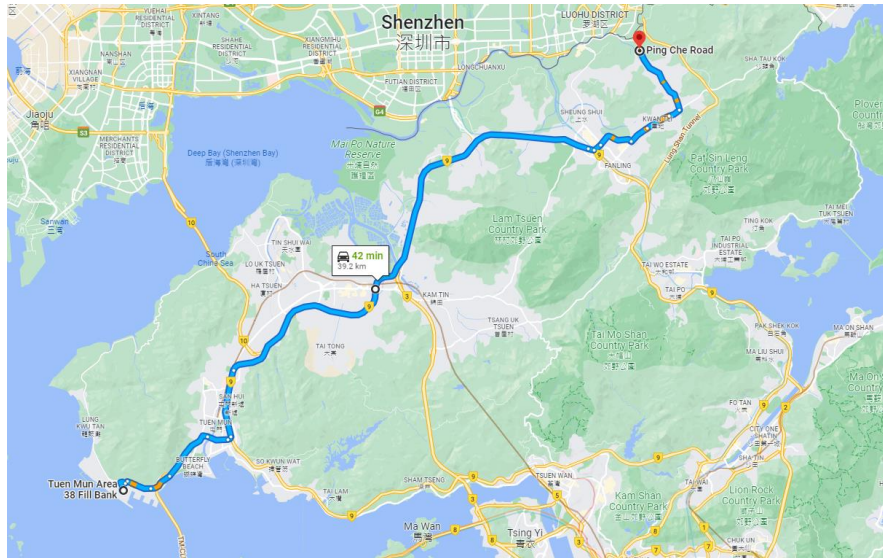
Table 6.9
Summary of the Quantities and Disposal Routes of C&D Materials and Waste Arising from the Project

C&D Materials and Waste Types	Estimated Quantities*	Disposal Routes (see note 5, 6)	Estimated Number of Truck Trips Required (see note 7)
Site Clearance / Demolition Materials - Inert C&D materials - Non-inert C&D materials	Total 24,394m ³ (see note 1) 19,515 m ³ 4,879 m ³	<u>Inert C&D materials</u> Sort out recyclable materials, suitable material reuse on site or reuse at other approved projects, dispose to designated Public Filling Facilities (e.g. Fill Bank at Tuen Mun Area 38). <u>Non-inert C&D materials</u> Sort out recyclable materials before disposal at NENT Landfill in Ta Kwu Ling.	<u>Inert C&D materials</u> 12 truck trips per day <u>Non-inert C&D materials</u> 3 truck trips per day
C&D Materials during Construction - Reused for this Project - Inert C&D materials - Non-inert C&D materials	Total 217,130 m ³ (see note 2) 119,520 m ³ 86,291 m ³ 11,319 m ³	<u>Inert C&D materials</u> Sort out recyclable materials, suitable material reuse on site or reuse at other approved projects, dispose to designated Public Filling Facilities (e.g. Fill Bank at Tuen Mun Area 38). <u>Non-inert C&D materials</u> Sort out recyclable materials before disposal at NENT Landfill in Ta Kwu Ling.	<u>Inert C&D materials</u> 21 truck trips per day <u>Non-inert C&D materials</u> 3 truck trips per day
Chemical Waste	50 litres per month (see note 3)	<u>Chemical waste</u> Recycle, dispose to approved chemical waste treatment	<u>Chemical waste</u> 1 truck trip per month

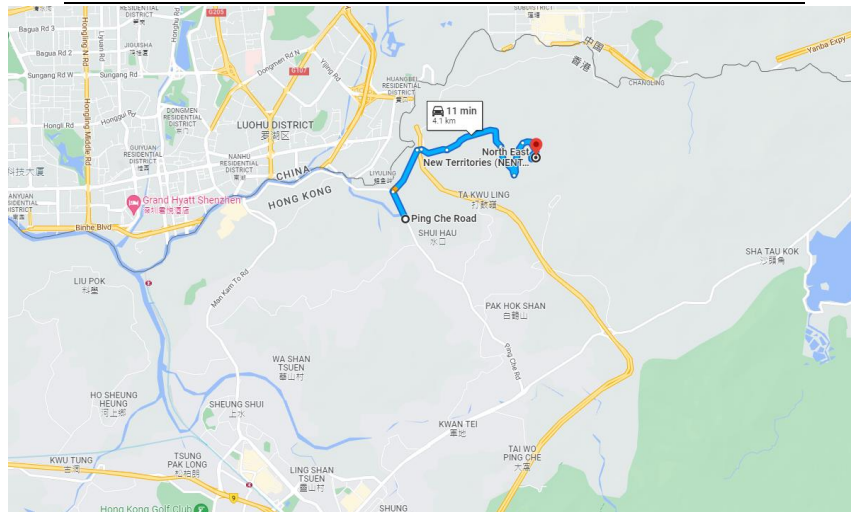
		facilities. (e.g. Chemical Waste Treatment Centre (CWTC) at Tsing Yi)	
General Refuse	39 kg per day (see note 4)	<u>General refuse</u> Sort out recyclable materials (e.g. paper, plastic, aluminium can), dispose to NENT Landfill in Ta Kwu Ling.	<u>General refuse</u> 1 truck trip per day

Notes:

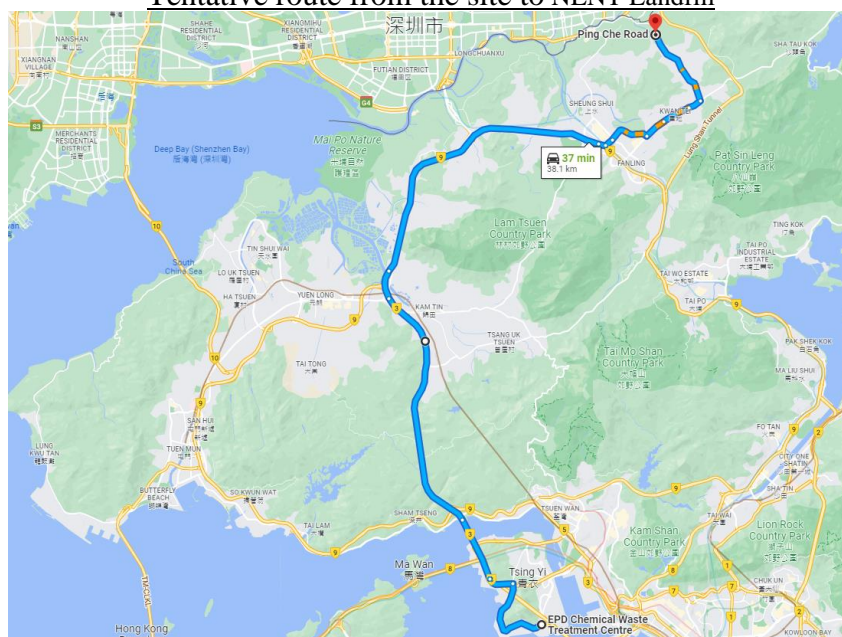
- * The estimated quantities are based on the preliminary design of the proposed channel works and the available ground investigation data. The waste arising will largely depends on the contractor works programme and activities. The contractor will be required to provide detailed estimation of all the C&D materials and waste generated on-site using a Monthly / Yearly Waste Flow Table as required under *ETWB TCW No. 19/2005*.
- 1 From clearance of vegetation, demolition of hard paved slab, temporary structures and small houses.
 - 2 Topsoil and suitable materials will be stockpiled for later reuse in this or other projects subject to approval by the relevant parties in accordance with *DEVB TC(W) No. 6/2010*. The amount of materials that can be reuse in this Project will be examined further during the detailed design and construction stages.
 - 3 The amount of chemical waste will be dependent on the contractor's on-site maintenance programme and the number of equipment and vehicles used on-site. Chemical waste should be collected by licensed contractor and properly disposed of at approved chemical waste treatment facilities (e.g. the Chemical Waste Treatment Centre at Tsing Yi).
 - 4 The amount of general works waste will depend on the contractor's operating procedures and housekeeping practices as well as the size of the workforce on-site. All such wastes will be sorted, reused and recycled before disposal at designated outlets.
 - 5 All suitable materials will be reuse and recycle before disposal. Reuse of C&D materials at other projects is subject to approval by the relevant parties in accordance with *DEVB TC(W) No. 6/2010*. Final disposal outlets subject to final agreement with Public Fill Committee of CEDD for Public Filling Facilities and EPD for landfills. The tentative disposal routes (subject to further change) of inert C&D material in Fill Bank at Tuen Mun Area 38, non-inert C&D material at NENT landfill and chemical waste in CWTC in Tsing Yi, are presented after Table 6.9.
 - 6 No barging point or conveyor system will be used in this Project. The stockpiling area and disposal outlet will be determined on site subject to contractor arrangement. It is anticipated that the stockpiling location will be shifted along the river side based on the construction programme and the stockpiling period will be less than 1 week in average.
 - 7 The quantities of the disposal works will depend on the contractor's programme after the contracts are awarded.



Tentative route from the site to Fill Bank at Tuen Mun Area 38



Tentative route from the site to NENT Landfill



Tentative route from the site to Chemical Waste Treatment Centre

Operational Phase

- 6.5.21 General inspection and maintenance in 6 months basis will be necessary for the proposed drainage channel to remove excessive silts, vegetation growth, debris and obstructions in order to maintain the flow in the channel and its structural integrity. Siltation will generally be allowed to accumulate and removal of excess silt would only be carried out at locations where water flow is impeded. All chemical waste (i.e. lubricants, oils, solvents and paint products) should be properly stored, labelled and removed by licensed waste collectors in accordance with Waste Disposal (Chemical Waste) (General) Regulation. Such small-scale maintenance works will only generate small volume of waste (about 10 m³ each time) and it is thus anticipated that adverse impacts regarding waste management will not occur provided that the generated wastes are stored, transported and disposed properly.

6.6 Mitigation Measures

Construction Phase

General

- 6.6.1 The HKSAR Government's construction and demolition waste management policy follows the same hierarchy as for other wastes i.e. in order of desirability: avoidance, minimisation, recycling, treatment and safe disposal of waste. As the Project will generate more than 50,000 m³ of C&D materials, a Construction and Demolition Material Management Plan (C&DMMP) should be prepared and submit to the Public Fill Committee of CEDD for approval prior to commencement of the detailed design in accordance with Appendix 4.12 of Chapter 4 of the Project Administration Handbook for Civil Engineering Works (PAH) .".
- 6.6.2 Training of construction staff should be undertaken by the contractor about the concept of site cleanliness and appropriate waste management procedures. The contractor should develop and provide toolbox talk for on-site sorting of C&D materials to enhance worker's awareness in handling, sorting, reuse and recycling of C&D materials. Requirements for staff training should be included in the Contractor's Environmental Management Plan (EMP).
- 6.6.3 Good planning and site management practice should be employed to eliminate over ordering or mixing of construction materials to reduce wastage. Proper storage and site practices will minimise the damage or contamination of construction materials.
- 6.6.4 Where waste generation is unavoidable, the potential for recycling or reuse should be rigorously explored. If waste cannot be recycled, disposal routes described in the EMP should be followed. A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be implemented. In order to monitor the disposal of C&D material and solid wastes at public filling facilities and landfills and to control fly-tipping, a trip-ticket

system should be included. One may make reference to *DEVB TC(W) No. 6/2010* for details.

- 6.6.5 Regular cleaning and maintenance of the waste storage area should be provided.

On-site Sorting, Reuse and Recycling

- 6.6.6 All waste materials should be segregated into categories covering:

- Inert C&D materials suitable for reuse on-site;
- Inert C&D materials suitable for public filling facilities;
- Recyclable non-inert C&D materials for recycling;
- Non-recyclable non-inert C&D materials for landfill;
- Chemical waste; and
- General refuse for landfill.

- 6.6.7 Proper segregation and disposal of construction waste should be implemented. Separate containers should be provided for inert and non-inert C&D materials .

- 6.6.8 Sorting is important to recover materials for reuse and recycling. Specific area should be allocated for on-site sorting of C&D materials and to provide a temporary storage area for those sorted materials. If area is limited, all C&D materials should at least be sorted on-site into inert and non-inert components. Non-inert materials such as bamboo, timber, vegetation, packaging waste and other organic materials should be reused and recycled wherever possible and disposed to designated landfill only as a last resort. Inert materials (public fill) such as concrete, stone, clay, brick, soil, asphalt and the like should be separated and reused in this or other projects (subject to approval by the relevant parties in accordance with the *DEVB TC(W) No. 6/2010*) before disposed of at a public filling facility operated by CEDD. Steel and other metals should be recovered from demolition waste stream and recycled.

- 6.6.9 The reuse of inert materials such as soil, rock and broken concrete should be maximised. Waste should be separated into fine, soft and hard materials. To facilitate the blue-green design scheme, hard material can be reused and placed in the riverbed to form riprap. This minimises the use of imported material and maximises use of the C&D material produced. Except for excavated clay, most of C&D material can easily be reused. Suitable soft materials should be used for landscaping and grading of embankments. Fine material should be separated out and used as topsoil.

- 6.6.10 The feasibility of using recycled aggregates in lieu of virgin materials should be rigorously considered during the detailed design and construction stages as stipulated in *WBTC No. 12/2002* and *ETWB TCW No. 24/2004*. In general, recycled aggregates are suitable for use as fill materials in earthworks, road sub-base formation, and drainage works. Recycled aggregates can also be used in concrete (up to Grade 35) for mass concrete walls and other minor structures such as planter boxes, toe wall planters and pavement, etc. In addition, some recycled rock material can be reused in the gabions, as rock fill or as stream bed material.

Concrete Waste (Inert C&D materials)

- 6.6.11 Dry concrete waste (considered as inert C&D materials) should be sorted out from the other wastes and recycled for reuse or sorted out for disposal at designated public filling facilities.

Wooden Materials (Non-inert C&D materials)

- 6.6.12 All wooden materials (considered as non-inert C&D materials) used on-site should be kept separate from other wastes to avoid damage and to facilitate reuse. Timber which cannot be reused should be sorted out from other waste and stored separately from all inert waste before being disposed of to landfill.
- 6.6.13 Reusable steel or concrete panel shutters, fencing and hoarding and signboard should be used as a preferred alternative to items made of wood, to minimise wastage of wood. Attention should be paid to *WBTC No. 19/2001 - Metallic Site Hoardings and Signboards* to reduce the amount of timber used on construction sites. Metallic alternatives to timber are readily available and should be used rather than new timber. Precast concrete units should be adopted wherever feasible to minimize the use of timber formwork.
- 6.6.14 Only waste material need be taken to a landfill. It should be separated from recyclable wood and steel materials. As for all waste types these materials should be reused on-site or other approved sites before disposal is considered as an option. Disposal to landfill should only be considered as a final option. Contractors are responsible for storage of re-useable materials on-site.

Site Clearance / Demolition Materials/ C&D Materials

- 6.6.15 Control measures for temporary stockpiles on-site should be taken in order to minimize the noise, generation of dust, pollution of water and visual impact. These measures include:
- Surface of stockpiled soil should be regularly wetted with water especially during dry season;
 - Disturbance of stockpiled soil should be minimized;
 - Stockpiled soil should be properly covered with tarpaulin especially when heavy rain storms are predicted;
 - Stockpiling areas should be enclosed where space is available;
 - Stockpiling location should be away from the water bodies; and
 - An independent surface water drainage system equipped with silt traps should be installed at the stockpiling area.
- 6.6.16 The identification of final disposal sites for C&D materials generated by the construction works will be considered during the detailed design stage of the Project when the volume and types of C&D materials can be more accurately estimated. The Public Fill Committee of CEDD should be consulted on designated outlets (e.g. public filling area) for inert C&D materials, whilst EPD should be consulted on landfills for non-inert C&D materials. Disposal of

construction waste to landfill must not have more than 50% (by weight) inert material. The construction waste delivered for landfill disposal should contain no free water and the liquid content should not exceed 70% by weight.

- 6.6.17 In order to avoid dust or odour impacts, any vehicle leaving a works area carrying inert or non-inert C&D materials should have their load covered up before leaving the construction site.
- 6.6.18 C&D materials should be disposed of at designated public filling facilities or landfills. Disposal of these materials for use at other construction projects is subject to the approval of the Engineer and/or other relevant reception authorities. Furthermore, unauthorized disposal of C&D materials in particular on private agricultural land is prohibited and may be subject to relevant enforcement and regulating actions. The disposal of inert and non-inert C&D materials will be controlled through trip-ticket system in accordance with *DEVB TC(W) No. 6/2010*.

Chemical Waste

- 6.6.19 Where the construction processes produce chemical waste, the contractor must register with EPD as a chemical waste producer. Wastes classified as chemical wastes are listed in the *Waste Disposal (Chemical Waste) (General) Regulation*. These wastes are subject to stringent disposal routes. EPD requires information on the particulars of the waste generation processes including the types of waste produced, their location, quantities and generation rates. A nominated contact person must be registered with EPD. An updated list of licensed chemical waste collector can be obtained from EPD.
- 6.6.20 Storage, handling, transport and disposal of chemical waste should be arranged in accordance with the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* published by EPD, and should be collected by a licensed chemical waste collector.
- 6.6.21 Chemical waste should be stored away from channels or water bodies.
- 6.6.22 Suitable containers should be used for specific types of chemical wastes, containers should be properly labelled (English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations), resistance to corrosion, stored safely and closely secure. Stored volume should not be kept more than 450 litres unless the specification has been approved by the EPD. Storage area should be enclosed by three sides by a wall, partition or fence that is at least 2 m height or height of tallest container with adequate ventilation and space.
- 6.6.23 Hard standing, impermeable surfaces draining via oil interceptors and grease trap should be provided in works area compounds. Interceptors should be regularly emptied to prevent release of oils and grease into the surface water drainage system after accidental spillages. The interceptor should have a bypass to prevent flushing during periods of heavy rain. Oil and fuel bunkers should be bunded and/or enclosed on three sides to prevent discharge due to accidental spillages or

breaches of tanks. Bunding should be of sufficient capacity to accommodate 110% of the volume of the largest container or 20% of the total volume of waste, whichever is largest. Waste collected from any grease traps should be collected and disposed of by a licensed contractor.

- 6.6.24 Lubricants, waste oils and other chemical wastes are likely to be generated during the maintenance of vehicles and mechanical equipment. Used lubricants should be collected and stored in individual containers which are fully labelled in English and Chinese and stored in a designated secure place. If possible, such waste should be sent to specialised recycling companies, and the empty oil drums collected by appropriate companies for reuse or refill.
- 6.6.25 The registered chemical waste producer (i.e. the contractor) has to arrange for the chemical waste to be collected by licensed collectors. The licensed collector should regularly take chemical waste to a licensed chemical waste treatment facility (such as the Chemical Waste Treatment Centre in Tsing Yi). A trip ticket system operates to control the movement of chemical wastes.
- 6.6.26 No chemicals/chemical waste (i.e. lubricants, oils, solvents and paint products) should be allowed to discharge into water courses, either by direct discharge, or as contaminants carried in surface water runoff from the construction site.

General Refuse

- 6.6.27 General refuse generated on-site should be stored in enclosed bins or skips and collected separately from other construction and chemical wastes and disposed of at designated landfill. A temporary refuse collection point should be set up by the contractor to facilitate the collection of refuse by licensed contractors. The removal of waste from the site should be arranged on a daily or at least on every second day by the contractor to minimise any potential odour impacts, minimise the presence of pests, vermin and other scavengers and prevent unsightly accumulation of waste.
- 6.6.28 The recyclable component of the general refuse generated by the workforce, such as aluminium cans, paper and cleansed plastic containers should be separated from other waste. Provision and collection of recycling bins for different types of recyclable waste should be set up by the contractor. The contractor should also be responsible for arranging recycling companies to collect these materials.

Operation Phase

- 6.6.29 The silt materials and debris collected during operation and maintenance should be properly packed and transported to the designated landfill for disposal as soon as possible. All chemical waste (i.e. lubricants, oils, solvents and paint products) should be properly stored, labelled and removed by licensed waste collectors in accordance with Waste Disposal (Chemical Waste) (General) Regulation.

6.7 Residual Environmental Impacts

6.7.1 With the implementation of the recommended mitigation measures, no unacceptable residual impacts are anticipated from the construction and operation of the Project.

6.8 Environmental Monitoring and Audit Requirements

Construction Phase

6.8.1 To facilitate monitoring and control over the contractors' performance on waste management, a waste monitoring and audit programme will be implemented throughout the construction phase and a Waste Management Plan (WMP) which form part of the EMP, will be submitted to Architect/Engineer for approval before construction in accordance with ETWB TC(W) No. 19/2005. The aims of the monitoring and audit programme are:

- To review the WMP including the quantities and types of C&D materials generated, reused and disposed of off-site, the amount of fill materials exported from/imported to the site and the quantity of timber used in temporary works construction for each process/activity;
- To monitor the implementation and achievement of the WMP on site to assess its effectiveness; and
- To monitor the follow-up actions on deficiencies identified.

6.8.2 Site inspections will be undertaken each week. Particular attention will be given to the contractor's provision of sufficient spaces, adequacy of resources and facilities for on-site sorting and temporary storage of C&D materials. The C&D materials to be disposed of from the site will be visually inspected to ensure the absence of non-inert materials (e.g. general refuse, timber, etc.). The waste to be disposed of at landfills will as practicable contain no inert or reusable/recyclable C&D materials (e.g. soil, broken rock, metal, and paper/cardboard packaging, etc.). Any irregularities observed during the site inspections will be raised promptly to the contractor for rectification.

6.8.3 The findings of the waste inspections will be reported in the monthly Environmental Monitoring and Audit Report.

Operation Phase

6.8.4 No monitoring and audit are required during operation of the Project.

6.9 Conclusion

6.9.1 The proposed drainage improvement works is adopted in a manner of optimizing land resumption and balancing different design constraints. The proposed alignment is designed to follow the original river as far as practicable in order to minimize the generation of inert C&D materials. Wastes generated by the construction activities are likely to include inert and non-inert C&D materials

from the construction works, general refuse from the workforce and chemical waste from any maintenance of construction plant and equipment. Provided that these identified wastes arisen are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed in terms of the avoidance-minimisation-reuse-recycling-disposal hierarchy, unacceptable environmental impacts are not anticipated during construction of the Project.

- 6.9.2 The waste generated by different construction activities are categorised into “Site Clearance/ Demolition Materials”, “C&D Materials during Construction”, “Chemical Waste” and “General Refuse”. The estimated quantities are about 24,394m³, 217,130m³ 50L/month and 39kg/day respectively. In general, the excavated inert C&D materials will be reused as much as practicable of about 119,520 m³ and the rest will be sent to public fill facilities (i.e. Fill Bank at Tuen Mun Area 38) for disposal. The recyclable C&D materials will be sort out from the non-inert C&D materials before disposal at NENT Landfill. The chemical waste will be collected and then recycle, dispose to approved chemical waste treatment facilities (e.g. Chemical Waste Treatment Centre (CWTC) at Tsing Yi). The general refuse will be disposed to NENT Landfill.
- 6.9.3 The recommended measures can be enforced by incorporating them into the waste management requirements in the WMP as part of the EMP and it shall be submitted to Architect/Engineer for approval before construction. Environmental site audit would be necessary to ensure the implementation of proper waste management practices during construction.
- 6.9.4 A C&DMMP shall be prepared and submit to the Public Fill Committee of CEDD for approval prior to commencement of the detailed design in accordance with Appendix 4.12 of Chapter 4 of the Project Administration Handbook for Civil Engineering Works (PAH).
- 6.9.5 For the operation phase, silts, vegetation, debris and obstruction are expected to be generated during maintenance works of the river. Such waste will be removed by manual means and disposed of to landfill after the clearance works. All chemical waste (i.e. lubricants, oils, solvents and paint products) should be properly stored, labelled and removed by licensed waste collectors in accordance with Waste Disposal (Chemical Waste) (General) Regulation. No unacceptable environmental impacts are anticipated with proper waste management practices.

END OF TEXT