

7 WASTE MANAGEMENT IMPLICATIONS

7.1 Overview

This section identifies the quality and quantity of waste generated from construction and operational phase of the Project, and evaluates the potential waste management implications that may result from waste generated during these phases.

Mitigation measures and good site practices, including waste handling, storage and disposal, have been recommended with reference to relevant waste legislation and management guidelines.

The waste management implications have been assessed in accordance with the requirements of Annexes 7 and 15 of the TM-EIAO as well as the requirements set out under Clause 3.4.8 of the EIA Study Brief.

7.2 Environmental Legislation, Standards and Guidelines

The relevant legislation and associated guidance notes relate to the study for the assessment of waste management implications include:

- Waste Disposal Ordinance (WDO) (Cap 354) and subsidiary Regulations;
- Environmental Impact Assessment Ordinance (Cap 499), Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) Annex 7 and Annex 15;
- Dumping at Sea Ordinance (Cap 466);
- Land (Miscellaneous Provisions) Ordinance (Cap 28); and
- Public Health and Municipal Service Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances By-laws.

Under the Waste Disposal Ordinance, some of the regulations are relevant to this EIA, including:

- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354); and
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap 354).

7.2.1 Waste Disposal Ordinance (WDO)

The Waste Disposal Ordinance (WDO) prohibits any unauthorised disposal of wastes. 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, wastes can only be disposed of at designated waste disposal facilities licensed by Environmental Protection Department (EPD). Breach of this Ordinance can lead to a fine and/or imprisonment. The WDO also stipulates the requirements for issuing licenses for the collection and transportation of wastes.

7.2.2 Waste Disposal (Charges for Disposal of Construction Waste) Regulation

Under the WDO and the Charging Regulation, wastes can only be disposed of at designated waste disposal facilities licensed by EPD. Schedule 5 of Regulation defines that inert construction waste includes rock, rubble, boulder, earth, soil, sand, concrete, brick, tile, masonry or used bentonite. According to Schedule 6 of the Regulation, 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 public fill reception facility for disposal must consist entirely of inert material.

For construction work with a value of more than HK\$1M, the main contractor is required to establish a billing account at EPD before transporting the construction waste to the designated waste disposal facilities (e.g. landfill, public fill etc). The vessels for delivering construction waste to public fill reception facility would need prior approval from EPD. Breach of these regulations can lead to a fine and/or imprisonment.

Depending on the percentage of inert materials in the construction waste, construction waste can be disposed at public fill, sorting facilities, landfills and outlying islands transfer facilities where different disposal cost would be applied. The scheme encourages reducing, reusing and sorting of construction waste such that the waste producer can minimise their disposal fee.

7.2.3 Waste Disposal (Chemical Waste) (General) Regulation

Chemical waste includes any scrap materials, or unwanted substances specified under Schedule 1 of this Regulation, if such a substance or chemical occurs in such a form, quantity or concentration that causes pollution or constitutes a danger to health or risk of pollution to the environment.

A person shall not produce, or cause to be produced, chemical wastes unless he is registered with EPD as a chemical waste producer. Any person who contravenes this requirement commits an offence and is liable to a fine and/or imprisonment. Chemical wastes must be treated, utilising on-site plant licensed by EPD or have a licensed collector to transport the wastes to a licensed facility. For each consignment of wastes, the waste producer, collector and disposer of the wastes must

sign all relevant parts of a computerized trip ticket. The system is designed to trace wastes from production to disposal.

This regulation also prescribes the storage facilities to be provided on site including labeling and warning sign. To minimize 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 storage of chemical wastes. The waste producer must also provide employees with training for such procedures.

7.2.4 Dumping at Sea Ordinance

According to the Dumping at Sea Ordinance, a permit from EPD is required if any waste producer intend to dump materials from vessels to designated marine dumping areas. The Authority will consider a number of factors including sources and nature of materials to be dumped, dumping rates, need for inspection / testing, water pollution avoidance measures etc before determining whether such a permit would be granted and, where deemed necessary, any conditions to be complied with. Breach of the requirements in the permit would result in a fine and / or to imprisonment.

7.2.5 Land (Miscellaneous Provisions) Ordinance

The inert portion of C&D materials may be taken to public filling facilities including public filling area, public filling barging points and stockpiling areas. This ordinance requires Dumping Licenses (to be issued by CEDD) to be obtained by individuals or companies, who deliver inert C&D materials to the public filling facilities.

Individual licenses and windscreen stickers are issued for each vehicle involved. Public filling areas will accept only inert building debris, soil, rock and broken concrete. There is no size limitation on the rock and broken concrete, and a small amount of timber mixed with inert material is permissible. The material should, however, be free from marine mud, household refuse, plastic, metal, individual and chemical wastes, animal and vegetable matters and any other materials considered unsuitable by the Filling Supervisor.

7.2.6 Public Cleansing and Prevention of Nuisances Regulation

This regulation provides further control on illegal dumping of litter or waste in street and public places (including water course, stream, channel etc). Offence of this regulation would result in a fine and / or to imprisonment.

7.2.7 Construction & Demolition (C&D) Material Management Plan

According to the ETWBTC (Works) No. 33/2002, for Designated Projects, a Construction and Demolition Material Management Plan (C&DMMP)

has to be submitted to the Public Fill Committee (PFC) for approval in case of C&D materials disposal exceeding 50,000m³. The C&DMMP has been approved by PFC.

ETWBTC (Works) No. 19/2005, Environmental Management on Construction Site, sets out the policy, procedures and requirements for contractor to prepare and implement an Environmental Management Plan for on-site sorting and waste reduction of C&D materials.

7.2.8 Disposal Criteria for Dredged / Excavated Sediment

ETWBTC (Works) No. 34/2002 stipulates the procedures for seeking approval to dredge or excavate marine sediment and the management framework for its disposal of such sediment. Applications for approval of dredging proposal and allocation of marine disposal shall be made to the Secretary of Marine Fill Committee (MFC). Marine Dumping Permits as stipulated under the Dumping at Sea Ordinance are required from EPD for the disposal of dredged sediment. No dredging works is allowed to proceed until all issues on management of dredged sediments have been resolved and all relevant arrangements have been endorsed by the relevant authorities including MFC and EPD. Exact location for marine disposal will be assigned by MFC.

7.2.9 Other Relevant Guidelines

The following documents and guidelines in **Table 7.1** also relate to waste management and disposal:

Table 7.1 - Other relevant documents and information

Bureau / Department	Documents / Guidelines / Technical Circulars
Development Bureau	<ul style="list-style-type: none"> • WBTC No. 2/93, Public Dumps • WBTC No 2/93B, Public Filling Facilities • WBTC No. 16/96, Wet Soil in Public Dumps • WBTC Nos. 4/98 and 4/98A, Use of Public Fill in Reclamation and Earth Filling Project • WBTC No. 12/2000, Fill Management • WBTC No. 19/2001, Metallic Site Hoardings and Signboards • WBTC No. 06/2002 and 06/2002A, Enhanced Specification for Site Cleanliness and Tidiness • WBTC No. 12/2002, Specification Facilitating the Use of Recycled Aggregates • DBTC(W) No. 6/2010, Trip-ticket System for Disposal of Construction and Demolition Material • Environment, Transport and Works Bureau Technical Circular (ETWBTC) (Works) No. 33/2002, Management of Construction and Demolition Material Including Rock
Development Bureau	<ul style="list-style-type: none"> • ETWBTC (Works) No. 34/2002, Management of Dredged / Excavated Sediment • ETWBTC (Works) No. 19/2005, Environmental Management on Construction Site

Bureau / Department	Documents / Guidelines / Technical Circulars
EPD / CEDD	<ul style="list-style-type: none"> New Disposal Arrangements for Construction Waste (1992)
EPD	<ul style="list-style-type: none"> Waste Disposal Plan for Hong Kong (December 1989) Waste Reduction Framework Plan, 1998 to 2008 A Policy Framework for Management of Municipal Solid Waste (2005 -2014), (December 2005) Code of Practice on the Packaging, Labeling and Storage of Chemical Wastes (1992) Practice Guide for Investigation and Remediation of Contaminated Land (2011) Guidance Note for Contaminated Land Assessment and Remediation, (2007) Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management, (2007)
PlanD	<ul style="list-style-type: none"> Hong Kong Planning Standards and Guidelines, Chapter 9 (Section 6 – Waste Management)

7.3 Description of the Environment

7.3.1 Waste Handling and Management in the Study Area

7.3.1.1 Existing Land Use

KTN NDA

The KTN NDA covers an area of about 450ha and is predominantly rural in character and the existing developments are mostly located on the flat land in the southern and central parts of the NDA. Domestic structures, rural industries and open storage are commonly found along Fanling Highway and the major access roads.

FLN NDA

The FLN NDA has an area of about 164ha. It mainly comprises an elongated area of low flatland with channelized watercourse of Ng Tung River and a few mitigation meanders resulted from river training. Existing land uses are primarily agriculture intermixed with domestic structures. There are also a number of open storage uses alongside Man Kam To Road.

7.3.1.2 Existing Solid Waste Arising

The existing solid waste arising from the area within the proposed NDAs include domestic waste from village houses, agricultural waste (part of which are reused on site), commercial/ industrial waste generated from open storage and industrial uses; and chemical waste from vehicle breaking and repair operations. The majority of these wastes are generated from the Kwn Tung areas. Waste generated from Sheung Shui North and Fanling North areas are mainly agricultural related and are

expected to be re-used on site. The contribution of waste generated from these areas is considered to be small.

7.3.1.3 Waste Arising District (WAD)

The NENT NDAs fall within North Waste Arising District (WAD). Municipal Solid Waste (MSW) arising within North Waste WAD during 2011 was approximately 569 tonnes per day (tpd), of which approximately 30% was derived from the commercial and industrial sources. The breakdown of the type of waste generated within North WAD is shown in **Table 7.2**.

Table 7.2 - Arising of solid waste in NENT in 2011⁽¹⁾

WAD	Average daily quantity (tpd)				
	Domestic waste public collected (a)	Commercial & industrial waste (b)	Municipal solid waste (a) + (b)	Landfilled construction waste (c)	Total (a) + (b) + (c)
North	339	161	500	69	569

Note:

1. Source: Monitoring of Solid Waste in Hong Kong 2011, EPD.

Major existing waste facilities serving the Study Area are shown in **Table 7.3** below.

Table 7.3 - Summary of existing waste facilities serving the Study Area

Waste Facilities	Date of Commission	Design Capacity
Strategic Landfills		
NENT	1995	35 Mm ³
Refuse Transfer Stations		
North West New Territories (NWNTRTS) at Shun Tat Street, Tuen Mun (near Lam Tei)	2001	1,100 tpd
Special Waste Facilities		
Sha Ling Livestock Waste Composting Plant and livestock waste collection service	1991	20 tpd
Ngau Tam Mei Animal Waste Composting Plant	2008	20 tpd
Chemical Waste Treatment Centre	1993	100,000 t/year

7.4 Assessment Methodology

The assessment of waste management implications from handling, storage, collection, transportation and disposal of solid waste materials generated from the landuse proposals have been undertaken in accordance with Annexes 7 and 15 of the TM-EIAO and the EIA Study Brief.

The waste management hierarchy has been applied in the assessment and development of mitigation measures for waste. The waste management hierarchy is a concept which shows the desirability of

various waste management methods and comprises the following in order of preference:

- Avoidance;
- Minimisation;
- Recycling/reuse;
- Treatment; and
- Disposal.

All opportunities for reducing waste generation have been assessed based upon the following factors:

- Avoiding or minimising waste generation throughout design, construction and operational phase;
- Adopting better management practices to promote segregation materials;
- Reuse and recycling on site or other projects; and
- Diverting waste to public fills as far as possible.
- Using recycled materials for construction as far as practicable in the construction stage.
- Installing appropriate facilities for segregation of various types of wastes during operational stage; and
- Arranging and facilitating collection of wastes by the appropriate waste recyclers as far as practicable in the operational stage.

7.4.1 Analysis of Activities and Waste Generation

The quantity, quality and timing of the waste arising as a result of the construction and operation activities of the NENT NDAs project and associated works have been estimated, based on the sequence and duration of these activities. The design, general layout, construction methods and programme to minimize the generation of public fill/inert C&D materials for other construction works have been considered.

The potential waste management implications associated with the handling, transportation and disposal of waste arising from the construction works have been assessed with reference to the following approach:

- Estimation of the types, timing and quantities of the wastes to be generated and fill to be impacted; and
- Assessment of the potential waste management implications on the capacity of collection, transfer and disposal facilities.

The waste generation rate adopted in the assessment is based on statistical data and previous studies including *Monitoring of Solid Waste*

in Hong Kong – Waste Statistics for 2011, and Reduction of Construction Waste Final Report (Hong Kong Polytechnics, 1993).

7.4.2 Proposal for Waste Management

Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generated, on-site or off-site re-use and recycling have been evaluated. Measures which can be taken in the planning and design phases (e.g. by modifying the design approach) and in the construction phase for maximizing waste reduction have been separately considered.

After considering all the opportunities for reducing waste generation and maximizing re-use, the types and quantities of the remaining wastes required to be disposed of have been estimated and the disposal options for each type of wastes have been described. The disposal method recommended for each type of wastes has been taken into account the result of the assessment.

The impacts caused by handling (including labelling, packaging and storage), collection, and reuse / disposal of wastes has been addressed and appropriate mitigation measures have been proposed.

7.5 Identification and Evaluation of Waste Management Implications

7.5.1 Construction Phase

The following Designated Projects (DPs) have been included in the waste management implication assessment for construction phase:

KTN NDA

- San Tin Highway / Fanling Highway Kwu Tung Section Widening (between San Tin Interchange and Po Shek Wu Interchange) (Major Improvement); (DP1)
- Castle Peak Road Diversion (Major Improvement) (DP2)
- KTN NDA Road P1 and P2 (New Road), and associated new Kwu Tung Interchange (New Road) and Pak Shek Au Interchange Improvement (Major Improvement) (DP 3)
- KTN NDA Road D1 to D5 (New Road) (DP 4)
- New Sewage Pumping Stations (SPS) in KTN NDA(DP 5)
- Proposed railway station and associated facilities in KTN NDA (To be conducted under other separated studies). (DP 6)
- Utilization of Treated Sewage Effluent(DP 7)

FLN NDA

- Utilization of Treated Sewage Effluent(DP 7)
- Po Shek Wu Interchange Improvement (Major Improvement) (DP 8)
- Fanling Bypass Western Section (New Road) (DP 9)
- Fanling Bypass Eastern Section (New Road) (DP 10)
- Proposed expansion and upgrading of Shek Wu Hui Sewage Treatment Works at FLN NDA (DP 11)
- Reprovision of Wholesale market in FLN NDA (DP 12)
- Construction of new Sewage Pumping Stations (SPS) in FLN NDA (DP13)

The main activities which would potentially result in the generation of waste include:

- Site clearance and site formation activities;
- Construction of infrastructures within NDAs;
- External access route improvement works; and
- Construction of service reservoir.

Typical waste types associated with the above activities include:

- Site clearance waste;
- Excavated materials;
- Construction and demolition (C&D) materials;
- Asbestos containing materials;
- Chemical wastes;
- General refuse; and
- Sewage.

The quantities of wastes to be generated during construction of the proposed NDAs are largely depended on the programmes of various development packages and also require off-site disposal. The estimated amount of different type of wastes to be generated during construction phase is summarized in **Table 7.3**.

Table 7.3 - Estimated amount of different type of wastes to be generated during construction phase

NDAs	Activities	Activity period	Quantity of material to be generated (m ³)									
			Site Clearance				Site Formation				New Building Construction	
			Broken Concrete (Inert C&D)	Non-inert Portion (C&D Waste)	Top Soil	Broken Asphalt	Rock	Inert Soft C&D Material	Alluvium	Contaminated Soil	C&DM	General Refuse
KTN NDA	Site clearance, & site formation	2018 to 2028	252,000	105,000	96,000	57,000	0	1,346,000	288,000	1,181,000	0	
	Construction of new buildings & structures	2020 to 2031	0	0	0	0	0	0	0	0	272,046	
FLN NDA	Site clearance, & site formation	2019 to 2028	107,000	29,000	90,000	9,000	24,000	491,000	48,000	0	0	
	Construction of new buildings & structures	2020 to 2031	0	0	0	0	0	0	0	0	153,909	
												<1950 kg/ day
												Few hundred cubic meter per month

Note:

1. The above volumes are in-situ volume (without bulking factor) and rounded to the nearest 1,000 m³.
2. The C&D waste will be disposed at landfills.
3. The Top Soil will be on-site reuse.

7.5.1.1 C&D Materials from Site Clearance and Formation

C&D Material Generated during Site Clearance

The study area comprises the KTN NDA and FLN NDA. Since the large area, large quantities of waste will be generated from site clearance. Site clearance waste will mainly from the demolition of existing structures, tree felling and site clearance of existing ground surface and consists of broken concrete, non-inert portion, broken asphalt and top soil. It is estimated that up to approximately 359,000m³ broken concrete, 134,000m³ non-inert portion, 186,000m³ top soil and 66,000m³ broken asphalt will be generated. The broken concrete, broken asphalt and part of top soil could be reused in under this project. The quantity of material generated and to be reused/recycled are shown in **Table 7.4** below.

Part of the top soil generated would reused on-site for the proposed landscape works in NDAs. The surplus top soil may be supplied to the potential users such as the government agents of concurrent works projects in the vicinity of the NDAs. These potential users of the surplus top soil would be consulted in the later stages. Disposal of surplus top soil to landfill sites would be considered as the last resort

With the proper implementation of good construction site practice, the on-site handling and reuse of top soils would not cause adverse environmental impacts (including potential hazard, dust emissions, noise and wastewater discharge).

Table 7.4 - Estimation of C&D material volumes in each NDA during site clearance⁽¹⁾

NDA	(A) Broken Concrete (Inert C&D Hard) (m ³)	(B) Non-inert Portion (C&D Waste) (m ³) (2)	(C) Top Soil (m ³) (3)	(D) Broken Asphalt (m ³)
KTN	252,000	105,000	96,000	57,000
FLN	107,000	29,000	90,000	9,000
Reused/ Recycle	359,000	-	50,000	66,000
Total material to be disposed	0	134,000	136,000	0

Note:

1. The above volumes are in-situ volume (without bulking factor) and rounded to the nearest 1,000 m³.
2. The C&D waste will be disposed at landfills.
3. The Top Soil will be on-site reuse as far as possible.

C&D Material Generated during Site Formation

Excavated material is defined as inert virgin material removed from the ground and sub-surface which is generated during site formation. The storage and stockpiling of excavated material prior to utilisation on site may contribute to the generation of dust, visual impacts from unsightliness and water quality impacts from runoff. The disposal of

excavated material also has the potential to result in noise and dust impacts from loading and unloading and emissions from haul vehicles.

With reference to the site investigation results, alluvial clay is widely encountered in the study area, with a thickness of up to 8m in KTN NDA, generally 6 to 10m in FLN NDA. In addition, there are a number of ponds within the Project area affected, especially in KTN NDA. If there is any pond sediment generated, it would be left in-situ.

It is proposed to carry out appropriate soil mixing or cement mixing work to improve the physical properties of the excavated alluvium such that the grading and plasticity of the mixture will be suitable for reuse on-site as backfilling material.

The site formation for the freshwater service reservoir in Kwu Tung North would be commenced in year 2017 to suit the schedule of development of Lok Ma Chau Loop.

However, the stockpiling area in NDA would not be available until the completion of land resumption in mid 2018. Therefore about 90,000m³ of inert soft C&D material generated from the construction of freshwater service reservoir in Kwu Tung North before mid 2018 would be exported to Lok Ma Chau Loop for the filling works.

If the Lok Ma Chau Loop project would not be implemented, the commencement date of the service reservoir construction could be postponed until the available of the stockpiling area and exporting surplus material to concurrent project is not required. Coordination will be made with relevant departments and the Fill Management Committee for the disposal arrangement of surplus C&D materials.

The total volume of C&D materials generated is estimated to be 3.38Mm³ (in-situ volume) as shown in **Table 7.5** below. The inert soft C&D material, rock generation will be reused in the project. The alluvium and contaminated soil generation will be reused on-site as fill material after suitable improvement.

With the proper implementation of good construction site practice and mitigation measures recommended in **Section 7.6.1**, potential dust, noise and water quality impacts associated with on-site handling and transportation to disposal sites are not expected.

Table 7.5 - Estimation of C&D material generation during site formation

Area	(A) Rock Generati on (m ³)	(B) Inert Soft C&D Material Generation (m ³)	(C) Alluvium Generation (m ³)	(D) Contaminated Soil Generation (m ³)	(E) = (A)+(B)+(C)+(D) Excavation (m ³)
KTN	0	1,346,000	288,000	1,181,000	2,815,000
FLN	24,000	491,000	48,000	0	563,000
Sub-total	24,000	1,837,000	336,000	1,181,000	3,378,000
Reused/ Recycle	24,000	1,747,000	336,000	1,181,000	3,288,000

Area	(A) Rock Generati on (m ³)	(B) Inert Soft C&D Material Generation (m ³)	(C) Alluvium Generation (m ³)	(D) Contaminated Soil Generation (m ³)	(E) = (A)+(B)+(C)+(D) Excavation (m ³)
Total material to be exported	0	90,000	0	0	-

Note: The above volumes are in-situ volume (without bulking factor) and rounded to the nearest 1,000 m³.

Disposal Programme for C&D Materials

The estimated disposal programme of surplus C&D materials is shown in **Table 7.6**.

Imported Fill Materials

It is estimated that 1,604,000m³ of fill materials (bulk volume) will need to be imported. The imported fill materials will be used for backfilling during site formation for NDAs developments. The Project Proponent will review the programme during the detailed design stage and maximize the quantity of on-site reuse of surplus C&D materials. The estimated quantities of imported fill materials are shown in **Table 7.7**.

Table 7.6 Summary of annual disposal quantities of C&D materials

Material	Total (1,000 m ³)	In-situ Volume [Bulk Volume] (1,000 m ³) by year											
		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Inert Soft C&D Material	90 (refer table 7.5) [100]	66 [73]	25 [28]	-	-	-	-	-	-	-	-	-	-
Non-inert Portion (C&D Waste)	134 (refer table 7.4) [149]	-	-	10 [11]	15 [17]	7 [8]	2 [2]	1 [1]	1 [1]	19 [21]	46 [51]	30 [34]	3 [3]
Top Soil	136 (refer table 7.4) [151]	-	1 [1]	11 [12]	20 [22]	13 [14]	4 [5]	2 [2]	1 [2]	17 [19]	40 [44]	26 [28]	2 [2]

Note:

1. In-situ volume is given outside []. Bulk volume is denoted in []. Bulk factor of 1.11 is used for soil and non-inert C&D material.
2. The above quantities are rounded to integer.

Table 7.7 Summary of annual quantity of imported fill materials

Material	Total (1,000m³)	In-situ Volume [Bulk Volume] (1,000 m³) by year											
		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
General Fill	1,445 [1,604]	-	-	-	-	-	-	-	-	-	837 [929]	605 [672]	4 [4]

Note:

1. In-situ volume is given outside []. Bulk volume is denoted in []. Bulk factor of 1.11 is used for soil.
2. The above quantities are rounded to integer.

7.5.1.2 C&D Materials from New Building Construction

C&D materials will also be generated from construction of infrastructure including roads, new buildings and associated truck mains.

C&D materials comprises unwanted materials generated during construction, including rejected structures and materials, materials which have been over ordered or are surplus to requirements and materials which have been used and discarded. C&D materials will arise from a number of construction and maintenance activities and many include:

- Wood from formwork and falsework;
- Materials and equipment wrappings;
- Unusable / surplus concrete / grouting mixes; and
- Damaged / surplus construction materials.

C&D materials will also be generated from the demolition of existing structures within the proposed NDAs.

The C&D materials arising from the construction works will comprise inert (brick, concrete, soil etc) and putrescent (packaging material, paper, wood etc) materials. The estimation of the C&D materials arising has been based on the Gross Floor Area (GFA) provided in the RODP.

The quantities of C&D Material (including C&D waste and public fill) to be generated from the construction of the proposed infrastructures are summarized in **Table 7.8**.

Table 7.8 - Estimation of the arising of C&D Waste and Public Fill from new building Construction

NDAs	Gross Floor Area (m ²)	Total C&DM (m ³) ⁽¹⁾	C&D Waste (m ³) ⁽²⁾	Public Fill (Inert Part) (m ³) ⁽²⁾
KTN	2,720,464	272,046	35,365	236,680
FLN	1,539,097	153,909	20,008	133,900
Total	4,259,561	425,955	55,373	370,580

Note:

1. Based on the generation rate of 0.1m³ per 1m² of GFA (Source: Hong Kong Polytechnic University, 1993. Reduction of Construction Waste Final Report)
2. Based on Monitoring of Solid Waste in Hong Kong 2007, Environmental Protection Department, it is estimated that around 87% of the C&D material generated will be categorized as public fill and the remaining 13% as C&D Waste.

7.5.1.3 Contaminated Soil

The potential land contamination impacts of the Project have been assessed. The assessment involved site appraisal, site investigation, assessment of contamination level, and health risk assessment for high natural background of arsenic detected in KTN.

Site investigation works involving sampling and testing of soil and groundwater were conducted at 4 identified government sites (i.e. 3 in

KTN and 1 in FLN). No soil and groundwater contamination was detected, except the anomalous high arsenic was detected in all 3 sites in KTN.

All other potentially contaminated sites identified in 2 NDAs (include Fanling Bypass) were inaccessible and hence, no soil and groundwater sample has been collected during the course of this land contamination assessment study. Nevertheless, detailed SI for these sites should be conducted when they are resumed and handed over to the Project Proponent.

On the other hand, although many of the sites were not identified as potentially contaminated or could not be accessed for visual inspection during the site survey, these sites would still be in operation until commencement of construction. Any potential change of land uses (e.g. change of uses to say chemical storage area, dismantling workshop, etc) may result in potential land contamination. Re-appraisal of these sites is therefore required if they become part of the land requirement for NDA development.

The Project Proponent prepares and submits the Supplementary CAP to EPD prior to the commencement of SI works. Following on from the submission of CAP and completion of SI, prepare CAR, RAP and RR submitted to EPD for agreement prior to commencement of the development works on these sites.

Anomalous high arsenic detected in KTN was investigated. The investigation results indicated that the high arsenic in KTN is likely to be naturally occurred. A Health Risk Assessment (HRA) has been conducted for assessing the health risk levels due to the inhalation of arsenic-containing dust during construction stage and incidental ingestion of arsenic-containing soil during operational stage. A Health Risk Assessment Report has been prepared to summarize the extent mapping of arsenic level and health risk assessment findings, and appended in this land contamination assessment chapter of EIA Report. The HRA findings also indicated that the soils with arsenic level above 571 mg/kg will need to be treated, and the treatment methods "Excavation followed by Solidification/Stabilization" has been recommended for treating these arsenic-containing soils. It is estimated in the HRA report that 1.181Mm³ of arsenic soil should be treated.

As no other chemicals of concerns exceed the corresponding RBRG standards, so no treatment method is proposed.

7.5.1.4 Asbestos Containing Materials (ACM)

Asbestos is widely used in the construction industry before the early 1980's for fireproofing, thermal and electrical insulation and in sound absorption materials. However, asbestos is currently recognized as hazardous materials, due to its etiological effects on human respiratory system.

As the proposed project involves the demolition of buildings/structures that were built before 1980's, large amount of Asbestos Containing

Materials (ACM) may be present in the buildings of NDA areas. Thus, ACM which may be disturbed during the demolition activities, should be removed and disposed of in a proper manner prior to the demolition work, so as to avoid the release of harmful asbestos fibres into the environment and minimize potential hazard.

All ACM if confirmed to be present within the existing premises must be removed and disposed of in accordance with *the Air pollution Control Ordinance* and the *Waste Disposal Ordinance* prior to the refurbishment work. A Registered Asbestos Consultant and Registered Asbestos Laboratory shall be engaged to conduct investigation for the presence of ACM. An Asbestos Investigation Report, an Asbestos Abatement Plan (AAP) (if required) and a notification of commencement of asbestos abatement works shall be submitted to EPD at least 28 days before the asbestos abatement works commences. Also, the removal of ACMs should be carried out by a Registered Asbestos Contractor according to the approved AAP under the supervision of a Registered Asbestos Consultant. The asbestos waste generated shall be disposed of by a licensed waste collector in compliance with the *Waste Disposal Ordinance*.

7.5.1.5 Chemical Waste

Materials classified as chemical waste are listed in the *Waste Disposal (Chemical Waste) (General) Regulation*. The major chemical waste types arising from the construction sites may include the following:

- Scrap batteries;
- Spent hydraulic oils and waste fuel;
- Spent lubrication oils and cleaning fluids from mechanical machinery; and
- Spent solvent from equipment cleaning activities.

Chemical waste may pose the following environmental, health and safety hazards if not stored and disposed of appropriately:

- Toxic effects to workers;
- Adverse effects on water and land from spills; and
- Fire hazards.

It is difficult to quantify the amount of chemical waste as it will be highly dependent on the Contractor's on-site maintenance practice and the quantities of plant and vehicles utilized. Nevertheless, it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance will be small and in the order of few hundred litres per month.

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 Waste* published by the EPD.

Chemical waste should be collected by a licensed collector and to be disposed of at a licensed chemical waste treatment and disposal facility. Wherever possible, opportunities for the reuse and recycling of materials will be taken. Mitigation measures for chemical wastes are detailed in **Section 7.6.1.8**. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected.

7.5.1.6 General Refuse

The construction workers generate refuse comprising food wastes, waste paper, aluminium cans and plastic bottles during construction period.

The storage of general refuse may give rise to adverse environmental impacts. These could include water quality, odour and visual impact; and in the form of windblown litter. The construction site may also attract pests and vermin if the storage areas are not well maintained and cleaned regularly. In addition, disposal of waste at sites other than the approved disposal facilities could also lead to similar adverse impacts at those sites.

The number of work force (clerical and workers) to be employed for the Project is not available at this stage, but is anticipated not to be over 3,000 staffs. Based on the generation rate of 0.65kg/person/day, the total refuse generated per day would be less than 1950kg/day.

In order to minimize the final disposal quantities of general refuse, provisions of recycle bins for different types of recyclable waste should be provided together with a general refuse bin. Arrangements should be made with the recycling companies to collect the recycle waste as required. The Contractor should implement an education programme for workers relating to avoiding, reducing, reusing and recycling general waste. Participation in a local collection scheme should be considered by the Contractor to facilitate waste reduction.

Provided that the mitigation measures are adopted, the potential environmental impacts caused by the storage, handling transport and disposal of general refuse are expected to be minimal. It is recommended that general refuse should be collected on a daily basis for disposal. Mitigation measures to minimize potential environmental impacts are recommended in **Section 7.6.1.9**.

7.5.1.7 Sewage

Sewage will arise from amenity facilities used by the construction workers and site office's sanitary facilities. The sewage generated should be properly managed to minimize the adverse impact of odour and potential health risks to the workers by attracting pests and other disease vectors.

As the workers and staff are likely to be scattered along the proposed alignment and works area, adequate portable chemical toilets should be provided to ensure all sewage is properly collected. It is anticipated that no adverse environmental implications would arise if the chemical toilets are properly maintained and licensed collectors are employed for the

collection and disposal of sewage on a regular basis. Advanced notification and approval should be made to authorities prior to connection. With the implementation of mitigation measures described in **Section 7.6.1.10**, no adverse waste management implications would be expected.

7.5.1.8 Construction Waste Summary

A summary of the construction waste arising from the respective KTN NDA and FLN NDA with recommended mitigation during the construction phase is presented in **Table 7.9**.

Table 7.9 - Summary of waste arising from the construction phase

Phase	Major activities	Waste type	Total amount generated	Recommended outlets
KTN NDA	Site clearance	Broken Concrete(Inert C&D Hard)	252,000m ³	Reused within the site
		Non-inert Portion(C&D Waste)	105,000m ³	Disposal to landfill
		Top Soil	96,000m ³	- Disposal to landfill (70,000m ³); - Reused within the site (26,000m ³)
		Broken Asphalt	57,000m ³	Recycle
	Site formation	Rock	0 m ³	--
		Inert Soft C&D Material	1,346,000 m ³	- Disposal to other concurrent projects (66,000m ³); - Reused within the site (1,280,000m ³)
		Alluvium	288,000m ³	Reuse within the site
		Contaminated Soil	1,181,000 m ³	Reuse within the site
	Construction of new buildings and structures	C&D Materials	272,046 m ³	- Disposal to public fill (236,680m ³); - Disposal to landfill (35,366m ³)
	-	ACM	TBC ⁽¹⁾	TBC ⁽¹⁾
		General Refuse	Several hundreds kilogram per day	Disposal to landfill
		Chemical Waste	Few hundred cubic meter	Recycle by licensed facility and/or disposed of at CWTC

Phase	Major activities	Waste type	Total amount generated per month	Recommended outlets
		Sewage	Few hundred cubic meter per month	Chemical toilet to be collected and disposed by licensed collector
FLN NDA	Site clearance	Broken Concrete(Inert C&D Hard)	107,000m ³	Reused within the site
		Non-inert Portion(C&D Waste)	29,000m ³	Disposal to landfill
		Top Soil	90,000m ³	- Disposal to landfill (66,000m ³); - Reused within the site (24,000m ³)
		Broken Asphalt	9,000m ³	Recycle
	Site formation	Rock	24,000m ³	Disposal to public fill
		Inert Soft C&D Material	491,000m ³	- Disposal to other concurrent projects (24,000m ³); - Reused within the site (467,000m ³)
		Alluvium	48,000m ³	Reuse within the site
		Contaminated Soil	0 m ³	--
	Construction of new buildings and structures	C&D materials	153,909 m ³	- Disposal to public fill (133,900 m ³); - Disposal to landfill (20,009m ³)
	-	ACM	TBC ⁽¹⁾	TBC ⁽¹⁾
		General Refuse	Several hundreds kilogram per day	Disposal to landfill
		Chemical Waste	Few hundred cubic meter per month	Recycle by licensed facility and/or disposed of at CWTC
		Sewage	Few hundred cubic meter per month	Chemical toilet to be collected and disposed by licensed collector

Note:

1. Further investigation is required by asbestos specialist during the construction stage.

Construction work is not allowed to commence until all issues on management of C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including PFC and EPD.

7.5.2 Operational Phase

The operational phase of the proposed developments would generate the following categories of wastes based on their compositions:

- Municipal solid waste;
- Chemical waste; and
- Sewage sludge

The nature and quantity of each of these waste types arising from the operation of the proposed developments are described in the section below.

7.5.2.1 Municipal Solid Waste (MSW)

With reference to the data from Monitoring of Solid Waste in Hong Kong 2011 by EPD which is the latest information available. The MSW generation rate was 1.27kg/person/day. The estimated MSW arising in the NDAs is summarized in **Table 7.10** based on planned populations, showing about 270tpd of MSW would be generated during fully operational phase. This estimate assumed no waste reduction measure to reduce the demand for valuable landfill space. Based on information from EPD, the major components of MSW in Hong Kong included glass, metals, paper, plastics and putrescibles. Most of these materials are recyclable which could considerably reduce the amount for final disposal.

Table 7.10 - Estimated quantities of municipal solid waste to be generated from the NDAs

Locations	Planned Population	Estimated Employment	Estimated MSW Arising
KTN NDA	101,600	31,200	169tpd (61,685tpa)
FLN NDA	73,300	6,500	101tpd (36,865tpa)
Total	174,900	37,700	270tpd(98,550tpa)

1) Waste Collection and Disposal

An effective and efficient waste handling system is essential in order to minimize potential adverse environmental impacts during waste storage, collection and transport, such impacts may include odour if waste is not collected frequently; water quality if waste enters storm water drains; aesthetics and vermin problems if the waste storage area is not well maintained and cleaned regularly. The waste handling system may also facilitate materials recovery and recycling.

A refuse collection room could be installed in each building at the ground floor for localized refuse collection and the waste would be transported to a Central Refuse Collection Chamber (CRCC) using electrical vehicles.

The waste could be sorted to recover materials (such as paper and cardboards, plastics, metals and fluorescent lamps etc.) as far as possible, before to be compacted into containers at the CRCC. Different containers should be provided for the storage of different recyclable materials. To avoid potential odour nuisance to the students and residents during transport of waste, enclosed waste collection containers should be used and the collection route and time should be properly planned. The CRCC should contain mobile compactor and related equipment to provide adequate waste handling services. At least daily collection should be arranged by the waste collector.

2) Waste Recycling

In order to facilitate recycling, a 4-bin recycling system for paper, metals, plastics and fluorescent lamps should be adopted together with a general refuse bin. They should be placed in prominent places to promote waste separation at source. Additional recycling bins for toner cartridges and rechargeable battery should be provided in the offices. In addition, locations should be assigned for the collection of scrap electrical and electronic appliances. All recyclable materials should be transported to the CRCC and collected by recyclers. Moreover, the following measures should also be implemented to promote materials recovery and recycling:

- Banner should be erected at the recycling bins area;
- Operator should make arrangements with the recycler to collect and recycle used toner cartridges as well as the scrap electronic equipments, such as computers to avoid disposal of at landfills as far as practicable;
- Staff awareness training should be provided on waste management procedures, including waste reduction and recycling;
- Operator should set up waste reduction and recycled targets; and
- Operator should participate in the Wastewise Label Scheme to facilitate waste reduction.

7.5.2.2 Sewage Sludge

The proposed STW (Shek Wu Hui STW Extension) is designed to mainly handle the sewage arising from NDAs. It will be biological treatment plant. The design capacity of Shek Wu Hui (SWH)STW extension is 97,000m³/day. The major solid waste types produced from the STW would be grit and screenings from the inlet works and the digested sludge associated with the sewage treatment process. The total quantity of screenings and grit generated in the SWHSTW due to expansion is expected to increased by 16.5 m³/d and 1.4 m³/d respectively.

Sludge Thickening Tank is suggested to reduce the volume of primary sludge generated from primary sedimentation tank in SWHSTW, Anaerobic Digester is suggested to further reduce the sludge volume by about 50%. The biogas generated in the anaerobic digestion would be collected and reused in the anaerobic digester and for site use if sufficient. Centrifuge or filter press is suggested for digested sludge dewatering up to 30%w/w dry solid. It is estimated that 57m³/d of sewage sludge of Shek Wu Hui STW extension would be generated after sludge dewatering at full operation.

There are several sludge management technologies to treat the sludge before final disposal. Incineration and heat drying method are commonly applied for bulk volume reduction before disposal at landfills. The operation cost of incineration is lower than heat drying. Besides, the energy from the incineration process could be used and the volume of end product after incineration is considerably lower than that after heat drying. Incineration would be the preferred option for sludge management. However, owing to the high capital and operation cost of the incinerator, it is not cost effective to adopt incineration for on-site sludge treatment. Therefore, sewage sludge generated from STW is suggested to be treated at the proposed Sludge Treatment Facilities (STF) or landfill subject to detail design.

The sewage sludge would be delivered by road transport in water tight containers or skips to avoid odour emission during transportation to STF or landfill. It is estimated that 6-7 trucks from SWHSTW per day would deliver the sewage sludge to the STF or landfill at full operation.

7.6 Mitigation Measures

7.6.1 Construction Phase

The mitigation measures for construction phase are recommended based on the waste management hierarchy principles. Recommendations of good site practices, waste reduction measures as well as the waste transportation, storage and collection are described in following subsections.

7.6.1.1 Good Site Practice

Adverse waste management implications are not expected, provided that good site practices are strictly implemented. The following good site practices are recommended throughout the construction activities:

- Nomination of an approved personnel, such as a site manager, to be responsible for the implementation of 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, appropriate waste management procedures and concepts of waste reduction, reuse and recycling;
- Provision of sufficient waste disposal points and regular collection for disposal;
- Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- A Waste Management Plan (WMP) should be prepared by the contractor and submitted to the Engineer for approval.

7.6.1.2 Waste Reduction Measures

Amount of waste generation can be significantly reduced through good management and control. Waste reduction is best achieved at the planning and design phase, as well as by ensuring the implementation of good site practices. The following recommendations are proposed to achieve reduction:

- Segregate and store different types of waste in different containers, skip or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Proper storage and site practices to minimize the potential for damage and contamination of construction materials;
- Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste;
- Sort out demolition debris and excavated materials from demolition works to recover reusable/recyclable portions (i.e. soil, broken concrete, metal etc.);
- Provide training to workers on the importance of appropriate waste management procedures, including waste reduction, reuse and recycling.

In addition to the above measures, specific mitigation measures are recommended for the specific waste types so as to minimize environmental impacts during handling, transportation and disposal of waste.

7.6.1.3 Storage, Collection and Transportation of Waste

Storage of waste on site may induce adverse environmental implications if not properly managed. The following recommendation should be implemented to minimize the impacts:

- Waste such as soil should be handled and stored well to ensure secure containment;
- 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.

The collection and transportation of waste from works area to respective disposal sites may also induce adverse environmental impacts if not properly managed. The following recommendation should be implemented to minimize the impacts:

- Remove waste in timely manner;
- Employ the trucks with cover or enclosed containers for waste transportation;
- Obtain relevant waste disposal permits from the appropriate authorities; and
- Disposal of waste should be done at licensed waste disposal facilities.

In addition to the above measures, other specific mitigation measures on handling the excavated and C&D materials, chemical waste and materials generated from construction phase are recommended in the following subsections.

7.6.1.4 C&D Materials from Site Formation

Wherever practicable, C&D materials should be segregated from other wastes to avoid contamination and ensure acceptability at public filling areas or reclamation sites. The following mitigation measures should be implemented in handling the excavated C&D materials:

- Maintain temporary stockpiles and reuse excavated fill material for backfilling;
- Carry out on-site sorting;
- Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate;

- Adopt “selective Demolition” technique to demolish the existing structure and facilities with a view to recovering broken concrete effectively for recycling purpose, where possible; and
- Implement a trip-ticket system for each works contract to ensure that the disposal of C&D materials are properly documented and verified.

Details of the recommended on-site sorting and reuse of C&D materials is given below:

On-site Sorting of C&D Materials

All C&D materials arising from the construction of the Project would be sorted on-site to recover the inert C&D materials and reusable and recyclable materials prior to disposal off-site. Non-inert portion of C&D materials should also be reused whenever possible and be disposed of at landfills as a last resort.

The Contractor would be responsible for devising a system to work for on-site sorting of C&D materials and promptly remove all sorted and processed material arising from the construction activities to minimize temporary stocking on-site. It is recommended that the system should include the identification of the source of generation, estimated quantity, arrangement for on-site sorting and/ or collection, temporary storage areas, and frequency of collection by recycling Contractors or frequency of removal off-site.

The inert C&D materials (e.g. soil, building debris, concrete) would be sorted out from C&D materials at source to avoid double handling. Silty/ clayey materials from alluvium would be identified at source. Non-contaminated alluvial would be transported by leak proof trucks to eliminate water leakage during transportation. The trucks should also be covered with impervious sheeting to prevent any dust emissions.

Reuse of C&D Materials

The reused C&D materials would consist of fill Grade IV and V decomposed granite materials. It is anticipated that the excavated Grade IV and V decomposed granite materials consists of mainly Grade V, which is suitable for backfilling. Excavated rock, broken concrete and asphalt will be downsized and mixed with excavated inert soft C&D material and will be reused on-site as backfilling material. The actual amount of reused C&D material will depend on the content and quality of the excavated materials.

Disposal Programme for C&D Material

The NENT NDA project is a net fill-import project. However, due to the large amount of inert soft C&D material generation for site formation of service reservoirs in the early stage and unavailability of stockpiling area until year 2018, the excessive inert soft C&D material generation between year 2017 and February 2018 will be exported to other concurrent projects.

The Project Proponent shall liaise and agree with other concurrent project in detailed design phase.

Use of Standard Formwork and Planning of Construction Materials Purchasing

Standard formwork should also be used as far as practicable in order to minimise the arising of C&D waste. The use of more durable formwork (e.g. metal hoarding) or plastic facing should be encouraged in order to enhance the possibility of recycling. The purchasing of construction materials should be carefully planned in order to avoid over ordering and wastage.

Provision of Wheel Wash Facilities

Wheel wash facilities have to be provided at the site entrance before the trucks leaving the works area. Dust disturbance due to the trucks transportation to the public road network could be minimized by such arrangement.

7.6.1.5 Contaminated Soil

It is considered unlikely that contaminated land issues would be a concern during either the construction or the operational of the proposed development as remediation on contaminated area would be carried out prior to construction. However, as a precaution, it is recommended that standard good site practice should be implemented during the construction phase to minimize any potential exposure to contaminated soils or groundwater. The details of mitigation measures to minimize the potential environmental implications arising from the handling of contaminated materials are described in Land Contamination Impacts section.

7.6.1.6 C&D Material from Buildings Demolition and New Building Construction

The Contractor should recycle as much as possible of the C&DM on-site. Public fill and C&DM waste should be segregated and stored in different containers or skips to enhance reuse or recycling of materials and their proper disposal. For example, concrete and masonry can be crushed and used as fill, and steel reinforcing bar can be used by scrap steel mills. Different areas of the work sites should be designated for such segregation and storage.

The use of wooden hoardings shall not be allowed. An alternative material, such as metal, aluminium or alloy etc, could be used.

Government has developed a charging policy for the disposal of waste to landfill at present. It will provide additional incentive to reduce the volume of generated waste and ensure proper segregation to allow reuse of the inert material on site when implemented.

In order to minimize the impacts of the demolition works, the generated wastes must be cleared as quickly as possible after demolition. Therefore,

the demolition and clearance works should be undertaken simultaneously. To facilitate proper segregation of inert and non-inert C&D material arising from demolition works, selective demolition method should be adopted.

7.6.1.7 Asbestos Containing Materials (ACM)

Due to the potential large amount of ACM during the site clearance stage, asbestos investigation is required. However, as asbestos investigation will involve a large number of buildings and most premises will involve private access, which cannot be obtained at this stage, it is considered that an asbestos specialist shall be employed by the responsible parties during the construction stage to investigate this issue.

Sufficient and reasonable lead time shall be allowed for preparation, vetting and implementation of asbestos investigation report and asbestos abatement plan in accordance with Air Pollution Control Ordinance, Cap311, before commencement of any demolition or site clearance work.

Some key precautionary measures related to the handling and disposal of asbestos based on Handling of Asbestos Containing Materials in Buildings (ProPECC PN 2/97) are listed as following:

- Adoption of protection, such as full containment, mini containment, or segregation of work area;
- Provision of decontamination facilities for cleaning of workings, equipment and bagged waste before leaving the work area;
- Adoption of engineering control techniques to prevent fibre release from work area, such as use of negative pressure equipment with high efficiency particulate air (HEPA) filters to control air flow between the work area and the outside environment;
- Wetting of asbestos containing materials before and during disturbance, minimizing the breakage and dropping of asbestos containing materials, and packing of debris and waste immediately after it is produced;
- Cleaning of work area by wet wiping and vacuuming with HEPA-filtered vacuum cleaner;
- Coating on any surfaces previously in contact with or contained by asbestos with a sealant;
- Proper bagging, safe storage and disposal of asbestos and asbestos-contaminated waste;
- Pre-treatment of all effluent from the work area before discharged; and
- Air monitoring strategy to check the leakage and clearance of the work area during and after the asbestos work.

The handling and disposal of ACM will be carried out in accordance with the EPD's Code of Practice on Handling, Transportation and Disposal of Asbestos Waste and Practice Note for Professional Persons – Handling of ACM in Buildings.

7.6.1.8 Chemical Waste

For those processes which generated chemical waste, it may be possible to find alternatives to eliminate the use of chemicals, to reduce the generation quantities or to select a chemical type of less impact on environment, health and safety as far as possible.

If chemical wastes are produced at the construction site, the Contractors should register with EPD as chemical waste producers. Chemical wastes should be stored in appropriate containers and collected by a licensed chemical waste contractor. Chemical wastes (e.g. spent lubricant oil) should be recycled at an appropriate facility as far as possible, while the chemical waste that cannot be recycled should be disposed of at either the Chemical Waste Treatment Centre, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

7.6.1.9 General Refuse

General refuse should be stored in enclosed bins separately from construction and chemical wastes. Recycling bins should also be placed to encourage recycling. Preferably enclosed and covered areas should be provided for general refuse collection and routine cleaning for these areas should also be implemented to keep areas clean. A reputable waste collector should be employed to remove general refuse on a daily basis. It is expected that such arrangements would minimize potential environmental impacts.

7.6.1.10 Sewage

The WMP should document the locations and number of portable chemical toilets depending on the number of workers, land availability, site condition and activities. Regularly collection by licensed collectors should be arranged to minimize potential environmental impacts.

7.6.2 Operational Phase

The following measures should be implemented on new developments to minimize the amount of waste to be disposed of at landfill and to maximize the recovery of material from the waste stream.

7.6.2.1 Municipal Solid Waste

General refuse from residential, commercial and industrial buildings should be collected with lidded bins and delivered to a central collection point and stored in enclosed containers to prevent windblown, vermin, water pollution and visual impact. At least daily collection should be arranged by the waste collector. Furthermore, the low emission trucks, such as EURO V or later model would be used for waste transportation to minimize traffic emission and the potential air quality impacts. According

to EPD website
(<http://www.info.gov.hk/gia/general/201205/29/P201205290472.htm>),
EURO V standards is the most stringent motor vehicle fuel and emission
standards compared to other standards such as Euro IV .

7.6.2.2 Chemical Waste

The proposed mitigation measures for operation phase are the same as the construction phase. The operators of various industrial uses should register with EPD as chemical waste producers. Chemical wastes should be stored in appropriate containers and collected by a licensed chemical waste contractor. Chemical wastes (e.g. spent lubricant oil) should be recycled at an appropriate facility as far as possible, while the chemical waste that cannot be recycled should be disposed of at either the Chemical Waste Treatment Centre, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

7.6.2.3 Sewage Sludge

Sewage sludge generated from STW is suggested to be treated at the proposed Sludge Treatment Facilities (STF) at Nim Wan or landfill subject to detail design.

Unloading process would be operated in the designated area inside the STW which should be enclosed and served by negative pressure by extracting odorous gas to deodorizing unit. The sewage sludge would be delivered by road transport in water tight containers or skips to avoid odour emission during transportation to STF or landfill. It is estimated that 5-6 trucks from SWHSTW extension per day would deliver the sewage sludge to the STF or landfill at full operation. Furthermore, the low emission trucks, such as EURO V or later model would be used for transportation to minimize traffic emission and the potential air quality impacts.

7.7 Residual Waste Management Implications

With the implementation of recommended mitigation measures for the handling, transportation and disposal of the identified waste, adverse residual waste management implications are not anticipated during both the construction and operational phases.

7.8 Conclusion

7.8.1 Construction Phase

Potential waste management implications from the generation of waste during the construction phase have been evaluated. Measures, including the opportunity for on-site sorting, reusing excavated fill materials etc., are devised in the construction methodology to minimise the surplus materials to be disposed. Recommendations have been made for

implementation by the Contractor during the construction period to minimise waste generation and off-site disposal. The disposal quantities for C&D materials and their disposal methods have also been assessed. Construction work is not allowed to commence until all issues on management of C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including PFC and EPD.

7.8.2 Operational Phase

The types of waste that would be generated during the operational phase have been assessed. Recommendations have been made to ensure proper treatment and disposal of these wastes.