8 WASTE MANAGEMENT IMPLICATION

8.1 Environmental Legislation, Standards and Guidelines

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

(1) Waste Disposal Ordinance (WDO) (Cap 354) and subsidiary Regulations;

(2) Environmental Impact Assessment Ordinance (EIAO) (Cap. 499), Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) Annex 7 and Annex 15;

(3) Land (Miscellaneous Provisions) Ordinance (Cap 28); and

(4) Public Health and Municipal Service Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances Regulation.

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

(1) Waste Disposal (Chemical Waste) (General) Regulation (Cap 354); and

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

Waste Disposal Ordinance (WDO)

8.1.3 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.

8.1.4 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.

Waste Disposal (Charges for Disposal of Construction Waste) Regulation

8.1.5 Under the Waste Disposal (Charges for Disposal of Construction Waste) 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 Facilities for disposal must consist entirely of inert material.

Waste Disposal (Chemical Waste) (General) Regulation

8.1.6 Under the WDO, the Chemical Waste (General) Regulation provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. EPD has also issued a ‘guideline’ document, the Code

of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), which details how the Contractor should comply with the regulations on chemical wastes.

Land (Miscellaneous Provisions) Ordinance

8.1.7 The inert portion of Construction and Demolition (C&D) materials may be taken to public filling facilities including public filling area, public filling barging points and stockpiling areas. These facilities usually form part of land reclamation schemes and are operated by Civil Engineering and Development Department (CEDD). The 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.

Public Cleansing and Prevention of Nuisances Regulation

8.1.8 This regulation provides control on illegal tipping of wastes on unauthorised (unlicensed) sites.

Construction & Demolition Material Management Plan (C&DMMP)

8.1.9 According to the "Project Administrative Handbook Chapter 4, Section 4.1.3", 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 300,000m^3.

8.1.10 ETWB TCW 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.

Other Relevant Guidelines

8.1.11 The following documents and guidelines in **Table 8.1** also relate to waste management and disposal:

Table 8.1: Other relevant documents and information

Bureau / Department	Documents / Guidelines / Technical Circulars
Development Bureau	• 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. 12/2002, Specification Facilitating the Use of Recycled Aggregates • ETWB TCW No. 34/2002, Management of Dredged / Excavated Sediment • ETWB TCW No. 19/2005, Environmental Management on Construction Site • DEVB TCW No. 06/2010, Trip-ticket System for Disposal of Construction and Demolition Material • DEVB TCW No. 08/2010, Enhanced Specification for Site Cleanliness and Tidiness • DEVB TCW No. 09/2011, Enhanced Control Measures for Management of

Bureau / Department	Documents / Guidelines / Technical Circulars
	Public Fill • Project Administrative Handbook for Civil Engineering Works, 2010 Edition, Section 4.1.3 of Chapter 4
CEDD	• Project Administrative Handbook for Civil Engineering Works, 2010 Edition
EPD / CEDD	• New Disposal Arrangements for Construction Waste (1992)
EPD	• 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	• Hong Kong Planning Standards and Guidelines, Chapter 9 (Section 6 – Waste Management)

8.2 Description of the Environment

Waste Handling and Management

Existing Landuse

8.2.1 The Study Area, as delineated in **Figure 227724/E/0001**, is located on the south-western slopes of the Tai Shueng Tok Hill at the far north-eastern edge of urban East Kowloon, and lies close to the major population centres of Kwun Tong, Lam Tin and Sau Mau Ping. Specifically, the Study Area covers an area of about 86 ha, which includes a platform area of about 40 ha.

8.2.2 The Study Area is divided into northern part (ARQ-N) and southern part (ARQ-S) by the Anderson Road as shown in **Figure 227724/E/4001**, which is under the management of KWP Quarry Co. Ltd. and China State Construction Ltd. (i.e. main contractor of Contract No. CV/2007/03 Development at Anderson Road), respectively.

8.2.3 Existing facilities in the northern part (ARQ-N) include quarry sites, office buildings, crushing plants, concrete block manufacturing plant, concrete production and asphalt facilities. The southern part comprises a construction site and site formation was in progress.

Existing Solid Waste Arising

8.2.4 The existing solid waste arising from the Study Area includes industrial waste generated from plant/quarry operations, chemical waste from vehicle and equipment maintenance activities and general refuse generated by site staffs. Chemical waste produced in the Study Area is collected and transferred to the Chemical Waste Treatment Centre (CWTC) in Tsang Yi for waste treatment. The general refuse are collected and handled by local waste collectors.

8.2.5 As advised by the operators, the inert residual would be generated from the concrete production and asphalt facilities during the production, which would be disposed to Public Fill Facilities.

8.2.6 Major existing waste facilities serving the Study Area are shown in **Table 8.2**.

Table 8.2: Summary of existing waste facilities serving the Study Area

Waste Facilities	Date of Commission	Design Capacity
Strategic Landfills		
SENT	1994	43 Mm^3
Special Waste Facilities		
Chemical Waste Treatment Centre	1993	100,000 t/year

8.3 Assessment Methodology

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

8.3.2 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:

(1) avoidance;

(2) minimisation;

(3) recycling/reuse;

(4) treatment; and

(5) disposal.

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

(1) avoiding or minimising waste generation throughout design, construction and operational phase;

(2) adopting better management practices to promote segregation materials;

(3) reuse and recycling on site or other projects; and

(4) diverting C&D materials to public fills as far as possible.

Analysis of Activities and Waste Generation

8.3.4 The quantity, quality and timing of the waste arising as a result of the construction and operation activities of the 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 the construction works have been considered.

8.3.5 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:

(1) estimation of the types, timing and quantities of the wastes to be generated and fill to be imported; and

(2) assessment of the potential waste management implications on the capacity of collection, transfer and disposal facilities.

(3) the waste generation and disposal rate adopted in the assessment is based on statistical data issued by EPD including "An Urgent Need to Suppress Waste Generation, 2010" and "Monitoring of Solid Waste in Hong Kong – Waste Statistics for 2011".

Proposal for Waste Management

8.3.6 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 design phase (e.g. by modifying the design approach) and in the construction phase for maximizing waste reduction have been separately considered.

8.3.7 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 taken into account the result of the assessment.

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

8.4 Identification and Evaluation of Waste Management Implications

8.4.1 The waste implication during construction and operational phase due to the development of the Anderson Road Quarry (ARQ) for residential (including public housing) and other uses has been assessed and presented in the following sub-sections.

Construction Phase

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

(1) site clearance and site formation;

(2) construction of road networks; and

(3) construction of the proposed buildings and infrastructure.

8.4.3 A variety of type of wastes would be generated during construction phase that can be divided into the following distinct categories based on their compositions:

(1) site clearance wastes;

(2) site formation wastes;

(3) construction of buildings and structures;

(4) contaminated soil;

(5) chemical wastes;

(6) general refuse; and

(7) sewage.

8.4.4 The construction phase of the Study Area will be implemented in a number of phases. Details and time periods of each phase are summarized in **Table 8.3**.

Table 8.3: Summary of time periods of construction phases

Activities	Phasing [1]	Period	Duration (month)
Site clearance and site formation	Phase I	Jul 2016 – Dec 2018	30
	Phase II	Jan 2018 – Dec 2020	36
Construction of new buildings and infrastructures	Phase I	Jun 2019 – Dec 2022	43
	Phase II	Jan 2021 – Jan 2026	61

Note:

[1] Total durations of Phase I and Phase II are 73 and 97 months respectively.

8.4.5 The estimated amount of different types of wastes to be generated during construction phase is summarized in **Table 8.4**.

Table 8.4: Estimated amount of different type of wastes to be generated during construction phase

Activities	**Phasing**	**Quantity of waste to be generated (m^3)**								
		Top soil	**Inert soft C&D material [2]**	**Rock [3]**	**Artificial hard material [4]**	**Non-inert C&D material [5]**	**Vegetation**	**Contaminated soil**	**Chemical waste**	**General refuse & sewage**
Site clearance	Phase I	2,300	0	0	0	0	2,000	TBC [1]	A few hundred litres per month	General refuse: 718 tonne; Sewage: 37.5 m^3/day
	Phase II	2,300	0	0	0	0	2,000			
Site formation	Phase I	0	78,000	102,000	0	0	0			
	Phase II	0	312,000	120,000	0	0	0			
Construction of new buildings and structures	Phase I	0	0	0	23,112	5,778	0	0		
	Phase II	0	0	0	25,800	6,450	0	0		

Notes:

[1] TBC: To be confirmed. As the Study Area is managed by private owner and still in operation, therefore undertaking the environmental SI at this EIA stage is not feasible. The proposed environmental SI should be carried out once the operation is terminated and the land is resumed to determine the extent of land contamination.

[2] "Inert soft C&D material" includes, but not limited to, excavated soil.

[3] "Rock" includes all grade rock.

[4] "Artificial hard material" includes, but not limited to, broken concrete, asphalt, bitumen and granular materials, etc.

[5] "Non-inert C&D material" includes, but not limited to, bamboo, timber, paper and plastic, etc.

Site Clearance Waste

8.4.6 The Study Area comprises the Anderson Road Quarry. Site clearance waste will be generated mainly from the site clearance of existing ground surface. The waste will mainly consist of top soil and vegetation.

8.4.7 It is estimated that total approximately 4,600m^3 top soil and 4,000m^3 vegetation would be generated during the whole site clearance phases (i.e. Phase I and Phase II). The breakdown of site clearance waste generated during each phase is summarised in **Table 8.5**.

8.4.8 All generated top soil would be reused on-site as backfill material. Off-site disposal is not required. In addition, 400m^3 (200m^3 for Phase I and 200m^3 for Phase II) vegetation would need to be transplanted, and the remaining 3,600m^3 (1,800m^3 for Phase I and 1,800m^3 for Phase II) would be disposed to landfill. Summary of the recommendation outlets of the C&D materials is summarized in **Table 8.12**.

Table 8.5: Summary of C&D material volumes generated during site clearance

Phasing	Top soil (m^3)	Inert soft C&D material (m^3) [1]	Rock (m^3) [2]	Artificial hard material (m^3) [3]	Non-inert C&D material (m^3) [4]	Vegetation (m^3)
Phase I	2,300	0	0	0	0	2,000
Phase II	2,300	0	0	0	0	2,000
Total	4,600	0	0	0	0	4,000

Notes:

[1] "Inert soft C&D material" includes, but not limited to, excavated soil.

[2] "Rock" includes all grade rock.

[3] "Artificial hard material" includes, but not limited to, broken concrete, asphalt, bitumen and granular materials, etc.

[4] "Non-inert C&D material" includes, but not limited to, bamboo, timber, paper and plastic, etc.

8.4.9 With proper implementation of good construction site practice and mitigation measures, the on-site handling and reuse of site clearance waste would not cause adverse environmental impacts.

Site Formation Waste

8.4.10 Site formation waste will be generated mainly from excavation works during site formation within the Study Area. The waste will mainly consist of inert soft C&D material and rock etc.

8.4.11 It is estimated that total approximately 390,000m^3 inert soft C&D material and 222,000m^3 rock would be generated during the whole site formation phases (i.e. Phase I and Phase II). The breakdown of site formation waste generated during each phase is summarised in **Table 8.6**.

8.4.12 All generated inert soft C&D materials and rock would be reused on-site as backfill material. Off-site disposal is not required. Summary of the recommendation outlets of the C&D materials is summarized in **Table 8.12**.

Table 8.6: Summary of C&D materials volumes generated during site formation

Phasing	Inert soft C&D material (m^3) [1]	Rock (m^3) [2]	Artificial hard material (m^3) [3]	Non-inert C&D material (m^3) [4]
Phase I	78,000	102,000	0	0
Phase II	312,000	120,000	0	0
Total	390,000	222,000	0	0

Notes:

[1] "Inert soft C&D material" includes, but not limited to, excavated soil.

[2] "Rock" includes all grade rock.

[3] "Artificial hard material" includes, but not limited to, broken concrete, asphalt, bitumen and granular materials, etc.

[4] "Non-inert C&D material" includes, but not limited to, bamboo, timber, paper and plastic, etc.

8.4.13 With the proper implementation of good construction site practice and mitigation measures, the on-site handling and reuse of C&D materials would not cause adverse environmental impacts.

Construction of New Buildings and Structures

8.4.14 The construction of new buildings and structures would be also generated the C&D materials. The inert portion of the C&D materials including broken concrete, rock etc. is referred to public fill and the non-inert portion including packing materials and general refuse is referred to construction waste and would be disposed of at landfill. The buildings and structures to be constructed from the Project are shown in **Table 8.7**.

Table 8.7: Major construction works from the Project

Phasing	Proposed uses	Descriptions
Phase I	Commercial	Construction will include substructure and superstructure of new buildings
	Residential	
	Government / institution or community	
Phase II	Commercial	
	Residential	
	Government / institution or community	

8.4.15 The total estimated gross floor area (GFA) of the proposed development in the assessment area is approximately 611,400m^2 including 288,900m^2 for Phase I and 322,500m^2 for Phase II.

8.4.16 In accordance with the "Reduction of Construction Waste Final Report, Hong Kong Polytechnic University (March 1993)", a C&D materials generation rate of 0.1m^3 per 1m^2 of GFA is adopted. It is estimated that approximately total 61,140m^3 of C&D materials would be generated from construction of the buildings and structures of proposed development.

8.4.17 The estimated amount of C&D materials to be generated during the construction of buildings and structures is summarized in **Table 8.8**.

Table 8.8: Summary of C&D materials generated during construction of buildings and structures

Phasing	GFA (m^2)	Total C&D material generated (m^3) [1]	Artificial hard material (m^3) [2][3]	Non-inert C&D material (m^3) [2][4]
Phase I	288,900	28,890	23,112	5,778
Phase II	322,500	32,250	25,800	6,450
Total	**611,400**	**61,140**	**48,912**	**12,228**

Notes:

[1] Reduction of Construction Waste Final Report, Hong Kong Polytechnic University (March 1993)

[2] Approximately ratio for (inert waste) : (non-inert waste) is 8:2 "Monitoring of Solid Waste in Hong Kong, 1997" by EPD

[3] The inert waste mainly is Artificial Hard Material (AHM) which includes, but not limited to, broken concrete, asphalt, bitumen and granular materials, etc.

[4] "Non-inert C&D material" includes, but not limited to, bamboo, timber, paper and plastic, etc.

8.4.18 C&D materials can be minimised through careful planning during the detailed design stage and with good site practice during construction. This includes the use of non-timber formwork and temporary works and on-site sorting of the C&D materials for reuse and recycling as far as practicable.

8.4.19 With the proper implementation of good construction site practice and mitigation measures, potential impacts associated with on-site handling and transportation to disposal sites are not expected.

Contaminated Soil

8.4.20 Potentially contaminated areas within the Study Area have been identified based on desktop review and the information collected during site survey. The areas with those activities, posing the highest potential for contamination, have been identified in accordance with the criteria in EPD's *Practice Guide for Investigation and Remediation of Contaminated Land.*

8.4.21 Environmental SI is recommended to be carried out at 5 potentially contaminated areas to determine the types and quantities of contaminants. As the Study Area is managed by private owner and still in operation, undertaking the environmental SI works is not feasible. Therefore, quantity of contaminated soil could not be estimated in this EIA stage.

8.4.22 The proposed environmental SI works for these areas should commence once the operation is terminated and the land is resumed. Details could be referred to the land contamination section in **Chapter 9**.

Chemical Waste

8.4.23 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:

(1) scrap batteries;

(2) spent hydraulic oil and waste fuel;

(3) spent lubrication oil and cleaning fluids from mechanical machinery; and

(4) spent solvent from equipment cleaning activities.

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

(1) toxic effects to workers;

(2) adverse impacts on water quality from spills and associated adverse impacts on fresh water biota); and

(3) fire hazards.

8.4.25 It is difficult to quantify the amount of chemical wastes as it would 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 lubrication oil and solvent produced from equipment maintenance would be small and in the order of a few hundred litres per month.

8.4.26 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 **Sections 8.5.16** to **8.5.17**. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, potential environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

8.4.27 The estimated amount of chemical waste to be generated during construction phase is summarized in **Table 8.9**.

Table 8.9: Summary of chemical waste during construction phase

Waste type	Total amount generated
Scrap batteries	A few hundred litres per month
Spend hydraulic oil and waste fuel	
Spent lubrication oil and cleaning fluids	
Spend solvent	

General Refuse

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

8.4.29 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.

8.4.30 The number of work force (clerical and workers) to be employed for the Project is not available at this stage, but it is anticipated to be around 250 staff for each construction phase subject to Engineer's confirmation. Based on the generation rate of 0.65kg/person/day, the total refuse generated per day would be about 162.5kg/day. The estimated amount of general refuse generated during construction phase is summarized in **Table 8.10**.

Table 8.10: Summary of general refuse during construction phase

Phasing	No. of work force	Waste generation rate (kg/person/day)	Daily waste generation (kg/day)	Period	Duration (month)	Total amount generated (tonne) [1]
Phase I	250	0.65	162.5	Jul 2016 – Dec 2018; Jun 2019 – Dec 2022	73	308
Phase II	250	0.65	162.5	Jan 2018 – Jan 2026	97	410
					Total	**718**

Note:

[1] Assume 26 working days per month.

8.4.31 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.

8.4.32 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 8.5.18**. With the proper implementation of the recommended mitigation measures, potential environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

Sewage

8.4.33 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.

8.4.34 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 and septic tank 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.

8.4.35 The number of work force (clerical and workers) to be employed is not available at this stage, but is anticipated to have around 250 staff for each construction phase. According to Table T-2 of Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, the unit flow is $0.15m^3$/person/day, the total sewage generated per day would be $37.5m^3$/day.

8.4.36 With the implementation of mitigation measures described in **Section 8.5.19**, potential environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

8.4.37 The estimated amount of sewage to be generated during construction phase is summarized in **Table 8.11**.

Table 8.11: Summary of sewage during construction phase

Waste type	Total amount generated
Sewage	37.5 m^3/day

Construction Phase Waste Summary

8.4.38 A summary of the construction waste arising from the works area with recommendation for outlets during construction phase is presented in **Table 8.12**.

Table 8.12: Summary of waste arising from the works area with recommendation for outlets during construction phase (Phase I and Phase II)

Activities	**Waste type**	**Total amount generated (m^3)**		**Total amount reused (m^3)**		**Total amount disposed (m^3)**		**Recommended outlets**
		Phase I	**Phase II**	**Phase I**	**Phase II**	**Phase I**	**Phase II**	
Site clearance	Top soil	2,300	2,300	2,300	2,300	0	0	Reuse within the site
	Vegetation	2,000	2,000	200	200	1,800	1,800	Reuse within the site; Disposal to landfill
	Contaminated soil	TBC [5]		N/A		N/A		
Site formation	Inert soft C&D materials [1]	78,000	312,000	78,000	312,000	0	0	Reuse within the site
	Rock [2]	102,000	120,000	102,000	120,000	0	0	Reuse within the site
Construction of new buildings and structures	AHM [3]	23,112	25,800	23,112	25,800	0	0	Reuse within the site as much as possible
	Non-inert C&D materials [4]	5,778	6,450	0	0	5,778	6,450	Reuse and recycle as much as possible before disposal to landfill
General construction activities	General refuse	308 tonne	410 tonne	0	0	308 tonne	410 tonne	General refuse: Disposal to landfill
	Paper, metals, plastics etc.							Paper, metals and plastics etc.: Collected by recycler
	Chemical waste	A few hundred litres per month		A few hundred litres per month				Recycled by licensed facility as far as possible, the remaining was disposal of at CWTC
	Sewage	37.5 m^3/day		0		37.5 m^3/day		Chemical toilets to be collected and disposed by licensed collector

Notes:

[1] "Inert soft C&D material" includes, but not limited to, excavated soil.

[2] "Rock" includes all grade rock.

[3] "Artificial hard material" includes, but not limited to, broken concrete, asphalt, bitumen and granular materials, etc.

[4] "Non-inert C&D material" includes, but not limited to, bamboo, timber, paper and plastic, etc.

[5] TBC: To be confirmed. As the Study Area is managed by private owner and still in operation, therefore undertaking the environmental SI at this EIA stage is not feasible. The proposed environmental SI should be carried out once the operation is terminated and the land is resumed to determine the extent of land contamination.

Operational Phase

8.4.40 The operational phase of the proposed development in the Study Area would generate the following categories of wastes based on their compositions:

(1) municipal solid waste; and

(2) chemical waste.

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

Municipal Solid Waste

8.4.42 With reference to the latest data from "An Urgent Need to Suppress Waste Generation, 2010" by EPD, the MSW generation rate was 2.69kg/person/day. In addition, the disposal rate was 1.29kg/person/day in 2010 according to the "Monitoring of Solid Waste in Hong Kong 2010" by EPD. The leaving amount 1.4kg/person/day of waste was recycled.

8.4.43 The estimated MSW in ARQ is summarized in **Table 8.13** based on planned populations in Phase I and Phase II.

Table 8.13: Estimated quantities of municipal solid waste (MSW) during operational phase

Phases	Planned Population	Estimated MSW Generated [1]	Estimated MSW to be Recycled [2]	Estimated MSW Required Disposal [3]
Phase I	12,500	33.6 tpd (12,273 tpa)	17.5 tpd (6,388 tpa)	16.1 tpd (5,885 tpa)
Phase II	12,500	33.6 tpd (12,273 tpa)	17.5 tpd (6,388 tpa)	16.1 tpd (5,885 tpa)
Total	**25,000**	**67.2 tpd (24,546 tpa)**	**35.0 tpd (12,776 tpa)**	**32.2 tpd (11,770 tpa)**

Notes:

[1] MSW generation rate was 2.69kg/person/day according to "An Urgent Need to Suppress Waste Generation, 2010" by EPD.

[2] MSW recycled rate = MSW generation rate – MSW disposal rate (i.e. 1.4 kg/person/day).

[3] MSW disposal rate was 1.29 kg/person/day according to "Monitoring of Solid Waste in Hong Kong 2010" by EPD.

[4] tpd: tonne per day; tpa: tonne per annum

8.4.44 This estimate assumed no further waste reduction measure to reduce the demand for valuable landfill space. However, 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 further reduce the amount for final disposal.

Waste Collection and Disposal

8.4.45 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.

8.4.46 A refuse collection room would be installed in each building at the ground floor for localized refuse collection and the waste would be transported to a refuse collection

point (RCP). Waste recycling facilities / containers are recommended to be included in RCP. The waste could be sorted to recover materials (such as paper and cardboards, plastics, metals and glass etc.) as far as possible, before to be compacted into mobile waste container. Different containers should be provided for the storage of different recyclable materials. To avoid potential odour nuisance to the residents during transport of waste, enclosed waste collection trucks should be used and the collection route and time should be properly planned. The RCP should contain mobile compactor and related equipments to provide adequate waste handling services. At least daily collection should be arranged by the waste collector.

Waste Recycling

8.4.47 In order to facilitate recycling, a 4-bin recycling system for paper, metals, plastics and glass should be adopted together with a general refuse bin. They should be placed in prominent places to promote waste separation at source. All recyclable materials should be collected by recyclers.

8.4.48 ARQ at full operation would recycle 35.0 tpd out of 67.2 tpd of MSW, leaving 32.2 tpd of MSW that would need disposal to landfill. Assuming 7 to 8 tons loading capacity per truck, it is estimated that 4 to 5 trucks per day would deliver the waste for disposal at full operation.

8.4.49 With the implementation of mitigation measures described in **Section 8.5.21**, potential environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

Chemical Waste

8.4.50 One secondary school is planned in the proposed development. It is expected that chemical waste would be produced from the laboratories of secondary school during the operational phase.

8.4.51 It is anticipated that the total quantity of chemical waste such as acids, alkalis and organic solvent produced by school laboratories would be insignificant.

8.4.52 To minimize potential environmental hazard due to waste handling, localized chemical waste storage areas should be located close to the source of waste generation for temporary storage. Drum-type containers with proper labelling should be used to collect chemical wastes for storage at the designated areas.

8.4.53 Registration as chemical waste producers with EPD should be made by representatives of the school prior to operation. All chemical wastes generated should be dealt with according to the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes under the provisions of the Waste Disposal (Chemical Waste) (General) Regulation.

8.4.54 With the implementation of mitigation measures described in **Sections 8.5.22** to **8.5.26**, potential environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

Operational Phase Waste Summary

8.4.55 A summary of the waste arising from the operational phase is presented in **Table 8.14**.

Table 8.14: Summary of waste arising from the operational phase

Major activities	Waste type	Total amount generated	Handling procedures	Recommended disposal outlets
General activities within Study Area	Municipal Solid Waste	32.2tpd	Provide on-site refuse collection points with recycle bins	Disposal to landfill
	Paper, metal, plastic and glass etc.	35.0tpd		Recycler
Laboratory from secondary school	Chemical waste	Insignificant	Store on-site in designated area before being collected and disposed of by licensed collector	Recycle by licensed facility as much as possible, the remaining was disposal to CWTC

8.5 Mitigation Measures

Construction Phase

8.5.1 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 sub-sections.

Good Site Practice

8.5.2 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:

(1) 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;

(2) training of site personnel in site cleanliness, appropriate waste management procedures and concepts of waste reduction, reuse and recycling;

(3) provision of sufficient waste disposal points and regular collection for disposal;

(4) appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;

(5) regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors; and

(6) the contractor should prepare a Waste Management Plan (WMP) as part of the Environmental Management Plan (EMP) in accordance with the ETWB TC(W) No. 19/2005 for construction phase. The EMP should be submitted to the Engineer for approval. Mitigation measures proposed in the EIA Report and the EM&A Manual should be adopted.

Waste Reduction Measures

8.5.3 Amount of waste generation can be significant 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:

(1) segregate and store different types of waste in different containers, skip or stockpiles to enhance reuse or recycling of materials and their proper disposal;

(2) proper storage and site practices to minimize the potential for damage and contamination of construction materials;

(3) plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste;

(4) sort out demolition debris and excavated materials from demolition works to recover reusable/recyclable portions (i.e. soil, broken concrete, metal etc.);

(5) provide training to workers on the importance of appropriate waste management procedures, including waste reduction, reuse and recycling.

8.5.4 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.

Storage, Collection and Transportation of Waste

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

(1) waste such as soil should be handled and stored well to ensure secure containment;

(2) stockpiling area should be provided with covers and water spraying system to prevent materials from wind-blown or being washed away;

(3) different locations should be designated to stockpile each material to enhance reuse;

8.5.6 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:

(1) remove waste in timely manner;

(2) employ the trucks with cover or enclosed containers for waste transportation;

(3) obtain relevant waste disposal permits from the appropriate authorities; and

(4) disposal of waste should be done at licensed waste disposal facilities.

8.5.7 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.

Excavated and C&D Materials

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

(1) maintain temporary stockpiles and reuse excavated fill material for backfilling;

(2) carry out on-site sorting;

(3) make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate; and

(4) implement a trip-ticket system for each works contract to ensure that the disposal of C&D materials are properly documented and verified.

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

On-site Sorting of C&D Materials

8.5.10 All C&D materials arising from the construction 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.

8.5.11 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 minimise 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.

Reuse of C&D Materials

8.5.12 Based on the construction programme, all C&D materials would be reused on-site during the whole construction phase including Phase I and Phase II. Off-site disposal is not required.

Use of Standard Formwork and Planning of Construction Materials Purchasing

8.5.13 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

8.5.14 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.

Contaminated Soil

8.5.15 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.

Chemical Waste

8.5.16 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.

8.5.17 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 CWTC, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

General Refuse

8.5.18 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.

Sewage

8.5.19 The Wastewater Management Plan 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.

Operational Phase

8.5.20 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.

Municipal Solid Waste

8.5.21 General refuse from residential and commercial 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.

Chemical Waste

8.5.22 It is anticipated that chemical wastes generated from the school laboratories during operation would mainly include acid, alkali and solvent. To prevent health hazards to operators, all such chemical wastes should be collected and handled carefully.

8.5.23 To minimize potential environmental hazard due to waste handling, localized chemical waste storage areas should be located close to the source of waste generation for temporary storage. Drum-type containers with proper labelling should be used to collect chemical wastes for storage at the designated areas.

8.5.24 The producers should register with EPD as chemical waste producers. Chemical wastes should be stored in appropriate containers and collected by a licensed chemical waste contractor All chemical wastes generated from laboratories should be dealt with according to the Code of Practice on the Packaging, Labelling and Storage of Chemical

Wastes under the provisions of the Waste Disposal (Chemical Waste) (General) Regulation.

8.5.25 It is recommended that the chemical wastes are disposed at an appropriate waste disposal facility, such as the CWTC in Tsing Yi. A licensed contractor should be employed for the chemical waste collection.

8.5.26 Collection receipts issued by the licensed collector showing the quantities and types of chemical waste taken off-site and details of the treatment facility should be kept for record.

8.6 Residual Environmental Impacts

8.6.1 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 for both the construction and operational phases.

8.7 Environmental Acceptability of Schedule 2 Designated Projects

8.7.1 The engineering feasibility study of the proposed ARQ development is a Schedule 3 Designed Project (DP) under the EIAO, whilst there will be two Schedule 2 DPs; i.e. road improvement works and rock cavern developments under the ARQ project. Details of these two Schedule 2 DPs are provided in **Section 1.4** and shown in **Figure 227724/E/0002**.

Road Improvement Works

8.7.2 Three road improvement works were proposed at junction of (J/O) Lin Tak Road and Sau Mau Ping Road, at J/O Clear Water Bay Road and Road L1 of Development of Anderson Road (DAR), as well as at the new merging lane at New Clear Water Bay Road near Shun Lee Tsuen Road. The major waste arising during construction phase include inert C&D materials (e.g. excavated soil and rock etc.) and non-inert C&D materials (i.e. construction waste), small amount of chemical waste and general refuse. As advised by the Engineer, the quantity of inert C&D materials is estimated approximately 150,000m^3 which would be reused as much as possible in ARQ. With the implementation of mitigation measures such as good site practice and on-site sorting/reuse of C&D materials etc., waste management implication during construction phase is not anticipated. In view of the road project nature, waste management implication during operational phase is also not anticipated. Nevertheless, the detailed waste management implications of this Schedule 2 DP will be further investigated in a separate EIA under the EIAO.

Rock Cavern Developments

8.7.3 The proposed cavern development are located on the hillside of the proposed ARQ Development. The waste management implications of the cavern development during construction phase have been assessed in this Schedule 3 EIA. As advised by the Engineer, the quantity of inert C&D materials arising from cavern development is estimated approximately 53,000m^3 and all will be reused onsite. According to the best available information at this stage, the caverns are proposed for commercial use (e.g. food and beverage) as well as museum. The general refuse from these commercial activities 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, and at least daily collection should be arranged by the waste collector. With the implementation of these mitigation measures, waste management implication during operational phase is not anticipated. Nevertheless, the detailed waste management implications of this Schedule 2 DP will be further investigated in a separate EIA under the EIAO.

8.8 Conclusion

Construction Phase

8.8.1 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 C&D 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.

8.8.2 It is estimated that 4,600m^3 top soil, 390,000m^3 inert soft C&D material and 222,000m^3 rock would be generated from the Project. All generated top soil and C&D material would be reused on-site and off-site disposal is not required.

8.8.3 On the other hand, 4,000m^3 vegetation would also be generated from the Project. 400m^3 vegetation would need to be transplanted, and the remaining 3,600m^3 vegetation would be disposal of in landfill.

Operational Phase

8.8.4 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. It is estimated that ARQ at full operation stage would recycle 35.0 tonne per day (tpd) out of 67.2 tpd of municipal solid waste (MSW), leaving 32.2 tpd of MSW that would need disposal to landfill.