

7. Waste Management Implication

7.1 Introduction

This section identifies the potential waste arising from the construction and operation activities of the Project and evaluates the potential environmental impacts that may result from waste generated. Mitigation measures and good site practices, including waste handling, storage and disposal, are recommended with reference to applicable waste legislation and management guidelines to minimise potential waste management impacts.

7.2 Waste Management Legislations, Standards and Guidelines

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

The following legislation relates to the handling, treatment and disposal of wastes in Hong Kong and has been used in assessing potential impacts:

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

7.2.1 Waste Management

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

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. The Environmental Protection Department (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.

The Public Cleansing and Prevention of Nuisances Regulation provides control on illegal tipping of wastes on unauthorised (unlicensed) sites.

7.2.2 Inert Construction and Demolition (C&D) Materials

The current policy related to the dumping of inert C&D materials is documented in the Works Branch Technical Circular No. 2/93, 'Public Dumps'. Construction and demolition materials that are wholly inert, namely public fill, should not be disposed of to landfill, but taken to public filling areas, which usually form part of reclamation schemes. The Land (Miscellaneous Provisions) Ordinance requires that dumping licences be obtained by individuals or companies who deliver public fill to public filling areas. The Civil Engineering & Development Department (CEDD) issues the licences under delegated powers from the Director of Lands.

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

7.2.3 Excavated Sediment

Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers, PNAP No. ADV-21 (Previous Reference: PNAP No. 252) Management Framework for Disposal of Dredged / Excavated Sediment sets out the procedures for seeking approval to dredge/excavate sediment and the management framework for marine disposal of such sediment. Excavated sediment arising from the Project, if any, will be managed in accordance with the requirements of PNAP ADV-21.

In accordance with the Dumping at Sea Ordinance (DASO), application for dumping permits from EPD is required for marine disposal of dredged/excavated sediment, if any.

7.3 Assessment Methodology

The criteria for assessing waste management implications are outlined in Annex 7 of the EIAO-TM. The methods for assessing potential waste management impacts during construction and operation phases of the Project follow those presented in Annex 15 of the EIAO-TM and include the following:

- Identify the quantity, quality and timing of waste arising as a result of the construction and operation activities of the Project.
- Assessment of potential impacts from the management of solid waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges and public transport.
- Assessment of impacts on the capacity of waste collection, transfer and disposal facilities.

7.4 Identification, Prediction and Evaluation of Environmental Impact

7.4.1 Construction Phase

The activities to be carried out for construction of the WKCD would generate a variety of wastes that can be divided into different key categories based on their composition and ultimate method of disposal. The identified waste types include:

- Inert Construction and demolition (C&D) materials;
- C&D materials from site clearance;

- Chemical waste; and
- General refuse.

Each type of the above waste arising is described below, together with an evaluation of the potential environmental impacts associated with the waste generation, handling, storage, transport and disposal. It should be noted that no marine sediments would be excavated from the WKCD site (see **Section 7.4.1.1**).

7.4.1.1 Inert Construction and Demolition (C&D) Materials

Key sources of inert C&D materials

The excavation works for WKCD basement (including the underpass road and the flyover) will be the major source of inert C&D materials (mainly soil) generated by the Project. It is estimated that the total amount of inert C&D materials to be generated would be approximately 1,910,200 m³, in which about 1,837,200 m³ would be generated from excavation work for the WKCD basement and the remaining 73,000 m³ would be from construction of superstructures and substructures. The bulk excavation for the basement will be proceeded on a zone-by-zone basis from 2013 to 2017, and the construction of superstructures and substructures would be carried out progressively from 2013 to 2020. Based on the tentative construction programme (see **Appendix 2.4**), the amounts of inert C&D materials to be generated in different years have been estimated as summarized in **Table 7.1**.

Table 7.1: Estimates of Inert C&D materials to be Generated by WKCD Project

Year	Estimated Amount of Inert C&D materials from WKCD Basement Excavation (m ³)	Estimated Amount of Inert C&D materials from Construction of Superstructures and Substructures (m ³)	Estimated Total (m ³)
2013	17,000	7,270	24,270
2014	521,800	9,400	531,200
2015	639,400	9,600	649,000
2016	405,500	9,720	415,220
2017	253,500	9,640	263,140
2018	--	9,660	9,660
2019	--	9,660	9,660
2020	--	8,050	8,050
Total	1,837,200	73,000	1,910,200

The quantity of inert C&D materials to be generated from construction of superstructures and substructures has been estimated by applying the generation rate of 0.1m³ per m² of gross floor area (GFA), which is based on the Reduction of Construction Waste Final Report published by the Hong Kong Polytechnic University and Hong Kong Construction Association. Given that the total GFA of WKCD is around 730,000m², the amount of inert C&D materials due to construction of superstructures and substructures would be approximately 73,000 m³ from 2013 to 2020 (completion of Phase 1).

On-site reuse / import of inert C&D materials as fill materials

The WKCD development will require fill material for construction of the Park and the materials are proposed to be obtained from reuse of the inert C&D materials generated by the Project as far as practicable. Nevertheless, it is anticipated that newly imported material will be required, though all

practicable measures will be employed for reuse of the inert C&D materials generated by the Project before consideration of importing material.

It is estimated that the WKCD Project would require a total of 557,600 m³ of fill materials for construction of the Park. While all practicable measures will be employed for reuse of the inert C&D materials generated by the WKCD Project before consideration of importing material, it is anticipated that about 156,400 m³ of the inert C&D materials generated by the WKCD Project would be reused as the fill material mainly for construction of the Park. Therefore, about 401,200 m³ (557,600 – 156,400 m³) of fill material will need to be imported to this Project, as detailed in **Table 7.2**, whereas about 1,753,800 m³ (1,910,200 – 156,400 m³) of inert C&D materials will require off-site reuse by other projects or disposal during the period from 2013 to 2020. The overall proportion of inert C&D materials to be reused on-site from 2013 to 2020 appears to be relatively low (about 28% of the total amount of fill materials required) chiefly because of the space constraints for stockpiling within the WKCD site, and hence the inert C&D materials generated by the Project would be required to be immediately transported to other available projects for off-site reuse wherever practicable. Nevertheless, subject to the future contractor's detailed construction programme the amount of inert C&D materials that can actually be reused on-site may be higher than the current estimates.

Table 7.2: Estimates of Fill Materials to be Imported from Other Potential Projects and/or Government's Fill Banks

Year	Estimated Fill Material required at WKCD (m ³)	Estimated Inert C&D Materials to be reused on-site as Fill Material (m ³)	Estimated Fill Materials to be imported from Other Potential Projects and/or Government's Public Fill Reception Facilities (m ³)
2013	54,200	8,270	45,930
2014	127,230	42,400	84,830
2015	108,200	37,500	70,700
2016	96,530	32,230	64,300
2017	105,720	26,340	79,380
2018	65,720	9,660	56,060
2019	0	0	0
2020	0	0	0
Total (round up figure)	557,600	156,400	401,200

Off-site reuse of surplus inert C&D materials

There will be a number of large infrastructures projects under construction phase during the period from 2013 to 2017, which are identified as potential users of the excavated inert C&D materials from the WKCD Project. The proponents of such projects have been approached to identify the possibility of using the inert C&D materials from this Project. Based on the feedback from the project proponents, two potential projects have been identified, namely, the Hong Kong-Zhuhai-Macao Bridge (HZMB) and the 3rd runway project (copies of relevant correspondences attached in **Appendix 7.5**).

As discussed in the meeting with the consultant of HZMB project on 31 July 2012, it is possible for the HZMB project to use the surplus inert C&D materials from this WKCD Project. Based on the fill demand provided from the contractor of HZMB project, the surplus inert C&D materials could be delivered to HZMB during the period from December 2013 - August 2014. Communication mechanism has been established

with the HZMB project consultant, and regular meetings will be conducted with the HZMB project consultant and contractor for further liaison of logistics arrangement.

Based on the project profile entitled “Expansion of Hong Kong International Airport into a Three-Runway System” (i.e., 3rd runway project) available from the EPD’s website, major construction works of the project, which will involve land formation of about 650 ha, would be expected to commence in mid 2015 and completion of the project would be expected by end 2022. Verbal response from the project proponent indicated that provided construction of the 3rd runway project could be commenced as expected in the project profile, it would be possible for the project to receive the inert C&D materials generated from this WKCD Project. According to the information presented in the project profile, it would be reasonable to anticipate that the 3rd runway project could receive fill materials for its land formation work from the WKCD Project in 2016 and 2017. Liaison with the project proponent regarding the arrangement of using the inert C&D materials from WKCD Project will be made at a later stage when the programme of the 3rd runway project has become clearer.

In view of the responses received and the available information, it can be estimated that the total amount of inert C&D materials to be used by the HZMB project and/or the 3rd runway project in 2013, 2014, 2016 and 2017 would be about 905,000 m³, as detailed in **Table 7.3** below. In 2015, however, none of the inert C&D materials generated could be used by either of the two projects. The actual quantities and arrangement for using the inert C&D materials from WKCD Project will be subject to the programmes of the two projects and liaison with the relevant parties.

Table 7.3: Estimates of Inert C&D materials to be Used by Other Potential Projects

Year	Potential user projects of inert C&D materials	Estimated quantity of inert C&D materials that would be used by the projects (m ³)	Assumptions
2013	HZMB	16,000	90% of the amount of inert C&D materials to be generated in December 2013 (17,800 m ³) would be used by the potential project
2014	HZMB	278,500	90% of the amount of inert C&D materials to be generated from January to August 2014 (309,400 m ³) would be used by the potential project
2015	None	0	Not applicable
2016	3 rd runway project	373,700	90% of the amount of inert C&D materials to be generated in 2016 (415,220 m ³) would be used by the potential project
2017	3 rd runway project	236,800	90% of the amount of inert C&D materials to be generated in 2017 (263,140 m ³) would be used by the potential project
2018 – 2020	None	0	Not applicable
	Total	905,000	

During the detailed design stage, further alternative disposal arrangement (e.g., other potential projects that could receive inert C&D materials from the WKCD Project) shall be continuously explored and identified. If no potential projects could receive the surplus inert C&D materials, the remaining inert C&D materials could be disposed of at the Government’s Public Fill Reception Facilities (PFRFs) for beneficial use by any other projects in Hong Kong. No construction work is allowed to proceed until the issues on management of C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities (i.e. CEDD and EPD).

Off-site disposal of inert C&D materials

From the above estimates, the amount of inert C&D materials produced from the WKCD Project that would neither be reused on-site nor be reused by the two potential projects would be about 848,800 m³ (1,910,200 – 156,400 – 905,000 m³), which will need to be disposed of at the Government's Public Fill Reception Facilities (PFRFs) for beneficial use by other projects in Hong Kong. Hence, the forecast quantities for yearly generation, on-site reuse, off-site reuse and disposal of inert C&D materials at PFRFs are as summarised in **Table 7.4** below.

Table 7.4: Estimates of Inert C&D materials to be Generated, Reused On-site, Reused Off-site and Disposed

Year	Amount of inert C&D materials (m ³)			
	Generation	On-site Reuse	Off-site Reuse	Disposed of at PFRF
2013	24,270	8,270	16,000	0
2014	531,200	42,400	278,500	210,300
2015	649,000	37,500	0	611,500
2016	415,220	32,230	373,700	9,290
2017	263,140	26,340	236,800	0
2018	9,660	9,660	0	0
2019	9,660	0	0	9,660
2020	8,050	0	0	8,050
Total	1,910,200	156,400	905,000	848,800

Liaison with the CEDD Public Fill Committee (PFC) on the allocation of space for disposal of the inert C&D materials at PFRFs is underway. No construction work is allowed to proceed until all issues on management of inert C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including PFC and EPD.

It is proposed that four temporary barging points at the south of the site will be handed over from the XRL project to WKCD for handling the inert C&D materials of this Project. Dump trucks will be used for removal of inert C&D materials generated from construction site to the barging points. The estimated maximum total handling volume of inert C&D materials at the four barging points will be 4,000 m³/day. However, it is noted that these barging points have limited handling capacity and their availability, or lack of it, may affect the arrangement and programming of disposal of public fill by barge. A booking system is in place to facilitate such disposal and this must be followed by prospective users. The indicative locations of the barging points are as shown in **Figure 3.4a**.

Both land and marine access to the PFRFs are subject to capacity limitations, and hence quota and booking systems may be applied in order to ensure the disposal is carried out in controlled manner. The storage, handling, transport and disposal of surplus inert C&D materials, if not managed properly, would have the potential to create visual, water quality and dust impacts. Therefore, the waste reduction measures and good site practices as detailed in **Section 7.5.1** will be implemented to minimize the amount of surplus inert C&D materials as well as to prevent or reduce the associated potential impacts.

Review of any excavated marine sediments

Excavation depths at different zones are proposed to accommodate the underground vehicular traffic and various facilities including parking, loading & unloading areas and electrical & mechanical (E&M) plant and

locations of the zones are provided in **Appendix 7.1**. The anticipated excavation levels for bulk excavation of the basement at different zones are indicated as follows:

Zone 1	: -2.1mPD
Zones 2a and 2b	: -6.5mPD
Zone 3	: -1.1mPD
Zone 4	: -16.95mPD

The WKCD site is a piece of reclaimed land. Based on the previous reports available from the Geotechnical Engineering Office and relevant approved EIA reports, past site investigation had been undertaken for previous projects within or near the proposed WKCD Project area, including the West Kowloon Reclamation, MTRC Kowloon Station, Kowloon Southern Link (KSL) and Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) projects etc. In addition, ground investigation (GI) works were carried out for the WKCD Project for part of its site. Review of the relevant reports and available GI results for WKCD site has revealed that excavation of marine sediments is not anticipated at all the aforementioned Zones. Details of the justifications are given below.

Zone 1

According to the GI completed for the WKCD site at Zone 1 in March 2013, covering a total of 5 drillholes (A1-A, A2-B, A3-B, A4-A and A5-B), no marine sediment was encountered in drillholes A2-B, A3-B, A4-A and A5-B whereas a thin layer of marine sediment was found locally in drillhole A1-A between the depths of -12.68mPD and -14.73mPD. Details of the drillhole locations and records are given in **Appendix 7.1**. Based on the relevant drillhole record no. KSD100/DHE056 from the EIA report for KSL project (see **Appendix 7.1**), it was suspected that marine sediments might be present between the depths of -2.29 mPD and -7.29 mPD at Zone 1.

Given that the 5 drillhole records (A1-A, A2-B, A3-B, A4-A and A5-B) show no marine sediments down to -12.68mPD; the presence of marine sediment at drillhole KSD100/DHE056 (between -2.29 mPD and -7.29 mPD) was not ascertained; and the proposed excavation level at this Zone is only down to about -2.1 mPD, it is considered that marine deposit would not be excavated at Zone 1.

Zone 2a

The site in Zone 2a was reclaimed in early 2000. This Zone is currently the construction site for the Hong Kong Section of XRL project and the proposed ventilation facilities in West Kowloon Terminus (WKT) were proposed to be built underneath this Zone with approximately -22mPD by excavation (see **Appendix 7.2**). Sediment was found at certain sections of the proposed WKT with reference to the geological profile information. It is noted in the XRL EIA Report that the construction method for WKT is by cut-and-cover and the sediment is expected to be removed during the construction work. Also, marine deposit is not present outside the zone for proposed WKT with reference to the geological profile information. From the above quoted results, it is considered that marine deposit would not be excavated at Zone 2a.

Zone 2b

The site in this Zone was reclaimed in 1990s. Ground investigation works were carried out at Zone 2b under the project for MTRC Kowloon Station Package 5, 6 and 7 for water cooling system in 2001. The relevant drillhole records (drillhole nos. BH4 and BH5 as shown in **Appendix 7.3**) showed that only fill

material was present while marine deposit was not present at the proposed excavation depth for this Zone, i.e -6.5mPD.

In addition, based on the project for West Kowloon Reclamation Southern Area Roads Roads D10, D12 and D13 in 1994, the relevant drillhole records (drillhole nos. 62 - 68 as shown in **Appendix 7.3**) showed that only fill material was present while marine deposit was not present at the proposed excavation depth to this Zone, i.e. -6.5mPD. From the above quoted results, it is considered that marine deposit would not be excavated at Zone 2b.

Zone 3

The site in this Zone was reclaimed in 1990s. Ground investigation works were carried out at Zone 3 under the project for West Kowloon Reclamation Southern Area Roads D10, D12 and D13 in 1994. The relevant drillhole records (drillhole nos. 73, 73A, 74 and 75 as shown in **Appendix 7.4**) showed that only fill material was present while marine deposit was not present at the proposed excavation depth for this Zone, i.e - 1.1mPD. From the above quoted results, it is considered that marine deposit would not be excavated at Zone 3.

Zone 4

The site in this Zone was reclaimed in 1990s. Ground investigation work was not undertaken after reclamation in this zone. However, referring to the nearest locations of drillhole records under West Kowloon Reclamation Southern Area Roads (Roads D10, D12 and D13) in 1994, the relevant drillhole records (drillhole nos. 76-81 as shown in **Appendix 7.4**) showed that only fill material was present while marine deposit was not present at the proposed excavation depth for this Zone, i.e -16.95mPD. These drillholes are considered representative of the site by virtue of its close proximity and same stage of reclamation (in 1990s) .From the above quoted results, it is considered that marine deposit would not be excavated at Zone 4.

7.4.1.2 C&D Materials from Site Clearance Works

During the general site clearance in preparation for the subsequent construction works, it is estimated that the top 0.3m soil layer of the entire site excluding the XRL works area temporarily occupying the site (with a net area of around $40 - 3.9 = 36.1$ ha) would be removed, and hence approximately $108,300\text{m}^3$ of C&D materials would be generated. The XRL works area is excluded from the estimation because it is reasonable to assume that the XRL works area will have been cleared when it is returned to the Project Proponent. These C&D materials would mainly be a mixture of topsoil and vegetative material, and are considered as not suitable for direct reuse by any earthworks on site due to its non-inert contents. However, the inert materials should be segregated from the C&D materials on site for reuse as far as practicable, subject to constraints of the site area. The segregated inert materials that cannot be reused on site will be disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong. The amount of such segregated materials to be reused on site should be estimated in the Waste Management Plan to be prepared by the Contractor. The remaining non-inert portion of the C&D materials will be disposed of at a designated landfill site. 10% of the C&D materials (i.e. $108,300 \times 10\% = 10,830\text{m}^3$) would be assumed for disposal of at the landfill. Time schedule for the disposal would be from 2013 to 2017.

7.4.1.3 Chemical Waste

Chemical wastes arising during the construction phase may pose environmental, health and safety hazards if not stored and disposed of in an appropriate manner as stipulated in the Waste Disposal (Chemical Waste) (General) Regulations. The potential hazards include:

- Toxic effects to workers;
- Adverse impacts on water quality from spills and associated adverse impacts on marine biota; and
- Fire hazards.

The maintenance and servicing of construction plant and equipment may generate some chemical wastes such as used solvents, contaminated rags and waste lubricating oil. It is difficult to quantify the amount of chemical waste that will arise from the construction activities since it will be dependent on the Contractor's on-site maintenance requirements and the amount of plant utilised. However, it is anticipated that the quantity of chemical waste, such as waste lubricating oil and solvents produced from plant maintenance, will be small and in the order of a few cubic metres per month. The amount of chemical waste to be generated will be quantified in the Waste Management Plan to be prepared by the Contractor for the site.

Materials classified as chemical wastes will require special handling and storage arrangements before removal for off-site disposal at the approved Chemical Waste Treatment Facility or recycling by licensed facilities. Mitigation and control requirements for chemical wastes are detailed in **Section 7.5.1.4**. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected.

7.4.1.4 General Refuse

The construction workforce will generate refuse comprising food scraps, waste paper and empty containers etc. Such refuse will be properly managed so that intentional or accidental release to the surrounding environment will be avoided. Disposal of refuse at sites other than approved waste transfer or disposal facilities will be prohibited. Effective collection of site wastes will be required to prevent waste materials being blown around by wind, flushed or leached into the marine environment, or creating an odour nuisance or pest/vermin problem. Waste storage areas will be well maintained and cleaned regularly. The daily arising of general refuse from the construction workforce can be estimated based on a generation rate of 0.65 kg per worker per day.

The maximum number of construction workers to be employed for each year from 2013 is stated in **Table 7.5**. Based on a generation rate of 0.65 kg per worker per day, the maximum daily arising of general refuse during the construction period would be approximately 975 kg and this waste can be effectively controlled by normal measures.

Table 7.5: Estimation of Maximum Number of Construction Workers during Construction Phase

Construction Year	Maximum Number of Construction Workers	Maximum Daily Arising of General Refuse (kg/day)
2013	600	390
2014	1000	650
2015	1100	715
2016	1500	975
2017	1500	975

Construction Year	Maximum Number of Construction Workers	Maximum Daily Arising of General Refuse (kg/day)
2018	900	585
2019	700	455
2020	600	390
After 2020	500	325

With the implementation of good waste management practices at the site as detailed in **Section 7.5.1.5**, adverse environmental impacts are not expected to arise from the storage, handling and transportation of the general refuse from construction workforce.

7.4.1.5 Summary

Table 7.6 presents a summary of all key types of waste arising during the construction phase of the Project.

Table 7.6: Summary of Waste Arising during Construction Phase

Waste Type	Key Sources of Waste Generation	Timing of Waste Generation	Estimated Quantity of Waste Generation	Waste Reuse or Disposal	Waste Handling
Inert C&D Materials	Majority from excavation work for the WKCD basement (including the underpass road and the flyover); and minority from construction of superstructures and substructures (Note: Excavation of marine sediments is not anticipated)	Tentatively from 2013 to 2020	About 1,910,200 m ³ in total	About 156,400 m ³ to be reused on-site as fill materials for the Park About 905,000 m ³ to be reused by two potential projects, viz., HZMB project and 3rd runway project. Remaining quantity of about 848,800 m ³ to be disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong (subject to endorsement by the relevant authorities including PFC of CEDD and EPD) (Note: During the detailed design stage, further alternative disposal arrangement, e.g., other potential projects that could receive Inert C&D materials from the WKCD Project, shall be continuously explored and identified. If no potential projects could receive the surplus inert C&D materials, the remaining inert C&D materials could be disposed of at the Government's Public Fill Reception Facilities (PFRFs) for beneficial use by any other projects in Hong Kong. No construction work is allowed to proceed until the issues on management of C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities (i.e. CEDD and EPD).)	Segregate inert C&D materials to avoid contamination from other waste arising
C&D Materials from Site Clearance	General site clearance	Tentatively from 2013 to 2017	About 108,300 m ³ in total	Any inert materials segregated from the C&D materials to be reused on-site as far as practicable or disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong Non-inert materials segregated from the C&D materials to be disposed of at the designated landfill sites	Segregate on site the C&D materials into inert and non-inert materials
General Refuse	Waste paper, discarded containers, etc. generated from the site workforce	Tentatively from 2013 to 2020 (completion of Phase 1) and beyond	0.65 kg per worker per day, the maximum daily arising of general refuse during the construction period would be approximately 975 kg	Refuse station for compaction and containerisation and then to landfill for disposal	Provide on-site refuse collection points
Chemical Waste	Used solvents, contaminated rags, waste lubricating oil, etc., from maintenance and servicing of construction plant and equipment	Tentatively from 2013 to 2020 (completion of Phase 1) and beyond	Few cubic metres per month (preliminary estimate)	Disposal of at the Chemical Waste Treatment Centre or other licensed recycling facilities	Stored on-site by suitably designed containers for off-site disposal or recycling

7.4.2 Operation Phase

The proposed WKCD is anticipated to involve the following waste generating activities during operation phase:

- CACFs and OACFs operation;
- Residential activities;
- Office activities;
- Hotel activities;
- Retail stores within WKCD; and
- Restaurants within WKCD.

The following types of wastes would be generated from abovementioned activities:

- General refuse; and
- Chemical waste.

Each type of the above waste arising is discussed below.

7.4.2.1 General Refuse

General refuse (such as food scraps, waste paper, empty containers, etc) from operation of WKCD will mainly be generated from CACFs and OACFs operation, residential activities, office activities, hotel, retail stores and restaurants within WKCD. Such refuse will be properly managed by suitable waste collectors so that intentional or accidental release to the surrounding environment will not occur.

The amounts of general refuse generation during the operation phase have been preliminarily estimated based on the population intake estimates prepared for the Development Plan of WKCD, and are summarized in **Table 7.7**.

Table 7.7: Estimation of General Refuse Generation during Operation Phase

Item ⁽¹⁾	Population intake estimate ⁽¹⁾	Waste classification ⁽²⁾	Per capita disposal rate ⁽³⁾	Estimated Waste Generation
Total Residential Population	4,050	Domestic waste	0.87 kg/ person/ day	3,524 kg/day
Total Employment Population	11,777	Commercial waste	0.33 kg/ person/ day*	3,886 kg/day
Daily Average of Visitors**	92,160	Commercial waste	0.33 kg/ person/ day*	30,413 kg/day
Total No. of Hotel Guests	1,400	Commercial waste	0.33 kg/ person/ day*	462 kg/day

Source: (1) Section 7 of *West Kowloon Cultural District – Development Plan – Technical Report No. 10 – Volume 1*

(2) Appendix 1: Classification of Solid Waste and Monitoring Methodology, in *Monitoring of Solid Waste in Hong Kong – Waste Statistic for 2010*

(3) Plate 2.1 and Plate 2.7, in *Monitoring of Solid Waste in Hong Kong – Waste Statistic for 2010*

Note: *Calculated from percentage of commercial waste over total municipal solid waste, based on municipal solid waste disposal rate

**Comprising of CACF, OACF and RDE visitors; visitors to open space not included

Effective collection of general wastes will be implemented to prevent waste materials from creating odour nuisance or pest/ vermin problem. Waste storage areas will be well maintained and cleaned regularly. To reduce waste and improve recycling, it is expected that waste such as waste paper, plastics and aluminium can be segregated for off-site recycling.

7.4.2.2 Chemical Waste

Chemical waste will be generated from various routine maintenance and servicing activities for air conditioning system, emergency generators and other electrical and mechanical equipment. Chemical waste such as waste lubricating oil, contaminated rags, waste paint, used solvents and spent chemicals are expected to be generated from these activities. It is difficult to quantify the amount of chemical waste that will arise from those activities at this stage since it will be dependent on the equipment maintenance requirements and the amount of equipment utilised.

Chemical wastes may pose environmental, health and safety hazards if not stored and disposed of in an appropriate manner as stipulated in the Waste Disposal (Chemical Waste) (General) Regulations. Chemical wastes will require special handling and storage arrangements in accordance with the relevant regulations before removal for off-site disposal at the approved Chemical Waste Treatment Facility or recycling by licensed facilities. Mitigation and control requirements for chemical wastes are detailed in **Section 7.5.2.2**. Provided that the handling, storage and disposal of chemical wastes will be in accordance with these requirements, adverse environmental impacts will not be expected.

7.5 Mitigation of Adverse Environmental Impact

7.5.1 Construction Phase

7.5.1.1 Good Site Practices

Adverse impacts related to waste management such as dust, odour, noise and wastewater discharge will not be expected to arise, provided that good site practices will be strictly followed. Recommendations for good site practices during the construction activities include:

- Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site
- Training of site personnel in proper waste management and chemical handling procedures
- Provision of sufficient waste disposal points and regular collection of waste
- Appropriate measures to minimise windblown litter and dust/odour during transportation of waste by either covering trucks or by transporting wastes in enclosed containers
- Provision of wheel washing facilities before the trucks leaving the works area so as to minimise dust introduction to public roads
- Well planned delivery programme for offsite disposal such that adverse environmental impact from transporting the inert or non-inert C&D materials is not anticipated

7.5.1.2 Waste Reduction Measures

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

- Sort inert C&D materials to recover any recyclable portions such as metals
- Segregation and storage of different types of waste in different containers or skips to enhance reuse or recycling of materials and their proper disposal
- Encourage collection of recyclable waste such as waste paper and aluminium cans by providing separate labelled bins to enable such waste to be segregated from other general refuse generated by the work force
- Proper site practices to minimise the potential for damage or contamination of inert C&D materials
- Plan the use of construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste

In addition to the above measures, specific mitigation measures are recommended below for the identified waste arising to minimise environmental impacts during handling, transportation and disposal of these wastes.

7.5.1.3 Inert and Non-inert C&D materials

In order to minimise impacts resulting from collection and transportation of inert C&D materials for off-site disposal, the excavated materials should be reused on-site as fill material as far as practicable. In addition, inert C&D materials generated from excavation works could be reused as fill materials in local projects that require public fill for reclamation.

The surplus inert C&D materials will be disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong.

Liaison with the CEDD Public Fill Committee (PFC) on the allocation of space for disposal of the inert C&D materials at PFRF is underway. No construction work is allowed to proceed until all issues on management of inert C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including PFC and EPD.

The C&D materials generated from general site clearance should be sorted on site to segregate any inert materials for reuse or disposal of at PFRFs whereas the non-inert materials will be disposed of at the designated landfill site.

In order to monitor the disposal of inert and non-inert C&D materials at respectively PFRFs and the designated landfill site, and to control fly-tipping, it is recommended that the Contractor should follow the Technical Circular (Works) No.6/2010 for Trip Ticket System for Disposal of Construction & Demolition Materials issued by Development Bureau. In addition, it is also recommended that the Contractor should prepare and implement a Waste Management Plan detailing their various waste arising and waste management practices in accordance with the relevant requirements of the Technical Circular (Works) No. 19/2005 Environmental Management on Construction Site.

7.5.1.4 Chemical Waste

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

Potential environmental impacts arising from the handling activities (including storage, collection, transportation and disposal of chemical waste) are expected to be minimal with the implementation of appropriate mitigation measures as recommended.

7.5.1.5 General Refuse

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

7.5.2 Operation Phase

7.5.2.1 General Refuse

General refuse should be collected on daily basis and delivered to the refuse collection point accordingly. A reputable waste collector should be employed to remove general refuse regularly to avoid odour nuisance or pest/vermin problem. Sufficient recycling containers are recommended to be provided at suitable locations of the WKCD site to encourage recycling of such waste as aluminium cans, plastics and waste paper.

Other general refuse management initiatives including automatic refuse collection facility would also be considered subject to further review and investigation.

7.5.2.2 Chemical Waste

If chemical wastes are expected to be produced during the operation phase, the Project Proponent should register with the EPD as a chemical waste producer and follow the guidelines stated in the “Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes”. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. Licensed collector should be deployed to transport and dispose of the chemical wastes at the approved Chemical Waste Treatment Centre or other licensed recycling facilities, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

7.6 Evaluation of Residual Impact

With the implementation of the recommended mitigation measures for the handling, transportation and disposal of the identified waste arising, residual impacts are not expected for both construction and operation phases.

7.7 Environmental Monitoring and Audit

It will be the Contractor's responsibilities to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and the relevant regulations and requirements. The recommended mitigation measures shall form the basis of the Waste Management Plan to be developed by the Contractor in the construction phase.

During construction phase, regular site inspection as part of the EM&A procedures should be carried out to determine if various types of waste are being managed in accordance with approved procedures and the Waste Management Plan. It should cover different aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal.

7.8 Conclusion

7.8.1 Construction Phase

The major waste types generated by the construction activities will include inert C&D materials from excavation works for the basement (including the underpass road and the flyover) as well as from construction of superstructures and substructures; C&D materials from general site clearance; chemical waste from maintenance and servicing of construction plant and equipment; and general refuse from the workforce. Provided that all these identified wastes are handled, transported and disposed of in strict accordance with the relevant legislative and recommended requirements and that the recommended good site practices and mitigation measures are properly implemented, no adverse environmental impact is expected during the construction phase.

7.8.2 Operation Phase

The key waste types generated during the operation phase will include general refuse from the CACFs and OACFs operation, residential, office, hotel, retail and restaurant activities; as well as chemical waste from regular servicing and maintenance activities for different electrical and mechanical equipment. Provided that all these wastes are handled, transported and disposed of in strict accordance with the relevant legislative requirements and the recommended mitigation measures are properly implemented, no adverse environmental impact is expected during the operation phase.