

7. WASTE MANAGEMENT

7.1 Introduction

7.1.1 This section identifies the types of construction- and operation-related wastes that are likely to be generated by the Project and evaluates the potential environmental impacts that may result from handling, transport and disposal of the waste.

7.1.2 The main environmental concern regarding waste arises from the construction and demolition material from earthworks for the proposed reprovisioning works at Sha Tin WTW. Mitigation measures and good site practices, including waste handling, storage and disposal have been recommended with reference to the applicable waste legislation and guidelines.

7.2 Environmental Legislation, Plans, Standards and Guidelines

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

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

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

Waste Management

7.2.3 The *Waste Disposal Ordinance (WDO)* prohibits the unauthorised disposal of wastes. Construction waste is not directly defined in the WDO but is considered to fall within the category of “trade waste”. Trade waste is defined as waste from any trade, manufacturer or business, or any waste building/civil engineering materials, but does not include animal waste. Under the WDO, wastes can be disposed of only at sites licensed by the Environmental Protection Department (EPD).

7.2.4 Issued under the WDO, the *Chemical Waste (General) Regulation 1992* administers the possession, storage, collection, transport and disposal of chemical wastes. The 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.

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

Construction and Demolition (C&D) Materials

7.2.6 The current policy related to the dumping of C&D material¹ is documented in the *Works Branch Technical Circular (WBTC) No. 2/93, ‘Public Dump’*. Construction and demolition materials that are wholly inert, namely public fill, should not be disposed of to landfill, but taken to public filling areas

¹ “C&D material” contains a mixture of inert and non-inert material. The inert portion is the “public fill” and the non-inert portion is the “C&D waste”.

that 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 licences are issued by Civil Engineering and Development Department (CEDD) under delegated powers from the Director of Lands.

- 7.2.7 In addition to the WBTC, EPD and CEDD have produced a leaflet titled '*New Disposal Arrangements for Construction Waste*' (1992) and together with the approved *Construction Waste Disposal Charging Scheme* (2005) by the Legislative Council that C&D material with less than 50% by weight of inert material will be accepted at landfill. If the C&D material contains more than 50% inert material, the waste must be sorted with inert material sent to a public filling area and the non-inert material (that is, C&D waste) sent to landfill for final disposal.
- 7.2.8 Measures have been introduced under *Paragraph 4.1.3 of Chapter 4 of the Project Administration Handbook for Civil Engineering Works* to enhance the management of C&D material including rock, and to minimize its generation at source. The enhancement measures include:
- (i) Drawing up a Construction and Demolition Material Management Plan (C&DMMP) at an early design stage to minimize C&D material generation;
 - (ii) Vetting of the C&DMMP prior to upgrading of the project to Category A in the Public Works Programme; and
 - (iii) Providing the contractor with information from the C&DMMP in order to help the contractor prepare the Waste Management Plan (WMP) and to minimize C&D material generation during construction.
- 7.2.9 Technical circular *ETWB TCW No. 19/2005* introduces additional measures to enhance waste management on construction sites. The circular sets out the policy and procedures requiring contractors to prepare and implement an enhanced WMP to encourage on-site sorting of C&D material and to minimize generation of C&D material during the course of construction.
- 7.2.10 The finalized C&DMMP has been endorsed by the WSD Vetting Committee on C&DMMP in its meeting on 12 November 2012. The C&DMMP is attached in [Appendix 7.1](#). Consents on the endorsed C&DMMP and EIA report were obtained from the Public Filling Committee (PFC) on 3 January 2013, 26 August 2013 and 30 September 2014. The relevant memos from PFC are given in [Appendix 7.2](#).

Chemical Waste

- 7.2.11 Under the regulation of WDO, the Waste Disposal (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.

7.3 Assessment Methodologies

- 7.3.1 The methods for assessing potential waste management impacts during the construction and operation phases follow those presented in Annex 15 of the TM-EIA and include the following:
- Estimation of the types and quantities of the wastes generated;
 - Examination of opportunities for waste reduction and re-use (both on-site and off-site) and the required disposal options for each type of waste;
 - Assessment of potential environmental impacts from the transport/ management of solid waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges; and

- Identification of impacts on the capacity of waste collection, transfer and disposal facilities.

7.4 Identification of Potential Environmental Impacts

7.4.1 The construction activities to be carried out for the proposed Project would generate a variety of wastes that can be divided into distinct categories based on their composition and ultimate method of disposal. The identified waste types are:

- Construction and demolition (C&D) material.
- General refuse.
- Chemical waste.

7.4.2 Sludge would be the major waste generated during operation of the water treatment process. Other types of wastes such as chemical waste, and general refuse would also be generated during operation of the Project.

7.5 Prediction & Evaluation of Environmental Impacts

7.5.1 The nature of each type of waste arising is described below, together with an evaluation of the potential environmental impacts associated with the waste.

Construction Phase

Construction and Demolition Materials

7.5.2 Construction and demolition (C&D) materials would be generated from demolition works of the existing facilities of the South Works, construction of the new common facilities for the North and the South Works, the slope excavation works for the reprovisioning of the South Works and construction works of new access roads for both construction and operation of the plant. This C&D material would comprise both inert and non-inert components, such as soil, artificial hard materials (AHM) (broken concrete, etc.), rocks, wood and metals. The Engineer has estimated the volume of surplus C&D materials to be approximately 242,050 m³ of inert material (i.e. public fill) and approximately 9,980 m³ of non-inert material (i.e. C&D waste). There is no sediment requiring marine disposal.

7.5.3 The C&D material would be sorted on-site and the inert portion would be stored in different containers, skips or stockpiles to re-use on-site as far as possible to minimise the net amount of C&D material generated from this Project. Surplus excavated material would therefore require to be exported off-site. The Project Proponent shall notify CEDD for the estimated spoil volumes to be generated and liaise and agree with the PFC for the disposal of surplus inert C&D materials during the detailed design phase of the Project. A summary of inert C&D materials generated during construction phase is shown in **Table 7.1**. The potential environmental impacts arising from the handling and disposal of this inert C&D material, such as air and odour emissions, noise and potential hazard, would be negligible. Appropriate measures should be taken to minimise potential adverse impacts from dust during the transportation of C&D material.

Table 7.1 Summary of Inert C&D Material Quantities Generated

Works Area	Granitic Rock (Grade III or below) (m ³)	Soft Material (Fill, etc.) (m ³)	Artificial Hard Materials (m ³)	Total Volume (m ³)
Sha Tin WTW	27,490	190,940	30,670	249,100

7.5.4 The estimated volumes of inert and non-inert C&D material generated from the construction of the Project are presented in **Table 7.2** below, together with the estimated volumes of inert C&D material

to be disposed to public filling area. The timing of these construction activities is shown in **Table 7.3**.

Table 7.2 Summary of Inert and non-inert C&D Material Volumes Generated from Construction Activities (In Bulk Volumes)

Construction Activity	Inert C&D material (m ³)	Reusable inert C&D material (m ³)	Inert C&D material to be disposed to public filling area (m ³)	Non-inert C&D material (m ³)
Demolition of existing facilities of the South Works	151,950	7,050	144,900	2,500
Construction of New Facilities for both the North and the South Works	0	0	0	7,480
Cut-Back of the Existing Man-Made Slope	91,630	0	91,630	0
Cut-Back of Existing Slope for Construction of New Access Roads	5,520	0	5,520	0
Total	249,100	7,050	242,050	9,980

Table 7.3 Anticipated Timing of Wastes Arising/ Generation from Construction Activities and Disposal

Construction Activity	Anticipated Timing
Demolition of existing facilities of the South Works	November 2016 – April 2018 August 2019 – January 2020 May 2020 – October 2020
Construction of New Facilities for both the North and the South Works	August 2016 – April 2021
Cut-Back of the Existing Man-Made Slope	November 2016 – October 2017
Cut-Back of Existing Slope for Construction of New Access Roads	March 2016 – October 2016
Disposal of Surplus C&D Materials	Jul 2016 – Dec 2017 (Granitic Rock (Grade III or below)) Jan 2016 – Dec 2017 (Soft Material) Jul 2016 – Dec 2020 (Artificial Hard Material) Jul 2017 – Apr 2021 (Non-inert C&D Material)

7.5.5 It is anticipated that any fill materials required will be sourced from the excavated materials stockpiled at the temporary stockpiling areas, whenever it is suitable. Hence, no imported fill will be required.

- 7.5.6 Non-inert C&D materials generated would be reused and recycled as much as possible before disposal of at landfills. It is the Contractor's responsibility to separate the inert and non-inert C&D materials on site.
- 7.5.7 The Contractor would quantify in the site Waste Management Plan the amount of C&D material expected to be generated.

General Refuse

- 7.5.8 Throughout construction, the workforce would generate refuse comprising food scraps, waste paper, empty containers, etc. Escape of such refuse from the site should not be allowed to occur.
- 7.5.9 Effective collection and removal of site wastes will be required to prevent waste materials being blown around by wind, flushed or leached into the aquatic environment, and to prevent odour nuisance. The work sites may also attract pests and vermin if the waste storage area is not well maintained and cleaned regularly. Disposal of refuse must be at approved waste transfer or disposal facilities. With the implementation of good waste management practices at the site, adverse environmental impacts would not be expected to arise from the storage, handling and transportation of refuse.

Chemical Waste

- 7.5.10 The maintenance and servicing of construction plant and equipment may possibly generate some chemical wastes, for instance, cleaning fluids, solvents, lubrication oil and fuel. Maintenance of vehicles may also involve the use of a variety of chemicals, oil and lubricants.
- 7.5.11 Building demolition may possibly generate asbestos waste as the existing building insulation materials likely contain asbestos. Asbestos waste is categorized as chemical waste under the Waste Disposal (Chemical Waste) Regulation. The Project Proponent should conduct an asbestos investigation by a registered asbestos consultant prior to demolition of existing building structure. The investigation should reveal the presence, quantity and location of Asbestos Containing Materials (ACM). Asbestos waste will be handled in accordance with the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste issued by EPD.
- 7.5.12 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 on the workforce.
 - Adverse impacts on water quality and aquatic biota from spills.
 - Fire hazards.
- 7.5.13 Materials classified as chemical wastes will require special handling and storage arrangements before removal for appropriate treatment at the Chemical Waste Treatment Facility at Tsing Yi. Wherever possible opportunities should be taken to reuse and recycle materials. Mitigation and control requirements for chemical wastes are detailed below. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected to result.

Uncertainties in Prediction & Evaluation of Environmental Impacts

- 7.5.14 It is difficult to quantify the amount of general refuse and chemical waste that will arise from the construction activities since it would be highly dependent on the Contractor's on-site maintenance requirements and the number of plant utilised. However, as a worst case, it is estimated that a factor of 0.65 kg per worker per day of general refuse will be generated. The total quantity of waste generated would thus be estimated 128.7 kg per day, assuming the size of the work force would be

a maximum of 198 resident site staff (RSS) and construction workers. Also it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance, would be small and in the order of a few cubic metres per month. The amount of chemical waste to be generated would be quantified in the site Waste Management Plan to be prepared by the Contractor.

Operation Phase

- 7.5.15 Sludge arising from the water treatment process would be the major waste during the operation of the Project. The monthly volume of thickened sludge generated in the existing Sha Tin WTW was approximately 14,000 m³, and it should be subject to change with different raw water quality. The sludge would be thickened on-site and then transported through the twin sludge transfer pipeline underneath Shing Mun River to the Sha Tin Sewage Treatment Works (STW) for disposal.
- 7.5.16 The total volume of thickened sludge generated from the existing Sha Tin WTW was approximately 465 m³/day and relates to an average output of about 730 million litres per day (MLD). Taking into account the full capacity of the WTW after completion of the reprovisioning works with total output of 1,227 MLD, a total volume of thickened sludge would be approximately 782 m³/day. It is anticipated that the amount of thickened sludge to be generated from the proposed water treatment process would not be significantly different from that produced under the current process. The routing of sludge disposal would also follow the existing approach that thickened sludge is transported to Sha Tin STW for disposal based on the best available information at the time of writing this EIA report. It is anticipated that the handling and disposal of the sludge generated from the proposed water treatment process would not induce unacceptable impacts compared to the treatment process of the existing WTW.
- 7.5.17 Apart from sludge, other wastes such as chemical waste, general refuse, etc. that will be generated from the operation of the Project are considered to have no adverse or minimal environmental impacts.

7.6 Mitigation of Adverse Environmental Impacts

Good Site Practices

- 7.6.1 Appropriate waste handling, transportation and disposal methods for all waste arisings generated during the construction works for the Project should be implemented to ensure that construction wastes do not enter the nearby streams or drainage channel.
- 7.6.2 It is anticipated that adverse impacts would not arise on the construction site, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities include:
- Nomination of approved personnel, such as a site manager, to be responsible for good site practices, and making arrangements for collection of all wastes generated at the site and effective disposal to an appropriate facility.
 - Training of site personnel in proper waste management and chemical waste handling procedures.
 - Provision of sufficient waste reception/ disposal points, of a suitable vermin-proof design that minimises windblown litter.
 - Arrangement for regular collection of waste for transport off-site and final disposal.
 - Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers.

- Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors.
- A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed.
- A Waste Management Plan should be prepared and should be submitted to the Engineer for approval. One may make reference to *ETWB TCW No. 19/2005* for details.

7.6.3 In order to monitor the disposal of C&D material at landfills and public filling areas, as appropriate, and to control fly tipping, a trip-ticket system should be included as one of the contractual requirements to be implemented by an Environmental Team undertaking the Environmental Monitoring and Audit work. One may make reference to *DEVB TCW No.6/2010* for details.

Waste Reduction Measures

7.6.4 Good management and control of construction site activities/ processes can minimise the generation 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:

- Segregate and store different types of construction related waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal.
- Provide separate labelled bins to segregate recyclable waste such as aluminium cans from other general refuse generated by the work force, and to encourage collection by individual collectors.
- Any unused chemicals or those with remaining functional capacity shall be recycled.
- Maximising the use of reusable steel formwork to reduce the amount of C&D material.
- Prior to disposal of C&D waste, it is recommended that wood, steel and other metals shall be separated for re-use and / or recycling to minimise the quantity of waste to be disposed of to landfill.
- Adopt proper storage and site practices to minimise the potential for damage to, or contamination of, construction materials.
- Plan the delivery and stock of construction materials carefully to minimise the amount of waste generated.
- Minimize over ordering of concrete, mortars and cement grout by doing careful check before ordering.

7.6.5 In addition to the above measures, other specific mitigation measures are recommended below to minimise environmental impacts during handling, transportation and disposal of wastes.

Construction and Demolition Material

7.6.6 The C&D material generated from demolition works of existing facilities of the South Works, construction works of new facilities for the North and the South Works, slope excavation works and construction works of new access roads should be sorted on-site into inert C&D material (that is, public fill) and C&D waste. To minimise the impact resulting from collection and transportation of C&D material for off-site disposal, any excavated material should be reused on-site as backfilling material as far as practicable. C&D waste, such as wood, plastic, steel and other metals should be reused or recycled and, as a last resort, disposed of to landfill. A suitable area should be designated within the site for temporary stockpiling of C&D material and to facilitate the sorting

process. Within the stockpile areas, the following measures should be taken to control potential environmental impacts or nuisance:

- Covering material during heavy rainfall;
- Locating stockpiles to minimise potential visual impacts; and
- Minimising land intake of stockpile areas as far as possible.

7.6.7 For the disposal of any surplus inert C&D materials, the Project Proponent have notified CEDD of the estimated spoil volumes to be generated, and liaised and agreed with the PFC. The finalized C&DMMP has been endorsed by the WSD Vetting Committee on C&DMM in its meeting on 12 November 2012. Consents on the endorsed C&DMMP and EIA report were obtained from the PFC on 3 January 2013, 26 August 2013 and 30 September 2014. No construction work is allowed until consensus has been made on the overall management and disposal arrangements be endorsed by the relevant authorities such as PFC and EPD.

General Refuse

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

Chemical Wastes

7.6.9 All storage of asbestos waste should be carried out properly in a secure place isolated from other substances so as to prevent any possible release of asbestos fibres into the atmosphere and contamination of other substances. The storage area should bear warning panels to alert people of the presence of asbestos waste.

7.6.10 A licensed asbestos waste collector will be appointed to collect the asbestos waste and deliver to the designated landfill for disposal. The Project Proponent should notify EPD in advance for disposal of asbestos waste. After processing the notification, EPD will issue specific instructions and directions for disposal. The waste producer must strictly follow these directions.

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

7.6.12 **Table 7.4** provides a summary of the various waste types likely to be generated during the construction works for the Project, together with the recommended handling and disposal methods.

Table 7.4 Waste Arising, Waste Handling Procedures and Disposal Routes

Waste Material Type	Generated from	Materials Generated	Total Quantity Generated	Disposal	Handling Methods / Reuse
C&D Materials	Excavation, Demolition Works, Cut-back of the existing man-made slope, Construction of new common facilities for the North and South Works and Construction of new access roads	Inert C&D materials – Rock, Soft Materials and Artificial Hard Materials	249,100 m ³	Suitable material to be reused on site or to be disposed of public filling areas	<ul style="list-style-type: none"> • Segregation from non-inert C&D materials during stockpiling and transportation • Stockpile area (if required) should be well managed with covers and water spraying system
		Non-inert C&D materials – Timber, Papers & Plastics	9,980 m ³	To be disposed to landfill	<ul style="list-style-type: none"> • Segregation from inert C&D materials during stockpiling and transportation • Reusable materials should be separated and recycled as far as practicable
General Refuse	Workforce - maximum of 198 RSS	Food waste, plastic, aluminium cans, waste papers etc.	Assumed 128.7kg per day	Refuse station for compaction and containerisation and then to landfill	<ul style="list-style-type: none"> • Provide on-site collection points together with recycling bins • Collected by licensed collectors
Chemical Waste	Maintenance and servicing of construction plant, equipment and vehicle	Oils and grease hydraulic fluids, paints, solvents, cleaners etc.	Few cubic metres per month	Chemical Waste Treatment Centre	<ul style="list-style-type: none"> • Store in compatible containers in designated area on site • To be collected and recycled by licensed collectors
	Building demolition	Asbestos Containing Materials		Designated landfill to be determined by EPD	<ul style="list-style-type: none"> • All storage of asbestos waste should be carried out properly in a secure place isolated from other substance and bear warning panels to alert people of the presence of asbestos waste

7.7 Evaluation of Residual Environmental Impacts

- 7.7.1 With the implementation of the recommended mitigation measures for the handling, transportation and disposal of the identified waste arising, adverse residual impact is not expected to occur during the construction and operation of the proposed Project.

7.8 EM&A Requirements

- 7.8.1 It will be the contractor's responsibility to ensure that any wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and relevant regulations and other legislative requirements. The recommended mitigation measures should form the basis of the site Waste Management Plan to be developed by the Contractor in the construction stage.

7.9 Conclusion

- 7.9.1 Waste types generated by the construction activities are likely to include inert and non-inert C&D materials from demolition works of existing facilities of the South Works, construction works of new facilities for the North and the South Works, slope excavation works and construction works of new access roads, general refuse from the workforce and chemical wastes from the maintenance of construction vehicles and equipment. Provided that these identified wastes would be handled, transported and disposed of using the recommended methods and that good site practices would be strictly followed, adverse environmental impacts are not expected.
- 7.9.2 The waste management assessment has recommended good waste management practices to ensure that adverse environmental impacts are prevented. The assessment concluded that no unacceptable environmental impacts would result from the storage, handling, collection, transport and disposal of wastes arising from the construction and operation of the project.

~ End of Section 7 ~