

6. WASTE MANAGEMENT IMPLICATION AND LAND CONTAMINATION ASSESSMENT

6.1 Introduction

6.1.1 This section identifies the potential waste arising from the construction and operation of the Project and assesses the potential environmental impacts associated with waste handling and disposal. Options for avoidance, minimization, reuse, recycling, treatment, storage, collection, transport and disposal of such wastes are examined.

6.1.2 Where unacceptable impacts are identified, appropriate mitigation measures and good site practices are recommended. Disposal options will be outlined for each type of waste, and the responsibilities for disposal or recycling discussed.

6.1.3 This section also identifies and assesses any potential land contamination issues arising from the Project and to propose remediation measures if required.

6.2 Relevant Legislation, Policies, Standards and Criteria

Legislation, Circulars, Guidelines related to Waste Management

6.2.1 The following legislation relates to the handling, treatment and disposal of wastes and will be used in assessing potential impacts:

- Environmental Impact Assessment Ordinance (Cap. 499);
- Waste Disposal Ordinance (Cap. 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C);
- 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; and
- Dumping at Sea Ordinance (Cap. 466).

6.2.2 The following documents, circulars and guidelines which relate to waste management and disposal will also be referred to during this study:

- Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) - Annexes 7 and Annex 15;
- Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, EPD (1992);
- WBTC No. 2/93 - Public Dumps;
- WBTC No. 2/93B - Public Filling Facilities;
- WBTC No. 16/96 - Wet Soil in Public Dumps;
- WBTC No. 4/98 & 4/98A - Use of Public Fill in Reclamation and Earth Filling Projects;
- WBTC No. 12/2000 - Fill Management;
- WBTC No. 19/2001 - Metallic Site Hoardings and Signboards;
- WBTC No. 12/2002 - Specifications Facilitating the Use of Recycled Aggregates;
- ETWB TCW No. 34/2002 - Management of Dredged/Excavated Sediment;
- ETWB TCW No. 24/2004 - Specifications Facilitating the Use of Concrete Paving Units Made of Recycled Aggregates;
- ETWB TCW No. 19/2005 - Environmental Management on Construction Sites;
- DEVB TCW No. 6/2010 - Trip-ticket System for Disposal of Construction &

- Demolition Material;
- DEVB TCW No. 8/2010 - Enhanced Specification for Site Cleanliness and Tidiness;
- DEVB TCW No. 2/2011 - Encouraging the Use of Recycled and other Green Materials on Public Works Projects;
- DEVB TCW No. 9/2011 - Enhanced Control Measures for Management of Public Fill; and
- Project Administration Handbook for Civil Engineering Works (2014 Edition) - section 4.1.3 relating to Construction and Demolition Materials)

6.2.3 The following guidelines are related to land contamination:

- Practice Guide for Investigation and Remediation of Contaminated Land;
- Guidance Note for Contaminated Land Assessment and Remediation; and
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management.

6.3 Assessment Methodology

6.3.1 Reference has been made to the methodology laid out in the EIAO-TM (Annexes 7 and 15). The assessment of potential waste management implications include the following tasks:

- Estimation of the types and quantities of waste arisings;
- Evaluation of potential impacts from the handling, collection, transportation and disposal of waste; and
- Proposal of mitigation measures for the waste management.

6.3.2 In order to identify and evaluate the potential contamination impacts associated with the Project, a desktop study has been conducted to review the current and historical land uses. Site inspections have been conducted to identify any potential contamination hotspots and its current site condition.

6.4 Sources and Types of Waste arising from the Project

Construction Phase

6.4.1 The proposed sewerage works include the following construction activities:

- site clearance and demolition works;
- expansion of the Sha Tau Kok Sewage Treatment Works (STKSTW);
- construction of a temporary sewage treatment plant (TSTP);
- demolition of the existing Sha Tau Kok Sewage Pumping Station (STKSPS) and decommissioning of the rising main between STKSPS and STKSTW;
- construction of new gravity sewers; and
- decommissioning of the existing submarine outfall and construction of a new one.

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

- site clearance / demolition materials;
- excavated materials;
- sediment;
- bentonite slurry;
- chemical waste; and
- general refuse.

Operational Phase

6.4.3 The following waste will be generated during operation of the TSTP and the expanded STKSTW:

- sludge;
- solid waste ; and
- chemical waste.

6.5 Impact Assessment and Evaluation

Construction Phase

Inert C&D Materials

Site Clearance / Demolition Works

6.5.1 Site clearance and demolition works will be required for the works, thus generating unwanted materials during construction.

6.5.2 Parts of the existing STKSTW will need to be demolished to facilitate expansion works. Upon completion of the expansion works of STKSTW, the existing sewage pumping station at Shun Hing Street will be decommissioned and demolished. Site clearance / demolition works will generate concrete rubble, plastics, metals, glass, asphalts, wood, vegetation and refuse. In addition, existing road surface for the gravity sewers will have to be broken up thus generating broken concrete and asphalt. As these materials are likely to be in a deteriorating condition, the potential for reuse of such materials on site is very limited. Approximately 4,885 m³ of inert C&D materials consisting of concrete rubbles and broken asphalt and approximately 23 m³ of non-inert C&D materials will require disposal to public fill reception facilities (either Tseung Kwan O (TKO) Area 137 Fill Bank or Tuen Mun (TM) Area 38 Fill Bank) and landfill (assume to be NENT Landfill) respectively.

Excavation Works

6.5.3 The majority of C&D materials generated from the Project will be from excavation works associated with the expansion of the STKSTW, gravity sewers and from the HDD works for the new submarine outfall. It is noted from historic aerial photos that some of the works areas are reclaimed land. According to site investigation results and based on the proposed excavation depth, the excavated materials will be mainly inert C&D materials consisting of general fill. The excavated materials from HDD works for the new submarine outfall will also be mainly inert C&D materials consisting of rock cuttings. The C&D materials will consist of about 45,795 m³ of soils and about 3,081 m³ of rocks. Approximately 9,500 m³ and 1,609 m³ of soils and rocks could be reused in the STKSTW works and gravity sewers works respectively. As such, the estimated inert C&D materials requiring disposal to public fill reception facilities (either TKO Area 137 Fill Bank or TM Area 38 Fill Bank) will be 37,767 m³ (consisting of 36,295 m³ of soils and 1,472 m³ of rocks). An average of about 6 truck trips per day is envisaged. Disposal routing will be via Sha Tau Kok Road, Fanling Highway, Tolo Highway, Tate's Cairn Tunnel, Kwun Tong Bypass, Tseung Kwan O

Road and Wan Po Road to the TKO Area 137 Fill Bank or via Sha Tau Kok Road, San Tin Highway, Yuen Long Highway and Lung Mun Road to the TM Area 38 Fill Bank.

Non-inert C&D Materials

- 6.5.4 Non-inert C&D materials from construction activities will generate waste from removal of vegetation, metal and timber formwork, bamboo scaffolding and packaging materials. Such waste should be sorted for reuse and recycling as far as possible before disposal to landfill (assume to be NENT Landfill). Approximately 275 m³ of non-inert C&D materials will be generated of which about 23 m³ will be from site clearance / demolition works and the remaining 252 m³ will be from other construction works. Together with general refuse generated during construction, about 1 truck trip every other day is envisaged. Disposal route will be via Sha Tau Kok Road and Wo Keng Shan Road to the NENT Landfill.

Marine Sediment

- 6.5.5 To minimize the generation of excavated marine sediments, various construction methods for the new submarine outfall have been considered (see **Section 2**). With the use of HDD, the need for sediment excavation during construction of the new submarine outfall can be significantly reduced. Nonetheless, localised excavation of a small seabed area will be necessary to facilitate the construction of the diffuser for the new submarine outfall. Based on the engineering design, the existing seabed will be exposed for a length of approximately 54m by excavation method. The trapezoidal trench will be approximately 22m top wide (3m bottom wide) and 4.5m deep. The volume of marine sediments to be excavated during construction of the submarine outfall and requiring disposal is about 3,040 m³.
- 6.5.6 Reusing the sediment at the outfall diffuser site is not possible as the void space surrounding the diffuser will need to be backfilled with armour rock for protection purpose. Reusing the sediment as backfill material in other parts of this Project is also not possible as the works will generally require exportation of fill rather than import of fill as well as the limited space available on-site for handling and storage of the sediment. Furthermore, the sediment to be reused will need to be transported by dump trucks from the Sha Tau Kok public pier to the works site which could generate additional environmental nuisance due to the handling/transport of sediment with high water content. Disposal to the marine disposal site is therefore considered more practical.
- 6.5.7 A Sediment Sampling and Testing Plan (SSTP) in accordance with ETWB TCW No. 34/2002 was conducted and submitted to EPD for approval. The SSTP was approved by EPD on 19 November 2015. Rationale for sediment removal was approved by MFC/CEDD on 22 December 2015. Copy of the relevant correspondences and the SSTP are enclosed in [Annex 6A](#). Sediment sampling and laboratory testing was undertaken on 12 February 2016 in the proposed excavation area in accordance with the approved SSTP. At the sampling location, surface grab sample was taken using Van Veen Grab Sampler lowered from a boat. For sampling below seabed level, gravity coring was employed. The sampling tube was manually driven from the boat into the seabed to obtain the sediment sample at the required depth. Details of the sediment sampling and results of the chemical test are presented in [Annex 6B](#). From the chemical testing results, only Category L sediment was identified. In accordance with ETWB TCW No. 34/2002, Type 1 – Open Sea Disposal should be adopted for Category L sediment. The disposal of marine sediment will be via sea route by barge

from the works site to the marine disposal site allocated by MFC/CEDD. Approximate 5 barge trips is anticipated.

Bentonite Slurry

- 6.5.8 Drilling fluid is used in HDD mainly to cool and lubricate the bit and drill string, transport cuttings to surface and stabilize the borehole. The most common type of drilling fluid is bentonite mixed with water to form a viscous, shear thinning material often referred to as bentonite slurry. The amount of bentonite slurry for use during the drilling works and requiring disposal is estimated to be approximately 6,500 m³ with reference to the best available design information.
- 6.5.9 Bentonite slurry is normally recycled and reused during the drilling process. Inadvertent release of bentonite slurry or improper disposal may lead to contamination of the nearby water bodies. The storage, treatment and recycling of the bentonite slurry (drilling fluid) will only be conducted at the proposed launching site in STKSTW. Spent bentonite slurry will be disposed to public fill reception facilities (either TKO Area 137 Fill Bank or TM Area 38 Fill Bank) via land route or sea route depending on Contractor's proposal.

Chemical Waste

- 6.5.10 Wastes classified as chemical waste are listed in the Waste Disposal (Chemical Waste) (General) Regulation. Where the construction processes produce chemical waste, the Contractor must register with EPD as a chemical waste producer. In general, chemical waste would mainly arise from maintenance of construction equipment. These may include the following items:
- scrap batteries or spent acid/alkali from their maintenance;
 - used engine oils, hydraulic fluids and waste fuel;
 - spent mineral oils/cleaning fluids from mechanical machinery; and
 - spent solvents/solutions from equipment cleaning activities.
- 6.5.11 Chemical wastes pose serious environmental and health and safety hazards if not stored and disposed of in an appropriate manner as outlined in the Chemical Waste Regulation. These hazards include:
- toxic effects to works;
 - adverse effects on water quality from spills; and
 - fire hazards.
- 6.5.12 The amount of chemical waste cannot be accurately predicted at this stage since it largely depends on the Contractor's housekeeping and equipment maintenance requirement. The amount is anticipated to be small in the order of about 50 litres per month and will be disposed of at regular interval when sufficient quantities warrant disposal (tentatively assume 1 trip per month). It is recommended that the Contractors should implement good housekeeping measures to minimise the amount of chemical waste generated. The amount of chemical waste to be generated will be quantified in the monthly Waste Flow Table to be prepared by the Contractor. Disposal routing will be via Sha Tau Kok Road, San Tin Highway, Tai Lam Tunnel, Tsing Long Highway and Tsing Yi Road to the Chemical Waste Treatment Centre.

General Refuse

- 6.5.13 General refuse will be generated by the site staff and construction workers during the construction period. This includes food scraps, waste papers, plastic containers, packaging materials, etc. The amount of municipal waste that may be produced is dependent on size of workforce at site.
- 6.5.14 It is expected not more than 50 site staff and construction workers will be working on site at any one time. With a general refuse generation rate of 0.65 kg per person per day, the amount of general refuse to be generated will be about 32.5 kg per day. Together with non-inert C&D materials generated during construction, about 1 truck trip every other day is envisaged. Disposal route will be via Sha Tau Kok Road and Wo Keng Shan Road to the NENT Landfill.
- 6.5.15 The storage of general refuse has the potential to give rise to a variety of adverse environmental impacts. These include odour if putrescible food waste is not collected frequently, water quality impacts if waste enters water bodies and visual impact from windblown litter. The refuse may attract pests and vermin if the storage areas are not well maintained and cleaned regularly. In addition, disposal of waste at sites other than approved waste transfer or disposal facilities can also lead to environmental impacts.
- 6.5.16 Handling and disposal of general refuse should cope with the presence of peak workforce during the construction period. Provided that the refuse is stored and transported in accordance with proper practices and disposed at approved disposal facilities, potential environmental impact is not expected.
- 6.5.17 A summary of the main C&D materials and wastes expected to arise from the Project and the estimated quantities is presented in **Table 6.1**.

Table 6.1 – Preliminary Estimated Quantities of C&D Materials, Sediment and Different Types of Waste during the Construction Phase

Types	Estimated Quantities*
Bentonite	6,500 m ³ (see Note 1)
Inert C&D Materials (granitic rock – Grade III or below)	3,081 m ³ (see Note 2)
Inert C&D Materials (soft public fill)	45,795 m ³ (see Note 2)
Inert C&D Materials (artificial hard material)	4,885 m ³ (see Note 2)
Sediment	3,040 m ³ (see Note 3)
Chemical Waste	50 litres/month (see Note 4)
Non-inert C&D Materials	275 m ³ (see Note 5)
General Refuse	32.5 kg/day (see Note 5)
Approximate timing * : mid 2017 – mid2021	

Notes:

* Tentative construction programme of mid 2017 – mid 2021 may be subject to further changes. The estimated quantities are based on preliminary design of the proposed works and the best available ground investigation data. The waste arising will largely depend on the contractor works programme and activities. The contractor will be required to provide detailed estimation of all the C&D materials and waste generated on-site using the Monthly / Yearly Summary Waste Flow Table as required under ETWB TCW No. 19/2005.

1 The amount of bentonite used and requiring disposal will depend on the Contractor HDD works procedure.

- Bentonite should be recycled and reused during the drilling process. Any spent bentonite unsuitable for reuse should be suitably dewatered for disposal at public fill reception facilities.
- 2 Topsoil, rocks and suitable materials should be stockpiled for later reuse in this or other projects subject to approval by relevant parties in accordance with the DEVB TCW No. 6/2010. The amount of materials that can be reused in this Project will be examined further during the detailed design stage. Artificial hard materials include concrete rubble and broken asphalt which are not suitable for reuse in this Project.
 - 3 According to the chemical testing results, the sediment to be excavated is classified as Category L sediment.
 - 4 The amount of chemical waste will be dependent on the contractor's on-site maintenance programme and the number of equipment and vehicles used on-site. Chemical waste should be collected by licensed contractor and properly disposed of at approved chemical waste treatment facilities (e.g. the Chemical Waste Treatment Centre at Tsing Yi). Chemical waste will be generated throughout the construction period.
 - 5 The amount of non-inert C&D materials and general refuse will depend on the contractor's operating procedures and housekeeping practices as well as the size of the workforce on-site. All such materials should be sorted, reused and recycled before disposal at designated outlets. General refuse will be generated throughout the construction period.
- 6.5.18 Out of the total 53,761 m³ of inert C&D materials generated, it is tentatively anticipated that about 20% of soft public fill can be reused in this Project.

Operational Phase

Sludge

- 6.5.19 During the operational phase, sludge will be generated after the sewage treatment process. The sludge will be dewatered on-site at the TSTP / STKSTW before delivered via Shek Wu Hui STW (SWHSTW) to the Sludge Treatment Facility (STF) at Tuen Mun for disposal. The production rate for the TSTP, Phase 1 expanded STKSTW and Phase 2 expanded STKSTW is expected to be about 1.7, 3.5 and 7 m³ per day respectively.
- 6.5.20 Sealed sludge tankers will be used to transport the sludge at around 1 trip per day via Fanling Highway, Po Shek Wu Road, SWHSTW, San Tin Highway, Yuen Long Highway, Lung Mun Road to the Tuen Mun STF. The holding area of the dewatered sludge and loading of the sludge will be located in enclosed area of the STKSTW, in which odourous air will be drawn to a deodourization unit for treatment before release to the atmosphere. As the sludge holding and transfer process will be in enclosed environment, no adverse odour impact is expected.

Solid Waste

- 6.5.21 Screenings will be generated from the fine screens at the sewage inlet. These screenings will be removed regularly to maintain efficiency of the screen. It will be collected and stored in covered containers for disposal at landfill (assume to be the NENT Landfill) at around 2-3 times per week. The membrane filters will be replaced when worn, and will be disposed of at landfill. The amount of screenings is estimated to be approximately 1.3 m³ per day with reference to the best available design information.
- 6.5.22 In addition, small amount of general refuse will be generated from the operators. General refuse may include food waste, plastic, glass bottles, aluminium cans and waste paper. About 6 operators are expected to be working at the STKSTW each day. With an estimated general refuse generation rate of 0.65 kg per person per day, the amount of general refuse to be generated will be about 4 kg per day. This will be collected for disposal at landfill (assume to be the NENT Landfill) after recyclable materials are separated, together with the screenings and worn filters at around 2-3 times per week. Disposal routing will be via Sha Tau Kok Road and Wo Keng Shan Road to NENT Landfill.

Chemical Waste

- 6.5.23 A small amount of chemical waste will be generated from normal operation and maintenance of the STW. This may include spent UV lamps, scrap batteries and lubricating oil. The chemical waste will be collected by licensed waste collectors at regular interval when sufficient quantities warrant disposal to the Tsing Yi Chemical Waste Treatment Centre. Disposal routing will be via Sha Tau Kok Road, San Tin Highway, Tai Lam Tunnel, Tsing Long Highway and Tsing Yi Road to the Chemical Waste Treatment Centre. All chemical wastes should be properly stored, labelled and removed by licensed waste collectors in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

6.6 Mitigation Measures

Construction Phase

General

- 6.6.1 Upon appointment, the main Contractor of each construction contract should prepare and implement an Environmental Management Plan (EMP) in accordance with ETWB TCW No. 19/2005 – “Environmental Management on Construction Sites” which should describe the arrangements for avoidance, reduction, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities. The EMP should incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. The waste management plan now becomes part of the EMP. The EMP should be submitted to the Engineer for approval. The Contractor should implement the waste management practices in the EMP throughout the construction stage of the Project. The EMP should be reviewed regularly and updated (preferably monthly) by the Contractor. The EMP should take into account the recommended mitigation measures in the approved EIA report.
- 6.6.2 The Contractor should refer to the estimated quantities in this EIA to facilitate him in the preparation of the EMP.
- 6.6.3 The Contractor should nominate an appropriate person, such as site agent or environmental officer, to be responsible for good site practices, arrangement for collection and effective disposal of all wastes generated at the site to an approved facility. Training of construction staff should be undertaken by the Contractor about the concept of site cleanliness and appropriate waste management procedures. The Contractor should develop and provide toolbox talk for on-site sorting of C&D materials to enhance worker’s awareness in handling, sorting, reuse and recycling of C&D materials. Requirements for staff training should be included in the EMP.
- 6.6.4 Good planning and site management practices should be employed to eliminate over ordering or mixing of construction materials to reduce wastage. Proper storage and site practices will minimise the damage or contamination of construction materials. Regular cleaning and maintenance of the waste storage area should be provided.
- 6.6.5 Where waste generation is unavoidable, the potential for recycling or reuse should be rigorously explored. If waste cannot be recycled, disposal routes described in the EMP should be followed. A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be implemented in accordance with DEVB TCW No. 6/2010. In order to monitor the disposal of C&D

materials and solid wastes at public fill reception facilities and landfills and to control fly-tipping, a trip-ticket system should be included.

- 6.6.6 Imported soft fill and rocks, if required, should be sourced from CEDD's fill bank, other projects or other approved sources instead of using new materials. Approval from the Engineer and all other relevant parties should be obtained by the Contractor before importation of the fill materials.

On-site Sorting, Reuse and Recycling

- 6.6.7 All waste materials should be segregated into categories covering:
- inert C&D materials suitable for public filling facilities;
 - recyclable materials / waste;
 - non-inert C&D materials for landfill;
 - spent bentonite for public filling facilities;
 - chemical waste; and
 - general refuse for landfill.
- 6.6.8 Proper segregation and disposal of construction waste should be implemented. Separate containers should be provided for inert C&D materials and non-inert C&D materials.
- 6.6.9 The reuse of excavated materials within this Project should be adopted as far as practicable. The opportunity of reusing the material in other projects in North District should also be explored.
- 6.6.10 Sorting is important to recover materials for reuse and recycling. Specific areas should be allocated for on-site sorting of C&D materials and to provide a temporary storage area for those sorted materials such as metals, concrete, timber, plastics, glass, excavated spoil, bricks / tiles and waste paper. If the area is limited, all C&D materials should at least be sorted on-site into inert and non-inert components. Non-inert C&D materials (such as bamboo, timber, vegetation, packaging waste and other organic materials should be reused and recycled wherever possible and disposed of to designated landfill only as a last resort. Inert C&D materials such as concrete, rock, clay, brick, soil, asphalt and the like should be separated and reused in this or other projects (subject to approval by the relevant parties) before disposed of at public fill reception facilities operated by Civil Engineering and Development Department (CEDD). Steel and other metals should be recovered from demolition waste stream and recycled.
- 6.6.11 The reuse of inert C&D materials such as soil, rock and broken concrete should be maximised. Waste should be separated into fine, soft and hard materials.
- 6.6.12 Prior to export of material from the site, the potential for it to be reused should be assessed. Most C&D materials can easily be reused with minimum processing. Waste separation methods should be followed to ensure that non-inert C&D materials are separated at source. Suitable soft materials should be used for landscaping and grading of embankments. Fine material should be separated out and used as topsoil.
- 6.6.13 The feasibility of using recycled aggregates in lieu of virgin materials should be rigorously considered during the detailed design and construction phases. In general, recycled aggregates are suitable for use as fill materials in earthworks, road sub-base formation, and drainage works. Recycled aggregates can also be used in concrete (up to Grade 35) for mass concrete walls and other minor structures such as planter boxes, toe wall planters and pavement, etc.

Site Clearance / Demolition Works

Excavation Works

- 6.6.14 All C&D materials should be sorted on-site into inert and non-inert components by the Contractor. Non-inert C&D materials such as wood, glass and plastic should be reused and recycled before disposal to a designated landfill as a last resort (currently assume to be the NENT Landfill). Inert C&D materials (should be reused on-site or in other projects approved by relevant parties before disposed of at public fill reception facilities. Steel and other metals if any should be recovered from C&D materials and recycled.
- 6.6.15 Good quality reusable topsoil should be stockpiled for later landscaping works. Stockpiles should be less than 2m in height, formed to a safe angle of repose and hydroseeded or covered with tarpaulin to prevent erosion during the rainy season and to minimise dust generation.
- 6.6.16 Control measures for temporary stockpiles on-site should be taken in order to minimize the noise, generation of dust, pollution of water and visual impact. These measures include:
- surface of stockpiled soil should be regularly wetted with water especially during dry season;
 - disturbance of stockpiled soil should be minimized;
 - stockpiled soil should be properly covered with tarpaulin especially when heavy rain storms are predicted;
 - stockpiling areas should be enclosed where space is available;
 - stockpiling location should be away from the water bodies; and
 - an independent surface water drainage system equipped with silt traps should be installed at the stockpiling area.
- 6.6.17 The identification of final disposal sites for C&D materials generated by the construction works will be considered during the detailed design stage of the Project when the volume and types of C&D materials can be more accurately estimated. The Public Fill Committee and Marine Fill Committee of CEDD should be consulted on designated outlets for inert C&D materials and sediment, whilst EPD should be consulted on landfills for non-inert C&D materials. The inert C&D materials to be disposed to public fill reception facilities must consist entirely of inert construction materials. Disposal of non-inert C&D materials to landfill must not have more than 50% by weight of inert material. The non-inert C&D materials delivered for landfill disposal should contain no free water and the liquid content should not exceed 70% by weight.
- 6.6.18 In order to avoid dust or odour impacts, any vehicles leaving a works area carrying C&D materials should have their load covered up before leaving the construction site.
- 6.6.19 C&D materials should be disposed of at designated public fill reception facilities or landfills. Reuse of inert C&D materials at other construction projects is subject to the approval of the relevant project proponents, Engineer and/or other relevant authorities, such as LandsD, PlanD, etc. Furthermore, unauthorized disposal of C&D materials in particular on private agricultural land is prohibited and may be subject to relevant enforcement and regulating actions. The Contractor shall refer and strictly follow the trip-ticket system for the disposal of C&D materials as stipulated in the DEVB TCW No. 6/2010. According to the Waste Disposal (Amendment) Ordinance

2013, to enhance the control of deposition or dumping of construction waste¹ on private land, prior acknowledgement from EPD must be obtained before the commencement of the depositing activity. Furthermore, copy of the acknowledgment form must be display in a conspicuous place on the land lot before depositing the waste.

Marine Sediment

- 6.6.20 With reference to the Sediment Quality Report in [Annex 6B](#), only Category L sediment was identified. In accordance with ETWB TCW No. 34/2002, Type 1 – Open Sea Disposal should be adopted for the disposal of 3,040 m³ excavated sediment during construction of the proposed outfall diffuser. The location of marine disposal site should be sought with MFC/CEDD. The Contractor shall obtain a Marine Dumping Permit in accordance with the Dumping at Sea Ordinance. The Contractor should provide separate submissions (e.g. Sediment Sampling and Testing Plan / Sediment Quality Report) to EPD / DASO authority when applying for the Marine Dumping Permit under the Dumping at Sea Ordinance.

Bentonite Slurry

- 6.6.21 Bentonite slurry used in the drilling works should be treated and recycled at the works area in STKSTW. Any bentonite that is not suitable for recycling should be suitably dewatered before disposed of at public fill reception facilities.

Chemical Waste

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

¹ Construction waste means any substances that is generated from construction works and abandoned and usually includes rock, rubble, sand, concrete, asphalt, brick, tile, etc.

accidental spillages. The interceptor should have a bypass to prevent flushing during periods of heavy rain. Oil and fuel bunkers should be bunded and/or enclosed on three sides to prevent discharge due to accidental spillages or breaches of tanks. Bunding should be of sufficient capacity to accommodate 110% of the volume of the largest container or 20% of the total volume of waste, whichever is largest. Waste collected from any grease traps should be collected and disposed of by a licensed contractor.

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

Non-inert C&D Materials

- 6.6.29 All wooden materials used on-site should be kept separate from other wastes to avoid damage and to facilitate reuse. Timber which cannot be reused should be sorted out from other waste and stored separately from all inert C&D materials before being disposed of to landfill.
- 6.6.30 Reusable steel or concrete panel shutters, fencing and hoarding and signboard should be used as a preferred alternative to items made of wood, to minimise wastage of wood. Metallic alternatives to timber are readily available and should be used rather than new timber. Precast concrete units should be adopted wherever feasible to minimize the use of timber formwork.
- 6.6.31 Only waste material need to be taken to a landfill. It should be separated from recyclable wood and steel materials. As for all waste types these materials should be reused on-site or other approved sites before disposal is considered as an option. Disposal to landfill should only be considered as a final option. Contractors are responsible for storage of re-useable materials on-site.

General Refuse

- 6.6.32 General refuse generated on-site should be stored in enclosed bins or skips and collected separately from other construction and chemical wastes and disposed of at designated landfill. A temporary refuse collection point should be set up by the Contractor at the works area to facilitate the collection of refuse by licensed waste collector. The removal of waste from the site should be arranged on a daily or at least on every second day by the Contractor to minimise any potential odour impacts, minimise the presence of pests, vermin and other scavengers and prevent unsightly accumulation of waste.

- 6.6.33 The recyclable component of the municipal waste generated by the workforce, such as aluminium cans, paper and cleansed plastic containers should be separated from other waste. Provision and collection of recycling bins for different types of recyclable waste should be set up by the Contractor. The Contractor should also be responsible for arranging recycling companies to collect these materials.
- 6.6.34 A summary of the estimated C&D materials, sediment and different types of waste and their disposal routes are tabulated in **Table 6.2**. The preliminary reuse / disposal programme breakdown is shown in **Table 6.3**.

Table 6.2 - Summary of the Quantities and Disposal Routes of C&D Materials, Sediment and Different Types of Waste Arising from the Project during the Construction Phase

Construction Activity	Estimated Quantities*								
	Inert C&D Materials, m ³ [A]	Inert C&D Materials re-use in the Project, m ³ [B]	Inert C&D Materials for Disposal, m ³ [C=A-B]	Non-inert C&D Materials (C&D Waste), m ³ [D]	Bentonite, m ³ [E]	Total C&D Materials generated and requiring Disposal, m ³ [F=C+D+E]	Sediment, m ³	Chemical Waste	General Refuse
Site clearance and demolition works	3,552	0	3,552	18	-	3,570	-	50 litres/month (see Note 6)	32.5 kg/day
Modification and upgrading of STKSTW and construction of a TSTP	42,305	9,500	32,805	213	-	33,018	-		
Construction of submarine outfall	3,216	0	3,216	16	6,500	9,732	3,040		
Laying of gravity sewers	4,597	1,609	2,988	23	-	3,011	-		
Demolition of STKSPS	91	0	91	5	-	96	-		
Total	53,761	11,109	42,652	275	6,500	49,427	3,040		
Potential Disposal Routes (see Note 1)	-	-	(see Note 2)	(see Note 3)	(see Note 4)	-	(see Note 5)	(see Note 6)	(see Note 3)

Notes:

- * The estimated quantities are based on the preliminary design of the proposed sewerage works and the best available ground investigation data. The waste arising will largely depends on the contractor works programme and activities. The contractor will be required to provide detailed estimation of all the C&D materials and waste generated on-site using a Monthly / Yearly Waste Flow Table as required under ETWB TCW No. 19/2005.
- All suitable materials will be reuse and recycle before disposal. Reuse of C&D materials in other projects is subject to approval by the relevant parties in accordance with DEVB TCW No. 6/2010. Final disposal outlets subject to final agreement with Public Fill Committee and Marine Fill Committee of CEDD for public fill reception facilities and marine dumping sites, and EPD for landfills.
 - Suitable inert C&D materials will be stockpiled for later reuse. The amount of materials that can be reuse in this Project will be examined further during the detailed design and construction phases. Surplus material will be disposed to designated public fill reception facilities (either TKO Area 137 Fill Bank or TM Area 38 Fill Bank). Disposal routing will be via Sha Tau Kok Road, Fanling Highway, Tolo Highway, Tate's Cairn Tunnel, Kwun Tong Bypass, Tseung Kwan O Road and Wan Po Road to the TKO Area 137 Fill Bank or via Sha Tau Kok Road, San Tin Highway, Yuen Long Highway and Lung Mun Road to the TM Area 38 Fill Bank.
 - The amount of non-inert C&D materials and general refuse will depend on the contractor's operating procedures and housekeeping practices as well as the size of the workforce on-site. All such wastes should be sorted, reused and recycled before disposal at designated landfill (e.g. NENT Landfill). Disposal routing will be via Sha Tau Kok Road and Wo Keng Shan Road to NENT Landfill.
 - Bentonite will be used during the HDD works for the submarine outfall. The amount of bentonite will depend on the Contractor's working procedures for HDD works. All bentonite will be recycle and reuse in the drilling process, spent bentonite will be disposed to public fill reception facilities after dewatering. Spent bentonite slurry will be disposed to public fill reception facilities (either TKO Area 137 Fill Bank or TM Area 38 Fill Bank) via land route or sea route depending on Contractor's proposal.
 - According to the chemical testing results, the sediment to be excavated is classified as Category L sediment. The disposal of marine sediment will be via sea route by barge from the works site to the marine disposal site allocated by MFC/CEDD.
 - The amount of chemical waste will be dependent on the contractor's on-site maintenance programme and the number of equipment and vehicles used on-site. Chemical waste should be collected by licensed contractor and properly disposed of at approved chemical waste treatment facilities (e.g. the Chemical Waste Treatment Centre at Tsing Yi). Disposal routing will be via Sha Tau Kok Road, San Tin Highway, Tai Lam Tunnel, Tsing Long Highway and Tsing Yi Road to the Chemical Waste Treatment Centre.

Table 6.3 - Preliminary Reuse and Disposal Programme during the Construction Phase

Reuse / Disposal Arrangement	Approximate Quantity (m³)	Estimated Frequency of Trucks / Vessels Involved
2018		
Reuse of inert C&D materials	393	~7 truck trips per day
Disposal of inert C&D materials to public fill reception facilities	13,579	
Disposal to landfill	64	~1 truck trip every other day
2019		
Reuse of inert C&D materials	5,153	~8 truck trips per day
Disposal of inert C&D materials to public fill reception facilities	10,017	
Disposal to landfill	82	~1 truck trip every other day
2020		
Reuse of inert C&D materials	5,161	~8 truck trips per day
Disposal of inert C&D materials to public fill reception facilities	10,017	
Marine disposal of sediment <small>(see Note 2)</small>	3,040	~5 barge trips
Disposal to landfill	64	~1 truck trip every other day
2021		
Reuse of inert C&D materials	402	~5 truck trips per day
Disposal of inert C&D materials to public fill reception facilities	8,948	
Disposal to landfill	60	~1 truck trip every other day
2022 <small>(see Note 3)</small>		
Reuse of inert C&D materials	0	~1 truck trip per day
Disposal of inert C&D materials to public fill reception facilities	91	
Disposal to landfill	5	~1 truck trip

Notes:

1. The exact programme, quantities and frequency of the disposal will depend on the Contractor's programme after the contracts are awarded. Although the construction contract is expected to be awarded in mid-2017, the actual major construction works hence the generation of C&D materials is expected to commence in 2018.
2. Marine disposal site(s) to be allocated by MFC/CEDD.
3. The demolition of the STKSPS will be conducted upon completion of the main construction works. This is tentatively programmed in 2022 subject to the substantial completion of the main works.

Operational Phase

- 6.6.35 Dewatered sludge should be delivered by sealed sludge tanker for disposal at the Sludge Treatment Facility in Tuen Mun.
- 6.6.36 Screenings should be collected and stored in covered containers before disposed of at landfill. Likewise, worn membrane filters and general refuse should be properly stored and disposed of at landfill.
- 6.6.37 All chemical wastes should be properly stored, labelled and removed by licensed waste collectors in accordance with the Waste Disposal (Chemical Waste) (General) Regulation and the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.
- 6.6.38 No secondary impact is expected from the mitigation measures proposed in the EIA report.

6.7 Land Contamination

- 6.7.1 This section identifies and assesses sites within the proposed works area which, due to their past and present land uses and activities, will have potential land contamination implications.
- 6.7.2 The review of site historical information was conducted with reference to the Practice Guide for Investigation and Remediation of Contaminated Land. A review of historical aerial photos was undertaken to identify the past land uses of the proposed works area ([Annex 6C](#)). During the 70s, the STKSTW, proposed gravity sewer and STKSPS site was still vacant land and undeveloped with village houses mainly congregated at the current market area. STKSTW was constructed in the late 80s while Sha Tau Kok Chuen was progressively developed during the 90s. No significant land use change was noted since then. The land use in the area has been and up to now mainly residential uses with some community and recreational uses. Indeed, as the Project is within Closed Area, the presence of industrial land use and activity is not expected and not observed. Photos showing the existing site conditions of the proposed works area are shown in [Annex 6D](#).
- 6.7.3 Relevant authorities have been approached to obtain information on chemical waste producer, dangerous goods license and possible incident on spillage / leakage of chemicals / dangerous goods at the Project area. No records of dangerous goods license and spillage / leakage incidents were noted from the reply. Relevant correspondences are shown in [Annex 6E](#). Based on a search of EPD's record, no records of registered chemical waste producers within the works area were noted.
- 6.7.4 A site walkover was conducted in May 2015 with DSD representatives at the STKSTW and STKSPS. Part of the works are located within the existing STKSTW and STKSPS, site walkover indicates the works area is generally paved, clean, without stain or abnormal odour. Based on site observation ([Annex 6D](#)) and confirmation by DSD/ST1, there are no oil / chemical storage areas or any contaminating activities in the proposed works area of the STKSTW and STKSPS. The checklist is shown in [Annex 6F](#) and [Annex 6G](#). The proposed works area for the gravity sewers includes verge, road and open area. There are no contaminating activities or landuse in the proposed gravity sewers works area.
- 6.7.5 Based on the desk-top review and walkover, the presence of contaminated land in the proposed works area is therefore not expected. A summary of the land contamination review is presented in **Table 6.4**.
- 6.7.6 The operation of the TSTP will not require the use of large amount of chemicals or fuels that may potentially cause land contamination. Similar to the existing STKSTW, all chemicals required for sewage treatment would be stored indoor. For any spillage

/ leakage of chemical, the operator will clean up with appropriate materials stipulated in the material safety data sheet. The resulting clean up materials will be considered as chemical waste and properly disposed by licensed waste collectors. In addition, the operator will be required to properly store, label and remove all chemical wastes in accordance with the Waste Disposal (Chemical Waste) (General) Regulation and the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. As such, no land contamination issue is expected for the demolition of the TSTP after the expanded STW comes into operation. Should any land contamination issue be identified in the decommissioning of the TSTP, the project proponent (DSD) should follow up in accordance with the prevailing guidelines.

Table 6.4 - Summary of Land Contamination Review

Review of Information	STKSTW	STKSPS	Gravity Sewers
Historical aerial photo interpretation:			
1973	Undeveloped mudflat	Undeveloped land, bare ground	Partly undeveloped mudflat, partly village area
1986	Undeveloped mudflat	Roundabout	Partly reclaimed land under construction, partly village area
1987	Reclaimed land, under STKSTW construction	STKSPS under construction	Partly reclaimed land under construction, partly village area
1995	STKSTW	STKSPS	Road
2003	STKSTW, no change	STKSPS, no change	Road, no change
2008	STKSTW, no change	STKSPS, no change	Road, no change
2012	STKSTW, no change	STKSPS, no change	Road, no change
Government records:			
EPD memo dated 13 May 2015	No record of accidents of spillage/leakage of chemicals at the concerned location. A search of EPD's chemical waste producers record was conducted on 8 July 2015, no records of chemical waste producers within the works area were found.		
FSD memo ref. (114) in FSD GR 6-5/4 R Pt. 9 dated 3 June 2015	Neither records of dangerous goods license nor incidents of spillage / leakage of dangerous goods were found at the concerned location.		
Site walk:			
10 June 2015	Existing sewage treatment works with paved ground surface, no stain or abnormal odour. No polluting or land contaminating activities nearby.	Existing pumping station with paved ground surface, no stain or abnormal odour. No polluting or land contaminating activities nearby.	Existing paved road, no stain or abnormal odour. No polluting or land contaminating activities nearby.

6.8 Evaluation of Residual Impacts

6.8.1 With the implementation of proper waste management practices for storage, handling, transportation and disposal of waste arisings, no residual impacts are expected during the construction and operational phases of the Project.

6.8.2 As no residual impact is identified, no additional study is required.

6.9 Environmental Audit

6.9.1 Auditing should be carried out periodically to determine if waste is being managed in accordance with prescribed waste management procedures and the EMP. The audits should examine all aspects of waste management including waste generation, storage, recycling, treatment, transportation, and disposal. The general site inspections including waste management issues will be undertaken weekly by the Environmental Team to check all construction activities for compliance with all appropriate environmental protection and pollution control measures, including those set up in the EMP. Meanwhile, waste management audit will also be carried out as part of the monthly audit by the Independent Environmental Checker.

6.9.2 No EM&A is required for operational phase of the Project.

6.10 Summary

6.10.1 Construction and demolition (C&D) materials, sediment, chemical waste and general refuse will inevitably be produced during the construction phase of the Project.

6.10.2 Provided that there is strict control of C&D materials generated from construction works and that all arisings are stored, handled, transported and disposed of in accordance with the recommended mitigation measures, no unacceptable impact due to waste management is expected during construction phase. The recommended mitigation measures can be enforced by incorporating them into the waste management requirements as part of the Environmental Management Plan. Environmental audit would be necessary to ensure the implementation of proper waste management practices during construction

6.10.3 With the use of HDD, the need for sediment excavation during construction of the new submarine outfall can be significantly reduced. Nonetheless, localised excavation of a small seabed area will be necessary to facilitate the construction of the diffuser for the new submarine outfall. Sediment sampling and testing results indicated the excavated sediment is Category L sediment which should be disposed of as Type 1 – Open Sea Disposal. The Contractor shall obtain a Marine Dumping Permit in accordance with the Dumping at Sea Ordinance. The Contractor should provide separate submissions (e.g. Sediment Sampling and Testing Plan / Sediment Quality Report) to EPD / DASO authority when applying for the Marine Dumping Permit under the Dumping at Sea Ordinance.

6.10.4 Operation of the sewage treatment works will generate sludge, screenings, worn membrane filters, chemical waste and general refuse. With the implementation of the recommended mitigation measures, no unacceptable impact due to waste management is expected during operational phase.

6.10.5 A review of the past and present land use of the Project site area was conducted. Based on desk-top review and site walkover, the presence of contaminated land is not expected.