

10 Waste Management Implications

10.1 Introduction

10.1.1 This Section provides an evaluation of the potential waste management implications associated with the construction and operation of the Project. Mitigation measures have been proposed if considered necessary.

10.2 Relevant Legislation, Standards and Guidelines

10.2.1 The criteria and guidelines for evaluating potential waste management implications are laid out in Annexes 7 and 15 of the Technical Memorandum on EIA Process (EIAO-TM) under the Environmental Impact Assessment Ordinance (EIAO) (Cap 499). The following legislation covers, or has some bearing upon the handling, treatment and disposal of the wastes generated from the construction and operation of the Project.

- 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)

Waste Disposal Ordinance (Cap.354)

10.2.2 The Waste Disposal Ordinance (WDO) prohibits the unauthorised disposal of wastes. Construction waste is defined under Cap. 354N of the WDO as any substance, matter or thing that is generated and abandoned from construction works regardless if it has been processed or stockpiled before being abandoned, excluding sludge, screenings or any matter removed or generated from desludging, desilting or dredging works. Under WDO, waste can be disposed of only at designated waste disposal facilities licensed by the Environmental Protection Department (EPD).

Waste Disposal (Chemical Waste) (General) Regulation (Cap.354C)

10.2.3 Issued under the WDO, the Waste Disposal (Chemical Waste) (General) Regulation administers the possession, storage, collection, transport and disposal of chemical wastes. EPD has also issued three guidelines detailing how the Contractor should comply with the regulations on chemical wastes, namely A Guide to the Chemical Waste Control Scheme (2016), A Guide to the Registration of Chemical Waste Producers (2016) and Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992).

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

10.2.4 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 (PFRF) for disposal must consist entirely of inert material.

Land (Miscellaneous Provisions) Ordinance (Cap.28)

- 10.2.5 The inert Construction and Demolition (C&D) materials (also called public fill) may be taken to PFRFs. PFRFs usually form part of land reclamation schemes and are operated by the Civil Engineering and Development Department (CEDD) and others. The Land (Miscellaneous Provisions) Ordinance requires that individuals or companies who deliver inert C&D materials to the PFRFs to obtain Dumping Licenses. The licenses are issued by CEDD under delegated authority from the Director of Lands.

Public Health and Municipal Services Ordinance (Cap.132) – Public Cleansing and Prevention of Nuisances Regulation

- 10.2.6 This Regulation provides a further control on the illegal dumping of wastes on unauthorised (unlicensed) sites.

Dumping at Sea Ordinance (Cap.466)

- 10.2.7 The Dumping at Sea Ordinance (DASO) is to control the disposal of substances and articles at sea and the dumping of substances and articles in the sea and under the sea-bed, and for connected purposes. All these operations would require a permit to be issued by the Director of Environmental Protection (DEP) as the Authority under the DASO. Before an application of a marine dumping permit is made, requirements stipulated in ETWB TC(W) No. 34/2002 regarding the sampling, testing and disposal arrangement of dredged/excavated sediments must be fulfilled.

Other Relevant Guidelines

- 10.2.8 Other guideline documents which detail how the Contractor will comply with the WDO and its associated regulations include:
- Waste Disposal Plan for Hong Kong (December 1989), Planning, Environment and Lands Branch Government Secretariat, Hong Kong Government;
 - Works Branch Technical Circular (WBTC) No. 2/93, Public Dumps;
 - WBTC No. 2/93B, Public Filling Facilities;
 - WBTC No. 16/96, Wet Soil in Public Dumps;
 - WBTC Nos. 4/98 and 4/98A, Use of Public Fill in Reclamation and Earth Filling Projects;
 - WBTC No. 12/2000, Fill Management;
 - WBTC No. 19/2001, Metallic Site Hoardings and Signboards;
 - WBTC No. 12/2002, Specification Facilitating the Use of Recycled Aggregates;
 - Environment, Transport and Works Bureau Technical Circular (Works) (ETWB TC(W)) No. 34/2002 Management of Dredged/Excavated Sediment;
 - ETWB TC(W) No. 19/2005 Environmental Management on Construction Site;
 - Development Bureau (DEVB) TC(W) No. 6/2010, Trip Ticket for Disposal of Construction and Demolition Materials;
 - DEVB TC(W) No. 8/2010, Enhanced Specification for Site Cleanliness and Tidiness;
 - DEVB TC(W) No.2/2011, Encouraging the Use of Recycled and Other Green Materials in Public Works Projects;

- DEVB TC(W) No. 9/2011, Enhanced Control Measures for Management of Public Fill; and
- Hong Kong Blueprint for Sustainable Use of Resources 2013-2022, Environment Bureau, May 2013;
- Project Administration Handbook (PAH) for Civil Engineering Works (2020 Edition) – Section 4.1.3 relating to construction and demolition materials.

10.3 Assessment Methodology

10.3.1 The potential environmental impacts associated with the handling and disposal of waste arising from the construction and operation of the Project were assessed in accordance with the criteria presented in Annexes 7 and 15 of EIAO-TM and summarized as follows.

- Estimation of the types and quantities of the wastes to be generated;
- Evaluation of opportunities for waste reduction, re-use and recycling;
- Identification of disposal options for each type of waste;
- Assessment of the potential environmental impacts due to the management of waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges and public transport; and
- Assessment of impacts caused by handling, collection, transportation and re-use /disposal of wastes.

10.4 Identification of Potential Waste Sources

Construction Phase

10.4.1 The construction activities to be carried out for the Project include demolition of existing facilities, site clearance, site formation, excavation, installation of new facilities. The associated types of waste include:

- Construction and demolition (C&D) materials;
- Excavated sediments;
- Chemical waste; and
- General refuse.

Operational Phase

10.4.2 Wastes arising from the operation of the Project would include:

- Screenings and grits;
- Dewatered sludge;
- Chemical waste; and
- General refuse.

10.5 Impact Assessment and Evaluation

Construction Phase

C&D Materials

- 10.5.1 C&D materials will be generated from demolition of existing facilities, site clearance, site formation, excavation, installation of new facilities. The C&D materials may consist of inert materials such as soil, rock, concrete, brick and asphalt and non-inert materials comprising metal, timber, paper and plastic. During the planning and design of the general Project layout, construction method and construction programme, considerations have been given to minimize the generation of inert C&D materials and maximize the reuse of these inert C&D materials for construction works. As described in Section 2, this Project would receive pre-treated food waste and sewage sludge from other Sewage Treatment Works (STW) for co-digestion. These pre-treated food waste and sewage sludge are currently not received in the existing TPSTW. In addition, the capacity of TPSTW shall be increased from 120,000 m³/day to 160,000 m³/day to meet the sewage treatment demand. Thus, due to this Project, more space would be required to accommodate the new co-digestion and treatment facilities. To minimize the visual impact, the heights of new buildings / facilities of this Project shall be similar to that of the surrounding existing buildings in Tai Po Industrial Estate. Due to the space constraint at existing TPSTW, utilization of the underground space to accommodate new facilities would be required. In order to minimize the usage of underground space (and thus minimize the generation of excavated material), a piece of government land to the south of the existing TPSTW (1.6 hectares) is proposed to accommodate the new sewage treatment facilities. In addition, only compact-type sewage treatment technology is proposed at the proposed expansion site to allow more space at the existing TPSTW for new facilities and to minimize excavated volume. Furthermore, the construction works and programme have been designed to allow temporary stockpile of excavated materials generated on-site for backfilling.
- 10.5.2 Based on the latest design, the estimated volume of C&D materials generated from the Project is about 364,620 m³. No imported fill is required for the Project. All C&D materials generated shall be sorted on site into inert C&D materials and the non-inert C&D materials two separate portions. The C&D materials, the reusable and/or recyclable materials shall be recovered before disposal of the waste portion off-site as a last resort. An estimation of quantity of C&D materials generated during construction phase is summarized in **Table 10.1**.

Table 10.1 Estimated Quantities of C&D Materials during Construction Phase

Proposed Works	Inert C&D Material (m ³)			Non-inert C&D Material (m ³)			Total C&D Material (m ³)
	Generated	Re-used On-site	Disposal	Generated	Recycled Off-site *	Disposal	
Demolition of Existing Treatment Facilities of TPSTW (2029-2033)	130,740	19,610	111,130	19,380	13,560	5,820	150,120
Construction of New Facilities (2025-2036)	208,030	31,200	176,830	6,470	4,530	1,940	214,500
Total	338,770	50,810	287,960	25,850	18,090	7,760	364,620

Note: * The non-inert waste to be reused off-site includes wood, plastic, steel and other metals and equipment such as pumps, valves and instrument generated from the demolition works, which would have a certain value in the recycling industry.

- 10.5.3 Approximately 338,770 m³ of inert C&D materials will be generated. Approximate 15% (about 50,810 m³) inert C&D materials could be reused on-site as filled material, resulting in disposal

of about 287,960 m³. The surplus inert C&D materials would be disposed of at designated PFRF (Tuen Mun Area 38 Fill Bank) for off-site beneficial reuse. Assuming a capacity of 7 m³ per truck, bulk factor of 1.7 and 25 working days a month, it is estimated that approximate 20 truck trips per day would be required for the disposal of inert C&D materials. The designated disposal site of inert C&D materials shall be confirmed with the Public Fill Committee of CEDD. A Construction and Demolition Material Management Plan (C&DMMP) will be prepared and submitted to Public Fill Committee for approval in accordance with Project Administration Handbook for Civil Engineering Works. The control measures proposed in **Section 10.6** shall be followed for the management of inert C&D materials.

- 10.5.4 Approximately 25,850 m³ of non-inert C&D materials will be generated. Such materials will be sorted for reuse and recycling as far as possible before disposal to landfill. The estimated non-inert C&D materials recycling rate would be up to 70%. It is estimated that 18,090 m³ of the non-inert C&D materials would be recycled, resulting in disposal of about 7,760 m³. The non-recyclable non-inert C&D materials would be disposed of at North East New Territories (NENT) Landfill. The designated disposal site of non-inert C&D materials shall be confirmed with the EPD. The separated recyclable non-inert C&D materials shall be collected by recycling companies for off-site reuse or recycling. The control measures proposed in **Section 10.6** shall be followed for the management of non-inert C&D materials.

Excavated Sediments

- 10.5.5 The Project site (including the existing TPSTW site and the proposed expansion site) was formed via land reclamation during the 1970s. It is comprised of general fill over-lying a layer of marine deposit or alluvium. The public fill was previously placed on top of the marine deposits during the 1970s as a result of the land reclamation activities. The past GI data indicated that the majority of the marine deposits in the Project site would occur at a vertical level of over 13m below ground level (bgl). The land-based sediment (marine deposit) layer could potentially be encountered in some of the proposed excavation works areas of the Project. According to the preliminary design, approximately 26,200 m³ of excavated sediments would be generated during the construction of new facilities of the Project within the period from 2025 to 2036.
- 10.5.6 A Sediment Sampling and Testing Methodology Paper (SSTMP) was prepared with reference to ETWB TC(W) No. 34/2002 to present the sampling and testing requirements for the Project. The SSTMP is given in **Appendix 10.1**, which was accepted by EPD in October 2021.
- 10.5.7 Sediment sampling and testing was undertaken during the period from December 2021 to April 2022 in accordance with the SSTMP except that the sampling locations have been adjusted due to actual site constraints.
- 10.5.8 Three sampling locations, namely BH1, BH2 and BH3, were proposed in the SSTMP. Sampling at BH1 was terminated at less than 1m bgl due to encountering hard material. Attempts to sampling were made at three other alternative locations near BH1 but also unsuccessful due to the same reason. No other feasible sampling locations could be identified at or near the sampling grid of BH1 due to site constraints (e.g. with underground utilities). Sampling locations BH2 and BH3 were relocated to 26m north and 11m south of their original proposed locations in SSTMP respectively due to similar site constraints. The as-built sediment sampling locations are indicated in **Appendix 10.2**.
- 10.5.9 Chemical and biological screening of sediment samples were conducted in accordance with SSTMP and ETWB TC(W) No. 34/2002. A total of 6 samples had been collected from the sampling locations and tested for chemical screening. The details chemical screening results are provided in **Appendix 10.3**.

- 10.5.10 Based on the chemical screening results, Category H sediment was identified in 1 sample at BH3 with Lead exceeded the UCEL but below 10 times of the LCEL. Category M sediment was identified in 5 samples at BH2/BH3 with Lead exceeded the LCEL but below the UCEL.
- 10.5.11 Based on the chemical screening results, Tier III biological screening were conducted on the 5 Category M sediment samples. All the samples had passed the biological screening. The results of the biological screening are provided in **Appendix 10.3**.
- 10.5.12 The excavated sediments were classified based on their contaminant levels with reference to ETWB TC(W) No. 34/2002 as summarized in **Table 10.2**. If the estimated excavation depth of each building/facilities is lower than the termination depth of general fill layer of the nearest ground investigation (GI) point indicated in Figure 3.1 of **Appendix 10.1**, occurrence of excavated sediment would be anticipated. With the assumption of the layer between of the excavation depth and termination depth of general fill layer to be marine deposit, the quantity of excavated sediment for each building / facility has been estimated (i.e. excavation area (m²) × thickness of marine deposit (m)). The total volume of sediment generated was estimated to be approximately 26,200 m³. The quantity for each sediment category is estimated in pro rata basis according to categorization of the samples in the sediment sampling and testing.

Table 10.2 Estimated Quantities of Sediment under each Disposal Option

Disposal Option	Corresponding Category	Estimated <i>In-situ</i> Quantity* (m ³)
		Timing (2025 - 2036)
Type 1 – Open Sea Disposal	Category L Sediment	0
Type 1 – Open Sea Disposal (Dedicated Sites)	Category M Sediment (passed the biological screening)	21,800
Type 2 – Confined Marine Disposal at disposal site(s)	Category H Sediment and H+ Sediment (passed the biological screening)	4,400
Type 3 – Special Treatment/ Disposal	Category H+ Sediment (failed biological screening)	0
Total:		26,200

Note: *The quantities shown in the table are estimates only and will be subject to further review during the detailed design and construction stage.

- 10.5.13 The excavated sediments would be disposed of to the designated marine disposal areas in accordance with the requirements of the ETWB TC(W) No. 34/2002. The proposed disposal outlets of the Type 1 (Dedicated Sites) and Type 2 sediments would be South Cheung Chau / East Ninepin and East Sha Chau, respectively. The final disposal sites of the excavated sediments shall be confirmed with Marine Fill Committee (MFC). The proposed Mitigation and control requirements for excavated sediments are given in **Section 10.6**. Provided that the handling of excavated sediments is in accordance with the procedures in ETWB TC(W) No. 34/2002 and the recommendations in this EIA, the potential waste management implications on the environment associated with handling of excavated sediment during the construction phase of the Project are not expected.
- 10.5.14 The sediment sampling and testing results and disposal options presented in this report only serve the purpose of fulfilling this EIA Study under the EIAO. Separate submissions (e.g. Sediment Sampling and Testing Plan (SSTP) / Sediment Quality Report (SQR)) should be submitted to EPD's Marine Dumping Control Section / Territorial Control Office and to obtain MFC's agreement on the dredging rationale and disposal arrangement for marine disposal under the DASO.

Chemical Waste

- 10.5.15 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:

- Scarp 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.

10.5.16 Accidental spillages of chemicals in the works area may contaminate the top soils on exposed ground/earth. The contaminated soil particles may be washed away by construction site runoff causes water pollution.

10.5.17 Chemical wastes pose environmental and health and safety hazards if not stored and disposed of in an appropriate manner as outlined in the Waste Disposal (Chemical Waste) (General) Regulation. These hazards include:

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

10.5.18 The amount of chemical waste cannot be accurately predicted at this stage since it largely depends on the contractor's housekeeping measure. The amount is anticipated to be small (about 50 litres per month) and it is recommended that good housekeeping measures should be implemented to reduce the amount of chemical waste generated. The chemical wastes will be collected by licensed collector for the disposal of at licensed treatment facilities (i.e. Chemical Waste Treatment Centre (CWTC) at Tsing Yi) in accordance with relevant regulation and guideline.

10.5.19 With the incorporation of suitable arrangements for the storage, handling, transportation and disposal of chemical wastes under the requirements stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Waste, no unacceptable environmental impacts and hazards will result from the handling, transportation and disposal of chemical waste arising from the Project. The control measures proposed in **Section 10.6** shall be followed for the management of chemical waste.

General Refuse

10.5.20 General refuse will be generated by the site staff and construction workers during the construction period. This includes food scraps, aluminum cans, waste papers, plastic containers, food packaging, etc. The amount of general refuse that may be produced is dependent on size of workforce at site.

10.5.21 Based on a construction workforce of 400 persons (typical number for construction in similar scale) and assuming a general refuse generation rate of 0.65 kg per worker per day, the amount of general refuse to be generated on site will be about 260 kg per day. The general refuse generated will be collected by a waste collector and disposed of at waste transfer/disposal facilities and then to landfill.

10.5.22 The storage of general refuse has the potential to give rise to a variety of adverse environmental impacts. These include odour if waste is not collected frequently, water quality impacts if waste enters water bodies and visual impact from windblown litters. 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.

10.5.23 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. The control measures proposed in **Section 10.6** shall be followed for the management of general refuse.

10.5.24 The proposed disposal outlets and tentative transportation routings for the disposal of various types of waste during construction phase are shown in **Table 10.3**.

Table 10.3 Proposed Disposal Outlet and Tentative Transportation Routings for Waste Disposal during Construction Phase

Types of Waste		Estimated Generation Amount (Timing of Generation)	Handling	Proposed Disposal Outlet	Estimated Frequency of Truck	Tentative Transportation Routing
Inert C&D Materials		338,770 m ³ (2025 to 2036)	The inert C&D materials generated would be sorted and reused on-site as far as practicable; 50,810 m ³ of inert C&D material to be reused on-site.	287,960 m ³ of inert C&D material to be disposed at Tuen Mun Area 38 Fill Bank for other beneficial uses	20 truck trips per day	via Ting Kok Road, Fanling Highway, San Tin Highway, Yuen Long Highway, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road
Non-inert C&D Materials		25,850 m ³ (2025 to 2036)	Any recyclable materials (e.g., metal) will be segregated from the non-inert C&D materials for recycle; 18,090 m ³ of non-inert C&D material to be recycled off-site.	7,760 m ³ of non-inert C&D material or if rejected by recycling companies as the last resort to NENT Landfill	Not more than 1 truck trip per day	via Ting Kok Road, Fanling Highway, Jockey Club Road, Man Kam To Road, Wo Keng Shan Road
Excavated Sediments	Category M Sediment (passed biological screening)	21,800 m ³ (2025 to 2036)	To be handled with mitigation measures as per Sections 10.6.15 to 10.6.23	Type 1 - Open Sea Disposal (Dedicated Site) at South Cheung Chau / East Ninepin	Not more than 2 truck trip per day	via Ting Kok Road, Tolo Highway, Tai Po Road (Sha Tin), Tsing Sha Highway, Lin Cheung Road, Yuen Fat Wharf (for barging)
	Category H Sediment	4,400 m ³ (2025 to 2036)		Type 2 – Confined Marine Disposal at East Sha Chau	Not more than 1 truck trip per day	
Chemical Waste		50 litres per month (2025 to 2036)	Provide on-site chemical waste collection points for collection by licensed collector	To CWTC	As required	via Ting Kok Road, Tolo Highway, Tai Po Road (Sha Tin), Tsing Sha Highway, Tsing Yi Road
General Refuse		260 kg per day (2025 to 2036)	Provide on-site refuse collection points	To NENT Landfill	Not more than 1 truck trip per day	via Ting Kok Road, Fanling Highway, Jockey Club Road, Man Kam To Road, Wo Keng Shan Road

Operational Phase

Screenings and Grits

- 10.5.25 Screening and grits would be generated at the inlet works during the operation of the upgraded TPSTW. The estimated total volume of screening and grits to be generated would be 43 m³ per day. The generated screenings and grits would be compacted and stored properly in a covered container. The screenings and grits would be collected and transported by waste collector for disposal at NENT landfill. A reputable waste collector would be employed by the operators to minimize the potential pest and odour impacts.

Dewatered Sludge

- 10.5.26 Primary sewage sludge and activated sewage sludge will be generated from primary sedimentation and secondary treatment, respectively. Imported sludge from other STWs and pre-treated food waste will be received at truck unloading facilities. The sludge generated from the upgraded TPSTW and imported from other STWs will be co-digested with the imported pre-treated food waste. The imported sludge / pre-treated food waste will be transported by fully enclosed pipes or trucks to reduce odour nuisance.
- 10.5.27 The generated/imported sludge as well as the imported pre-treated food waste will be pumped to digester battery for co-digestion. The digestate generated from co-digestion would be dewatered to dry solid content of 30% (i.e. dewatered sludge) before disposal. The estimated quantity of dewatered sludge generated from the upgraded TPSTW would be approximately 469 tonne per day (i.e. 586 m³ per day with assumption of the density of 800kg/m³). The dewatered sludge would be stored properly in covered containers within the TPSTW and then delivered to the T· Park at Tuen Mun for disposal. With assumption of truck capacity of 12 tonne, it is estimated that approximate 40 truck trips per day would be required for the disposal.

Chemical Waste

- 10.5.28 Small quantities of chemical wastes including about 200 no. of spent UV lamps, about 9,000 litres (L) of spent lubricants, about 320 L of spent cleaning solvent and about 4 no. of used batteries would be generated from regular maintenance activities per year during the operational phase. The chemical wastes generated may pose environmental and health and safety hazards if not stored and disposed properly as outlined in the Waste Disposal (Chemical Waste) (General) Regulation. The operator shall register with EPD as a chemical waste producer if any chemical waste would be generated from the operation. The chemical wastes generated during operation of the Project will be collected by licensed collector for the disposal of at licensed treatment facilities (i.e. CWTC at Tsing Yi).

General Refuse

- 10.5.29 General refuse, such as paper, food waste, plastic, aluminum cans, packaging and office wastes etc., would be generated by staff, visitors, and office activities during operation of the Project. It is expected 240 site staff will be working on site during the operational phase. Assuming a general refuse generation rate of 0.65 kg per person per day, the amount of general refuse to be generated from the Project will be about 156 kg per day. The general refuse generated will be collected by a waste collector and disposed of at waste transfer/disposal facilities and then to landfill.
- 10.5.30 The proposed disposal outlets and tentative transportation routings for the disposal of various types of waste during operational phase are shown in **Table 10.4**.

Table 10.4 Proposed Disposal Outlet and Tentative Transportation Routings for Waste Disposal during Operational Phase

Types of Waste	Estimated Generation Amount (Timing of Generation)	Handling	Proposed Disposal Outlet	Estimated Frequency of Truck	Tentative Transportation Routing
Screenings and Grits	43 m ³ per day (from 2036 onwards)	To be compacted and stored in a covered container for collection by waste collector	To NENT Landfill	7 truck trip per day	via Ting Kok Road, Fanling Highway, Jockey Club Road, Man Kam To Road, Wo Keng Shan Road
Dewatered Sludge	586 m ³ per day (from 2036 onwards)	To be stored properly in covered containers	To T. Park	40 truck trips per day	via Ting Kok Road, Tai Po Road, Lam Kam Road, Kam Tin Road, Yuen Long Highway, Tuen Mun Road, Lung Mun Road, Nim Wan Road
Chemical Waste	Spent UV lamps -200 no. per year; Spent lubricants – 9,000 L per year; Spent cleaning solvent – 320 L per year; Used batteries – 4 no. per year (from 2036 onwards)	Provide on-site chemical waste collection points for collection by licensed collector	To CWTC	As required	via Ting Kok Road, Tolo Highway, Tai Po Road (Sha Tin), Tsing Sha Highway, Tsing Yi Road
General Refuse	156 kg per day (from 2036 onwards)	Provide on-site refuse collection points	To NENT Landfill	Not more than 1 truck trip per day	via Ting Kok Road, Fanling Highway, Jockey Club Road, Man Kam To Road, Wo Keng Shan Road

10.6 Mitigation Measures

Construction Phase

General

- 10.6.1 The management of C&D materials follows the same hierarchy as for other wastes i.e. in order of desirability: avoidance, minimization, reuse/recycling, treatment and safe disposal of waste.
- 10.6.2 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 workers' awareness in handling, sorting, reuse and recycling of C&D materials. Requirements for staff training should be included in the contractor's Environmental Management Plan (EMP). The EMP shall be submitted to the Engineer for approval before construction works in accordance with ETWB TC(W) No. 19/2005.
- 10.6.3 Good planning and site management practice should be employed to eliminate over ordering or mixing of construction materials to reduce wastage. Proper storage and site practices will minimize the damage or contamination of construction materials.

10.6.4 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 shall be followed. A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be implemented. In order to monitor the disposal of C&D material and solid wastes at public filling facilities and landfills and to control fly-tipping, a trip-ticket system should be included. DEVB TC(W) No. 6/2010 shall be referenced for details.

10.6.5 Regular cleaning and maintenance of the waste storage area should be provided.

Best Management Practice

10.6.6 The proposed mitigation measures are as below:

- An on-site environmental coordinator should be identified at the outset of the works. The EMP incorporating waste management shall be prepared in accordance with the requirements set out in the ETWB TC(W) No. 19/2005. The EMP shall include monthly and yearly Waste Flow Tables (WFT) that indicate the amounts of waste generated, recycled and disposed of (including final disposal site), and which shall be regularly updated;
- The reuse/recycling of all materials on site shall be investigated prior to treatment/disposal off-site;
- Good site practices shall be adopted from the commencement of works to avoid the generation of waste, reduce cross contamination of waste and to promote waste minimization;
- All waste materials shall be sorted on-site into inert and non-inert C&D materials, and where the materials can be recycled or reused, they shall be further segregated. Inert C&D materials will comprise stone, rock, masonry, brick, concrete and soil which is suitable for land reclamation and site formation whilst non-inert C&D materials include all other wastes generated from the construction process such as plastic packaging and vegetation (from site clearance);
- The contractor shall be responsible for identifying what materials can be recycled/ reused, whether on-site or off-site. In the event of the latter, the contractor shall make arrangements for the collection of the recyclable materials. Any remaining non-inert C&D materials shall be collected and disposed of to the landfills whilst any inert C&D materials shall be re-used on site as far as possible. Alternatively, if inert C&D materials cannot be reused on-site, the materials would be delivered to PFRFs for beneficial reuse after obtaining the appropriate license;
- With reference to DEVB TC(W) No.6/2010, a trip ticket system should be established at the outset of the construction to monitor the disposal of C&D materials and solid wastes from the site to public filling facilities and landfills;
- Under the Waste Disposal (Chemical Waste) (General) Regulation, the Contractor shall register as a Chemical Waste Producer if chemical wastes such as spent lubricants and paints are generated on site. Only licensed chemical waste collectors shall be employed to collect any chemical waste generated at site. The handling, storage, transportation and disposal of chemical wastes shall be conducted in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes and A Guide to the Chemical Waste Control Scheme both published by EPD;
- A sufficient number of covered bins shall be provided on site for the containment of general refuse to prevent visual impacts and nuisance to the sensitive

surroundings. These bins shall be cleared daily and the collected waste disposed of to the refuse transfer station. Further to the issue of DEVB TC(W) No. 8/2010, the contractor is required to maintain a clean and hygienic site throughout the Project works; and

- The contractor shall comply with all relevant statutory requirements and guidelines and their updated versions that may be issued during the course of Project construction.

On-site Sorting, Reuse and Recycling

10.6.7 All waste materials should be segregated into categories covering:

- Inert C&D materials suitable for reuse on-site;
- Inert C&D materials suitable for PFRFs;
- Recyclable non-inert C&D materials for recycling;
- Remaining non-inert C&D materials for landfill;
- Chemical waste; and
- General refuse for landfill.

10.6.8 Proper segregation and disposal of construction waste should be implemented. Separate containers should be provided for inert and non-inert C&D materials.

10.6.9 Sorting is important to recover materials for reuse and recycling. Specific area should be allocated for on-site sorting of C&D materials and to provide a temporary storage area for those sorted materials. If 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 to local recycler wherever possible and disposed to the designated landfill only as a last resort. Inert C&D materials such as concrete, stone, clay, brick, soil, asphalt and the like should be separated and reused in this or other projects (subject to approval by the relevant parties in accordance with the DEVB TC(W) No. 6/2010) before disposed of at a public filling facility operated by CEDD. Steel and other metals should be recovered from demolition waste stream and recycled.

Construction and Demolition Material

10.6.10 Inert C&D materials should be temporarily stored on-site for use as backfill as far as possible. It should be properly covered with tarpaulin or similar impervious sheeting to prevent dust nuisance and site runoff. Surplus inert C&D materials should be disposed of at PFRFs.

10.6.11 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.
- 10.6.12 The Public Fill Committee of CEDD should be consulted for disposal of inert C&D materials to PFRFs while EPD should be consulted for disposal of non-inert C&D materials to landfill. Disposal of C&D materials to landfill must not have more than 50% (by weight) inert material. The C&D materials delivered for landfill disposal should contain no free water and the liquid content should not exceed 70% by weight.
- 10.6.13 In order to avoid dust impacts, any vehicle leaving a works area carrying inert or non-inert C&D materials should have their load covered up before leaving the construction site.
- 10.6.14 C&D materials should be disposed of at designated PFRFs or landfills. Disposal of these materials for the use at other construction projects is subject to the approval of the Engineer and/or other relevant reception authorities. 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 disposal of C&D materials will be controlled through trip-ticket system in accordance with DEVB TC(W) No. 6/2010.

Excavated Sediments

- 10.6.15 The sediment should be excavated, handled, transported and disposed of in a manner that would minimize adverse environmental impacts.
- 10.6.16 Requirements of the Air Pollution Control (Construction Dust) Regulation, where relevant, shall be adhered to during excavation, transportation and disposal of the sediment.
- 10.6.17 In order to minimize the exposure to contaminated materials, workers shall, if necessary, wear appropriate personal protective equipment (PPE) when handling contaminated sediments. Adequate washing and cleaning facilities shall also be provided on site.
- 10.6.18 For off-site disposal, the requirements and procedures specified under ETWB TC(W) No. 34/2002 shall be followed. MFC of CEDD is managing the disposal facilities in Hong Kong for the excavated sediment, while EPD is the authority of issuing marine dumping permit under the DASO.
- 10.6.19 To ensure disposal space is allocated for the Project, the Project Proponent should be responsible for obtaining agreement from MFC on the rationale for sediment removal and the allocation of the disposal site. The contractor(s), on the other hand, should be responsible for the application of the marine dumping permit under DASO from EPD for the sediment disposal.
- 10.6.20 The excavated sediments are expected to be loaded onto the barge at public barging point of which the exact location will be determined by the contractor(s) and agreed by EPD/CEDD and transported to the designated disposal sites allocated by MFC. The excavated sediment would be disposed of according to its determined disposal options and ETWB TC(W) No. 34/2002.
- 10.6.21 Stockpiling of contaminated sediments should be avoided as far as possible. If temporary stockpiling of contaminated sediments is necessary, the excavated sediment should be covered by tarpaulin and the area should be placed within earth bunds or sand bags to prevent leachate from entering the ground, nearby drains and surrounding water bodies. The stockpiling areas for contaminated sediments should be paved with impermeable linings to avoid contamination to underlying soil or groundwater. Separate and clearly defined areas should be provided for stockpiling of contaminated and uncontaminated materials. Leachate, if any, should be collected and discharged according to the Water Pollution Control Ordinance (WPCO).

- 10.6.22 In order to minimize the potential odour / dust emissions during excavation and transportation of the sediment, the excavated sediments shall be wetted during excavation / material handling and shall be properly covered when placed on trucks or barges. Loading of the excavated sediment to the barge shall be controlled to avoid splashing and overflowing of the sediment slurry to the surrounding water.
- 10.6.23 The barge transporting the sediments to the designated disposal sites shall be equipped with tight fitting seals to prevent leakage and shall not be filled to a level that would cause overflow of materials or laden water during loading or transportation. In addition, monitoring of the barge loading shall be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels shall be equipped with automatic self-monitoring devices as specified by the EPD.

Chemical Waste

- 10.6.24 Should any chemical waste be generated, the contractor/operator 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. An updated list of licensed chemical waste collector can be obtained from EPD.
- 10.6.25 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.
- 10.6.26 Suitable containers should be used for specific types of chemical wastes. The containers should be properly labelled (in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations), resistance to corrosion, stored safely and closely secured. 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.
- 10.6.27 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 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 oil interceptors should be collected and disposed of by a licensed collector.
- 10.6.28 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. The chemical waste shall be collected by licensed chemical waste collectors.
- 10.6.29 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 CWTC in Tsing Yi). A trip ticket system operates to control the movement of chemical wastes.

- 10.6.30 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.

General Refuse

- 10.6.31 General refuse should be disposed of to landfill as designated by EPD only after recyclable materials (e.g. paper, metals, aluminum cans, etc.) have been sorted out.
- 10.6.32 The contractor should nominate approved site personnel 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 about site cleanliness, proper waste management and chemical handling procedures should be provided. Recyclable materials such as papers and aluminum cans should be separated and delivered to the local recyclers. An adequate number of waste containers should be provided to avoid spillage of waste.
- 10.6.33 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 by reputable waste collector. The removal of waste from the site should be arranged on a daily basis or at least on every second day by the contractor to minimize any potential odour impacts, minimize the presence of pests, vermin and other scavengers and prevent unsightly accumulation of waste.

Operational Phase

Screenings, Grits and Dewatered Sludge

- 10.6.34 The screenings and grits would be collected and disposed of at landfill by a reputable waste collector while the dewatered sludge would be disposed of at T· Park in Tuen Mun regularly. The screenings, grits and dewatered sludge shall be transported in sealed containers to minimize associated odour impact. The trucks and containers should be washed thoroughly before leaving the TPSTW to avoid odour nuisance during transportation.

Chemical Waste and General Refuse

- 10.6.35 The chemical waste and general refuse generated during the operational phase would follow the same handling procedures and disposal method presented in **Sections 10.6.24 to 10.6.33**. It is expected that there would be limited quantities of chemical waste and general refuse to be generated from the operation of the Project and will be properly handled by licensed chemical waste collectors and reputable waste collector.

10.7 Residual Impacts

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

10.8 Monitoring and Audit Requirement

- 10.8.1 No monitoring is required during construction phase. Weekly audit of waste management practice is recommended during the construction phase of the Project 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.
- 10.8.2 No monitoring and audit is considered required during the operational phase of the Project.

10.9 Conclusions

- 10.9.1 C&D materials will inevitably be produced during the construction phase of the Project. Waste generated during construction works include inert C&D materials, non-inert C&D materials, chemical waste and general refuse. Approximately 338,770 m³ of inert C&D materials would be generated of which 50,810 m³ would be reused on-site and 287,960 m³ would be disposed of at designated PFRF. Approximately 25,850 m³ of non-inert C&D materials would be generated of which 18,090 m³ would be recycled and 7,760 m³ would be disposed of at designated landfill. Approximately 26,200 m³ of excavated sediments would be generated during construction phase and the excavated sediment would be disposed of in accordance with ETWB TC(W) No. 34/2002. It is estimated that about 50 litres of chemical waste would be generated per month and collected by licensed chemical waste collector for disposal at licensed treatment facilities. About 260 kg of general refuse would be generated per day and collected by waste collector for disposal of at waste transfer/disposal facilities and then to landfill.
- 10.9.2 During operational phase, 43 m³ screenings and grits would be generated at the inlet works per day while 586 m³ dewatered sludge would be generated from sewage treatment and co-digestion per day. The collected screenings and grits would be disposed of at landfill by a reputable waste collector while the dewatered sludge/digestate would be disposed of at T·Park in Tuen Mun.
- 10.9.3 With the implementation of the mitigation measures during the construction and operational phases of the Project, no significant impact on waste management is anticipated. The implementation of the mitigation measures shall form part of the works contracts. Regular site inspections are recommended during construction phase to ensure the measures are implemented properly.