6. WATER QUALITY

6.1 Introduction

6.1.1 The assessment of potential water quality impacts associated with the construction and operation of the Project is presented in this section. Mitigation measures are recommended to minimise potential adverse impacts and to ensure the acceptability of any residual impact (that is, after mitigation).

6.2 Environmental Legislation, Plans, Standards and Guidelines

6.2.1 The criteria for evaluating water quality impacts in this EIA Study are:

- Technical Memorandum on Environmental Impact Assessment Process (TM-EIA)
- Water Pollution Control Ordinance (WPCO)
- Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS)
- Hong Kong Planning Standards and Guidelines (HKPSG)
- Water Supplies Department (WSD) Water Quality Criteria
- Practice Note for Professional Persons (ProPECC), Construction Site Drainage (PN 1/94).

Environmental Impact Assessment Ordinance (EIAO)

6.2.2 The TM-EIA was issued by EPD under Section 16 of the EIAO. It specifies the assessment criteria and guidelines that were followed in this Study:

- Annex 6 – Criteria for Evaluating Water Pollution
- Annex 14 – Guidelines for Assessment of Water Pollution.

Water Quality Objectives

6.2.3 *The Water Pollution Control Ordinance (Cap. 358)* provides the major statutory framework for the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten Water Control Zones (WCZs). Corresponding statements of Water Quality Objectives (WQOs) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in the WCZs based on their beneficial uses. The proposed Project is located within the Tolo Harbour & Channel WCZ and the corresponding WQOs are listed in **Table 6.1**.

Table 6.1 Summary of Water Quality Objectives for the Tolo Harbour & Channel WCZ

Parameters	Objectives	Sub-Zone
Offensive odour, tints	Not to be present	Harbour Subzone, Buffer Subzone, Channel Subzone
Visible foam, oil scum, litter	Not to be present	Harbour Subzone, Buffer Subzone, Channel Subzone
Dissolved oxygen (DO)	Not less than 2mg/L within two metres of the bottom, or not less than 4mg/L in the remainder of the water column	Harbour Subzone
	Not less than 3mg/L within two metres of the bottom, or not less than 4mg/L in the remainder of the water column	Buffer Subzone
	Not less than 4mg/L at any point in the water column	Channel Subzone
pH	Not to cause the normal pH range to be extended by more than ±0.5 pH units at any time.	Harbour Subzone
	Not to cause the normal pH range to be extended by more than ±0.3 pH units at any time.	Buffer Subzone

Parameters	Objectives	Sub-Zone
	Not to cause the normal pH range to be extended by more than ±0.1 pH units at any time.	Channel Subzone
Light Penetration	Should not reduce light transmission by more than 20% of the normal level at any location or any time.	Harbour Subzone
	Should not reduce light transmission by more than 15% of the normal level at any location or any time.	Buffer Subzone
	Should not reduce light transmission by more than 10% of the normal level at any location or any time.	Channel Subzone
Salinity	Not to cause the normal salinity range to be extended by more than ±3 parts per thousand at any time.	Harbour Subzone, Buffer Subzone, Channel Subzone
Temperature	Not to cause the natural daily temperature range to be extended by greater than ±1.0 ℃ at any location or time. The rate of temperature change shall not exceed 0.5 ℃ per hour at any location, unless due to natural phenomena.	Harbour Subzone, Buffer Subzone, Channel Subzone
Settleable Material	Bottom deposits or submerged objects should not adversely influence bottom-living communities, alter the basic Harbour geometry or shipping channels, present any hazard to shipping or diving activities, or affect any other beneficial use of the waters.	Harbour Subzone, Buffer Subzone, Channel Subzone
Bacteria	Not exceed 610 per 100 mL, calculated as the geometric mean of all samples collected in one calendar year	Secondary Contact Recreation Subzone and Fish Culture Zone
Chlorophyll-*a*	Not to cause the level of chlorophyll-*a* in waters of the subzone to exceed 20 mg/m^3, calculated as a running arithmetic mean of 5 daily measurements for any single location and depth.	Harbour Subzone
	Not to cause the level of chlorophyll-*a* in waters of the subzone to exceed 10 mg/m^3, calculated as a running arithmetic mean of 5 daily measurements for any single location and depth.	Buffer Subzone
	Not to cause the level of chlorophyll-*a* in waters of the subzone to exceed 6 mg/m^3, calculated as a running arithmetic mean of 5 daily measurements for any single location and depth.	Channel Subzone
Toxic substances	Should not attain such a level as to produce significant toxic effects in humans, fish or any other aquatic organisms.	Harbour Subzone, Buffer Subzone, Channel Subzone

Source: Statement of Water Quality Objectives for Tolo Harbour & Channel Water Control Zone.

Hong Kong Planning Standards and Guidelines (HKPSG)

6.2.4 The HKPSG, Chapter 9 (Environment), provides for protection against water pollution for sensitive uses such as aquaculture and fisheries zones, bathing waters and other contact recreational waters.

Water Supplies Department Water Quality Criteria

6.2.5 WSD has specified a set of water quality criteria (shown in **Table 6.2**) for flushing water at seawater intakes.

Table 6.2 WSD's Water Quality Criteria for Flushing Water at Sea Water Intakes

Parameter (in mg L^{-1} unless otherwise stated)	Target Limit
Colour (HU)	< 20
Turbidity (NTU)	< 10
Threshold Odour Number (odour unit)	< 100
Ammoniacal Nitrogen	< 1
Suspended Solids	< 10
Dissolved Oxygen	> 2

Parameter (in mg L^{-1} unless otherwise stated)	Target Limit
Biochemical Oxygen Demand	< 10
Synthetic Detergents	< 5
E. coli (no. per 100 mL)	< 20,000

Technical Memorandum - Effluents

6.2.6 Besides setting the WQOs, the WPCO controls effluent discharging into the WCZ through a licensing system. A Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) was issued under Section 21 of the WPCO that gives guidance on the permissible effluent discharges based on the type of receiving waters (foul sewers, storm water drains, inland and coastal waters). The limits control the physical, chemical and microbial quality of effluent. Sewage from the proposed construction activities must comply with the relevant standard for effluent discharged into the foul sewers, inshore waters and marine waters of the Tolo Harbour & Channel WCZs provided in the TM-DSS.

Practice Note on Construction Site Drainage

6.2.7 A practice note for professional persons (ProPECC PN 1/94 “Construction Site Drainage”) has been issued by the EPD to provide good practice guidelines for handling and disposal of ten types of construction site discharges. Relevant practices given in the ProPECC PN 1/94 should be followed during construction to minimise the water quality impact due to construction site drainage.

6.3 Description of the Environment

Marine Water

6.3.1 The EPD water quality monitoring station TM2 and TM4 in Harbour Subzone of the Tolo Harbour & Channel WCZ are the nearest EPD marine water quality monitoring stations to the Project area. Monitoring data collected at TM2 and TM4 in 2012 is extracted from the EPD’s publication “2012 Marine Water Quality in Hong Kong", which is the latest information published on the EPD website at the moment of preparing this Report. A summary of the monitoring data (in 2012) for these stations are presented in **Table 6.3**.

Table 6.3 EPD Marine Water Quality Monitoring Data in 2012

Parameter		Harbour Subzone		WPCO WQO (in marine waters)
		TM2	TM4	
Temperature (°C)		24.1 (15.4 - 29.1)	23.7 (15.4 - 28.7)	Change due to waste discharge not to exceed 1°C
Salinity		30.4 (29.1 - 31.6)	30.8 (29.8 - 32.1)	Not to cause more than 3ppt change
Dissolved Oxygen (mg/L)	Depth Average	7.9 (4.9 - 11.2)	7.1 (4.8 - 10.4)	Harbour and Buffer Subzones: not <4mg/L other than within 2m of the bottom; Channel Subzone: not <4mg/L
	Bottom	7.7 (4.3 - 11.2)	5.1 (1.8 - 9.7)	Harbour Subzone: not <2mg/L within 2m of the bottom; Buffer Subzone: not <3mg/L within 2m of the bottom; Channel Subzone: not <4mg/L
Dissolved Oxygen (% Saturation)	Depth Average	111 (75 - 170)	99 (73 - 134)	Not available
	Bottom	108 (67 - 169)	70 (26 - 121)	Not available
pH		7.9 (7.7 - 8.1)	7.9 (7.5 - 8.2)	Harbour Subzone: not to exceed by ±0.5 pH units; Buffer Subzone: not to exceed by ±0.3 pH units; Channel Subzone: not to exceed by ±0.1 pH units

Parameter	Harbour Subzone		WPCO WQO (in marine waters)
	TM2	TM4	
Secchi Disc Depth (m)	2.7 (2.0 - 3.4)	3.0 (2.0 - 5.0)	Not available
Turbidity (NTU)	1.1 (0.7 - 1.9)	1.2 (0.5 - 2.4)	Not available
Suspended Solids (SS) (mg/L)	1.8 (0.8 - 2.5)	1.5 (0.8 - 3.2)	Not available
5-day Biochemical Oxygen Demand (BOD_5) (mg/L)	1.5 (0.7 - 2.5)	1.3 (0.7 - 2.0)	Not available
Ammonia Nitrogen (NH_3-N) (mg/L)	0.063 (0.026 - 0.105)	0.059 (0.028 - 0.094)	Not available
Unionised Ammonia (mg/L)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.004)	Not available
Nitrite Nitrogen (NO_2-N) (mg/L)	0.011 (<0.002 - 0.059)	0.013 (<0.002 - 0.062)	Not available
Nitrate Nitrogen (NO_3-N) (mg/L)	0.029 (<0.002 - 0.089)	0.023 (0.005 - 0.067)	Not available
Total Inorganic Nitrogen (TIN) (mg/L)	0.10 (0.03 - 0.22)	0.09 (0.04 - 0.15)	Not available
Total Kjeldahl Nitrogen (mg/L)	0.27 (0.20 - 0.35)	0.26 (0.15 - 0.35)	Not available
Total Nitrogen (TN) (mg/L)	0.31 (0.23 - 0.39)	0.29 (0.23 - 0.40)	Not available
Orthophosphate Phosphorus (PO_4) (mg/L)	0.004 (0.002 - 0.007)	0.004 (0.002 - 0.006)	Not available
Total Phosphorus (TP) (mg/L)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	Not available
Silica (as SiO_2) (mg/L)	0.85 (0.17 - 2.00)	0.92 (0.34 - 1.67)	Not available
Chlorophyll-a (µg/L)	6.8 (0.8 - 15.0)	5.7 (1.2 - 11.2)	Harbour Subzone: not >20µg/L; Buffer Subzone: not >10µg/L; Channel Subzone: not >6µg/L
E.coli (count/100mL)	6 (1 - 45)	4 (1 - 18)	Geometric mean not to exceed 610 per 100mL at the secondary contact recreation subzone and fish culture zones
Faecal Coliforms (count/100mL)	48 (2 - 620)	17 (2 - 140)	Not available

Notes:
1. Data source: 2012 Marine Water Quality in Hong Kong
2. Except as specified, data presented are depth-averaged values calculated by taking the means of three depths: surface, mid-depth, bottom.
3. Data presented are annual arithmetic means of depth-averaged results except for *E.coli* and faecal coliforms that are annual geometric means.
4. Data in brackets indicate the ranges.

6.3.2 According to the "2012 Marine Water Quality in Hong Kong", full WQO compliances for depth-averaged DO, *E.coli* and chlorophyll-a were achieved at the two monitoring stations, whilst compliance for bottom DO was recorded at one of these two stations (namely TM2) only. Non-compliance with the WQO for bottom DO recorded at TM4 might be related to the reduction in the vertical mixing between the bottom and surface marine water layers caused by the stratification of the water column during the hot summer months in 2012.

Inland Water

6.3.3 Two natural streams / nullah flow along the site boundary of the Sha Tin WTW. One natural stream namely Tin Sum Nullah is located to the southeast of the Project Site, while the other one is located to the northwest of the Project site. EPD river water quality monitoring was conducted for Tin Sum Nullah once a month. A summary of the monitoring data in 2012, which is the most recent monitoring data published on the EPD website at the moment of preparing this Report, is presented in **Table 6.4**.

Table 6.4 EPD River Water Quality Monitoring Data in 2012

Parameter	Tin Sum Nullah TR20B	River WQO
Dissolved Oxygen (mg/L)	8.2 (7.8 – 9.6)	No less than 4 mg/L
pH	7.9 (7.7 – 8.4)	6.5 – 8.5
Suspended Solids (mg/L)	<1 (<1 – 6)	Not to cause more than 20 mg/L change
5-day Biochemical Oxygen Demand (mg/L)	<1 (<1 – <1)	Not to cause more than 5 mg/L change
Chemical Oxygen Demand (mg/L)	4 (<2 – 5)	Not to cause more than 30 mg/L change
Oil & grease (mg/L)	<0.5 (<0.5 – 0.5)	Not available
Faecal coliforms (cfu/100mL)	1 (<1 – <1)	Not available
E.coli (cfu/100mL)	1 (<1 – <1)	1000 counts per 100ml
Ammonia-nitrogen (mg/L)	0.02 (<0.01 – 0.28)	0.5 mg/L at any time
Nitrate-nitrogen (mg/L)	1.80 (0.67 – 2.50)	Not available
Total Kjeldahl Nitrogen (mg/L)	0.13 (0.05 – 0.51)	Not available
Ortho-phosphate (mg/L)	0.01 (<0.01 – 0.02)	Not available
Total Phosphorus (mg/L)	<0.02 (<0.02 – 0.03)	Not available
Total Sulphide (mg/L)	<0.02 (<0.02 – <0.02)	Not available
Aluminium (µg/L)	90 (<50 – 470)	Not available
Cadmium (µg/L)	<0.1 (<0.1 – 0.1)	Not available
Chromium (µg/L)	<1 (<1 – 1)	Not available
Copper (µg/L)	2 (<1 – 8)	Not available
Lead (µg/L)	<1 (<1 – 2)	Not available
Zinc (µg/L)	20 (<10 – 40)	Not available

Notes:
1. Data source: 2012 River Water Quality in Hong Kong
2. Except as specified, data presented are depth-averaged values calculated by taking the means of three depths: surface, mid-depth, bottom.
3. Data presented are annual arithmetic means of depth-averaged results except for *E.coli* and faecal coliforms that are annual geometric means.
4. Data in brackets indicate the ranges.

6.3.4 Full compliance with the river WQOs were achieved at the monitoring station (TR20B) in Tin Sum Nullah for pH, suspended solids (SS), dissolved oxygen (DO), COD and BOD_5. The water quality of this minor stream was reported to be excellent.

Water Sensitive Receivers

6.3.5 In order to evaluate potential water quality impacts arising from the Project, water sensitive receivers (WSR) within 500 m of the Project site boundary are considered. Two natural streams / nullah flow along the Project site boundary. One is located to the northwest of the Project boundary and the other one named Tin Sum Nullah is located along the southeast of the Project boundary. The ecological value of these two watercourses is generally low with low species diversity (refer to Section 8). No ecologically important species susceptible to water pollution were recorded. However, any pollutants generated by the Project activities could be discharged into these inland water courses if uncontrolled, and hence may affect aquatic communities. Locations of these WSRs are shown in **Figure 6.1**.

6.4 Assessment Methodologies

6.4.1 According to the EIA Study Brief, the assessment area for water quality impact assessment will cover all areas within a distance of 500 m from the boundary of the Project site. The water sensitive receivers which may be affected by the Project have been identified. Potential sources of water quality impact that may arise during the construction and operational activities were described. Possible mitigation measures were also identified to reduce adverse impacts on water quality.

6.5 Identification of Environmental Impacts

Construction Phase

6.5.1 The proposed construction works for reprovisioning of Sha Tin WTW would include demolition of the existing facilities of the South Works and common facilities for both the North and the South Works in phases as below; reprovisioning of the South Works; and construction of new common facilities for both the North and the South Works. Details of the construction works are described in Section 2. The construction sequence of the major facilities is:

- Construction of retaining wall and new access road;
- Construction of new chemical house;
- Demolition of existing South Works;
- Construction of washwater equalization facilities;
- Demolition of existing chemical house (named as Water Treatment Works Logistics Centre);
- Demolition of existing washwater recovery tanks;
- Construction of Administration Building cum Mainland East Laboratory with visitor facilities;
- Construction of the South Works (except Stage 2 filters);
- Demolition of existing administration building;
- Construction of Stage 2 filters; and
- Paving of access road.

6.5.2 No marine work including dredging would be required for this Project. No construction activities would be conducted within the natural streams / nullah within and adjacent to the Project Site. Also, there would be no canteen or kitchen in the construction site. Potential sources of water quality impact associated with the land-based construction of the Project include:

- General construction activities;

- Construction site runoff;
- Accidental spillage; and
- Sewage effluent from construction workforce.

General Construction Activities

6.5.3 The land-based construction works could have the potential to cause water pollution. Various types of construction activities may generate wastewater. These include general cleaning and polishing, wheel washing, and dust suppression. These types of wastewater would contain high concentrations of suspended solids (SS). There is no public sewer available for wastewater discharge on-site. If uncontrolled, these effluents could lead to deterioration in water quality.

Construction Site Runoff and Drainage

6.5.4 Construction site run-off would cause potential water quality impacts. Potential pollution sources of site run-off may include:

- Runoff and erosion from exposed soil surfaces, earth working areas and stockpiles;
- Release of any bentonite slurries, concrete washings and other grouting materials with construction run-off, storm water or ground water dewatering process;
- Wash water from dust suppression sprays and wheel washing facilities; and
- Fuel, oil and lubricants from maintenance of construction vehicles and equipment.

6.5.5 During rainstorms, site run-off would wash away the soil particles on unpaved lands and areas with the topsoil exposed. The run-off is generally characterized by high concentrations of SS. Release of uncontrolled site run-off would increase the SS levels and turbidity in the nearby water environment. Site run-off may also wash away contaminated soil particles and therefore cause water pollution.

6.5.6 Wind blown dust would be generated from exposed soil surfaces in the works areas. It is possible that wind blown dust would fall directly onto the nearby water bodies when a strong wind occurs. Dispersion of dust within the works areas may increase the SS levels in surface run-off causing a potential impact to the nearby sensitive receivers.

Accidental Spillage

6.5.7 A large variety of chemicals may be used during construction activities. These chemicals may include petroleum products, surplus adhesives, spent lubrication oil, grease and mineral oil, spent acid and alkaline solutions/solvent and other chemicals. Accidental spillage of chemicals in the works areas may contaminate the surface soils. The contaminated soil particles may be washed away by construction site run-off or stormwater drainage which in turn causes water pollution.

Sewage Effluent from Construction Workforce

6.5.8 During the construction of the Project, the workforce on site will contribute to the local population of the area, although the number of workers will vary over the construction period. Potential impacts may arise from wastewater generated from sanitary facilities and waste disposal areas.

Groundwater

6.5.9 Deep excavation would be required for construction of water tanks and the associated facilities. Since potentially contaminated areas at the Project site were identified in the Contamination Assessment Plan (CAP), any groundwater pumping out or from dewatering process during

excavation works could be potentially contaminated. Discharge / recharge of potentially contaminated groundwater generated may affect the surface / groundwater quality, if uncontrolled.

Operational Phase

6.5.10 The Sha Tin WTW is to treat raw water mainly imported from Dongjiang and to provide water supply to territory. The treated water would comply with the latest standards as specified by WSD. The existing treated water quality standards as specified by WSD, the authority in Hong Kong, is based on the World Health Organization (WHO)'s Guidelines for Drinking-water Quality 2008, supplemented by an additional 10 parameters not included in the Guidelines. Upon decommissioning for the South Works, it would then move to the construction phase. Similarly upon completion of the construction, it would move to the operation phase. No water quality impact would be expected from switching the existing facilities to the upgraded facilities. Potential sources of water quality impacts on the nearby water courses due to the Sha Tin WTW operation would be:

- Washwater effluent; and
- Overflow from Treatment Works Components.

Washwater Effluent

6.5.11 During operational phase of the Project, cleansing of the treatment works components such as filter beds would be required. Washwater may contain various chemicals, such as polymer, ammonium sulphate, sodium phosphate, and chlorine, and any impurities removed by the filters. Direct discharge of such washwater could deteriorate water quality in the receiving water bodies, if uncontrolled.

Overflow from Treatment Works Components

6.5.12 Possible failure of treatment works components or interruption of the electrical power supply could cause Sha Tin WTW operational failures, which could result in an overflow of water. If uncontrolled, overflow of water would be discharged to the surrounding area and adjacent water courses.

6.6 Cumulative Impacts from Concurrent Project

6.6.1 The construction works for Shatin to Central Link – Tai Wai to Hung Hom Section would be conducted concurrently with this Project. The construction for the railway alignment near the Sha Tin WTW will be land-based only. Provided that all mitigation measures as recommended in the EIA Report will be implemented properly, the potential water quality impact from the Project is expected to be localized and therefore no cumulative water quality impacts would be expected.

6.7 Prediction and Evaluation of Environmental Impacts

Construction Phase

General Construction Activities

6.7.1 Land-based construction activities would generate wastewater and cause water pollution. Their impacts are likely to be minimal, provided that good construction practices and proper site management would be observed. Effluent discharge from temporary site facilities should be controlled to prevent direct discharge to the neighbouring water environment. It is anticipated that water quality impacts caused by general construction activities would be insignificant with adequate implementation of recommended mitigation measures (as given in **Section 6.8**).

Construction Site Run-off and Drainage

6.7.2 Construction site run-off and drainage may cause local water quality impacts. Increase in SS arising from the construction site could block the drainage channels and may result in local flooding when

heavy rainfall occurs. As a good site practice, mitigation measures should be implemented to control construction site runoff and drainage from the works areas, and to prevent runoff and drainage water with high levels of SS from entering the nearby water bodies. With the implementation of appropriate measures to control run-off and drainage from the construction site, disturbance of water bodies would be avoided and deterioration in water quality would be minimal. Unacceptable impacts on the water quality are not expected, provided that the recommended measures described in **Section 6.8** are properly implemented.

Accidental Spillage

6.7.3 The use of engine oil and lubricants, and their storage as waste materials has the potential to create impacts on the water quality if spillage occurs and enters adjacent water environment. Waste oil may infiltrate into the surface soil layer, or run-off into nearby water environment, increasing hydrocarbon levels. The potential impacts could however be mitigated by practical mitigation measures and good site practices (as given in **Section 6.8**).

Sewage Effluent from Construction Workforce

6.7.4 Domestic sewage would be generated from the workforce during the construction phase. Provided that sewage is not discharged directly into stormwater drains or natural streams / nullah adjacent to the construction site and this temporary sewage will be properly treated by interim sewage treatment facilities, such as portable chemical toilets which are properly maintained with the employment of licensed collectors for the collection and disposal on a regular basis, it is unlikely that sewage generated from the site would have a significant water quality impact. Mitigation measures and good site practices given in **Section 6.8** should be implemented.

Groundwater

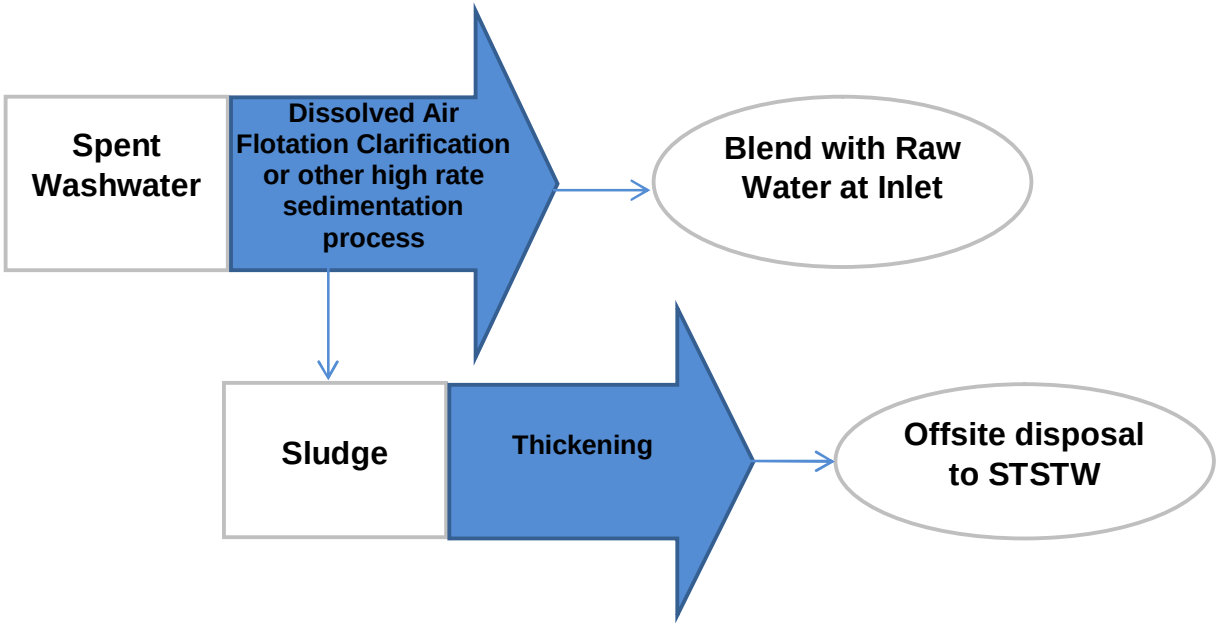
6.7.5 Deep excavation would be required for construction of water tanks and the associated facilities. Since potentially contaminated areas at the Project site were identified in the CAP, any groundwater pumping out or from dewatering process during excavation works could be potentially contaminated. Prior to the excavation works, the baseline groundwater quality in these potentially contaminated areas should be reviewed with reference to the relevant site investigation data and any additional groundwater quality measurement results. The review results should be submitted to EPD for examination. If the results indicate contamination for the groundwater to be generated from the excavation works, this contaminated groundwater would either be properly treated or properly recharged into the ground in compliance with the requirements of the TM-DSS. No direct discharge of contaminated groundwater would be allowed. Provided that all the mitigation measures and monitoring requirements as recommended in **Sections 6.8 and 6.10** are followed properly, no adverse water quality impact would be envisaged.

Operational Phase

Washwater Effluent

6.7.6 During operational phase, cleansing of the treatment works components would be required. The washwater would firstly be captured by the washwater equalization tanks, the washwater would then be treated using dissolved air flotation (DAF) clarification at the DAF clarifiers or other high rate sedimentation process and finally flow to the Inlet Works to be blended with raw water. The treatment of sludge generated from the DAF clarification or other high rate sedimentation process is detailed in the waste management section. A flow chart for the treatment of spent washwater is given below in **Plate 1**. No washwater would be discharged off-site and thus no adverse impacts upon the nearby watercourses arising from the washwater effluent would be anticipated.

Plate 1 Flow Chart for Spent Washwater



Overflow from Treatment Works Components

6.7.7 Overflow of raw water and process water may occur in the event of equipment failure or interruption of the electrical power supply. Potential overflow would come from raw water (which comes from local reservoir and Guangdong) and well process / treated water (which contains low level of chemicals that used to removed pollutants and enhance the drinking water quality). The discharge of overflow in case of equipment failure or power failure is not expected to result in significant impact on water quality of receiving waters. Provision of standby units and dual power supply could minimise occurrence of overflow. Discharge of overflow into the surrounding area and nearby water courses would be avoided and hence no adverse water quality impact would be anticipated.

6.8 Mitigation of Adverse Environmental Impacts

Construction Phase

Construction Site Run-off and General Construction Activities

6.8.1 The site practices outlined in ProPECC PN 1/94 “Construction Site Drainage” should be followed to minimise surface run-off and the chance of erosion. Effluent discharged from the construction site should comply with the standards stipulated in the TM-DSS. The following measures are recommended to protect water quality and sensitive uses of the inland and coastal waters, and when properly implemented should be sufficient to adequately control site discharges so as to avoid water quality impacts:

Construction Site Run-off

6.8.2 Surface run-off from construction sites should be discharged into storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sedimentation basins. Channels or earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Perimeter channels at site boundaries should be provided where necessary to intercept storm run-off from outside the site so that it will not wash across the site. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.

6.8.3 Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to prevent local flooding. Any practical options for the diversion and re-alignment of drainage should comply with both engineering

and environmental requirements in order to provide adequate hydraulic capacity of all drains. Minimum distances of 100 m should be maintained between the discharge points of construction site run-off and the existing saltwater intakes. While the locations of the discharge points of construction site run-off have not been confirmed at the current stage, the discharge points are confirmed to be located within the construction site boundary. The nearest seawater intake from the construction site within the same watershed would be the Sha Tin WSD flushing water intakes, which is located at Sha Tin Hoi (5 km away). It is anticipated that the minimum separation between the discharge points of construction site effluent and the existing seawater intakes would be satisfied.

6.8.4 Construction works should be programmed to minimize soil excavation works in rainy seasons (April to September) as far as practicable. If excavation in soil cannot be avoided in these months or at any time of year when rainstorms are likely, for the purpose of preventing soil erosion, temporary exposed slope surfaces should be covered e.g. by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (e.g. along the crest / edge of excavation) to prevent storm run-off from washing across exposed soil surfaces. Arrangements should always be in place in such a way that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.

6.8.5 Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed to prevent erosion caused by rainstorms. Appropriate drainage like intercepting channels should be provided where necessary.

6.8.6 Measures should be taken to minimize the ingress of rainwater into trenches. If excavation of trenches in wet seasons is necessary, they should be dug and backfilled in short sections. Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.

6.8.7 Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on sites should be covered with tarpaulin or similar fabric during rainstorms.

6.8.8 Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system.

6.8.9 Good site practices should be adopted to remove rubbish and litter from construction sites so as to prevent the rubbish and litter from spreading from the site area. It is recommended to clean the construction sites on a regular basis.

Wheel Washing Water

6.8.10 All vehicles and plant should be cleaned before they leave a construction site to minimize the deposition of earth, mud, debris on roads. A wheel washing bay should be provided at every site exit if practicable and wash-water should have sand and silt settled out or removed before discharging into storm drains. The section of construction road between the wheel washing bay and the public road should be paved with backfall to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains.

Wastewater from Building Construction

6.8.11 Before commencing any demolition works, all drainage connections should be sealed to prevent building debris, soil, sand etc. from entering drains.

6.8.12 Wastewater generated from building construction activities including concreting, plastering, internal decoration, cleaning of works and similar activities should not be discharged into the stormwater drainage system. If the wastewater is to be tankered off site for disposal into foul sewers, it should undergo the removal of settleable solids in a silt removal facility, and pH adjustment as necessary.

Acid Cleaning, Etching and Pickling Wastewater

6.8.13 Acidic wastewater generated from acid cleaning, etching, pickling and similar activities should be neutralized to within the pH range of 6 to 10. The neutralized wastewater should be tankered off site for disposal into foul sewers or treated to a standard acceptable to storm drains and the receiving waters.

Effluent Discharge

6.8.14 There is a need to apply to EPD for a discharge licence for discharge of effluent from the construction site under the WPCO. The discharge quality must meet the requirements specified in the discharge licence. All the run-off and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS. Minimum distances of 100 m should be maintained between the discharge points of construction site effluent and the existing seawater intakes. The nearest seawater intake from the construction site within the same watershed would be the WSD flushing water intakes, which is located at Sha Tin Hoi (5 km away). It is anticipated that the minimum separation between the discharge points of construction site effluent and the existing seawater intakes would be satisfied. The beneficial uses of the treated effluent for other on-site activities such as dust suppression, wheel washing and general cleaning etc., can minimise water consumption and reduce the effluent discharge volume. If monitoring of the treated effluent quality from the works areas is required during the construction phase of the Project, the monitoring should be carried out in accordance with the relevant WPCO licence which is under the ambit of regional office of EPD.

Accidental Spillage

6.8.15 Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.

6.8.16 Any service shop and maintenance facilities should be located on hard standings within a bunded area, and sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges.

6.8.17 Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance details the requirements to deal with chemical wastes. General requirements are given as follows:

- Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport.
- Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents.
- Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area.

Sewage Effluent from Construction Workforce

6.8.18 The construction workforce on site will generate sewage. It is recommended that all the sewage generated from the workforce should be properly treated by interim treatment facilities, such as chemical toilets which are properly maintained with the employment of licensed collectors for the collection and disposal on a regular basis. Interim treatment facilities should be properly maintained to avoid adverse impact upon the nearby water environment.

6.8.19 Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the surrounding environment. Regular environmental audit of the construction site will provide an effective control of any malpractices and can encourage continual improvement of environmental performance on site. It is anticipated that sewage generation during the construction phase of the project would not cause water pollution problem after undertaking all required measures.

Construction Works in Close Proximity of Inland Water

6.8.20 Construction works would be carried out in close proximity of inland water courses along Project site. To minimize the potential water quality impacts from the construction works near any water courses, the practices outlined in ETWB TC (Works) No. 5/2005 "Protection of Natural Streams/rivers from Adverse Impacts arising from Construction Works" should be adopted where applicable. Relevant mitigation measures are listed below:

- Temporary storage of materials (e.g. equipment, filling materials, chemicals and fuel) and temporary stockpile of construction materials should be located well away from any water courses during carrying out of the construction works.
- Stockpiling of construction materials and dusty materials should be covered and located away from any water courses.
- Shoring should be properly erected as appropriate to prevent soil/ mud from slipping into the watercourses. Stockpiles should be properly covered.
- Construction debris and spoil should be covered up and/or disposed of as soon as possible to avoid being washed into the nearby water receivers.
- Construction activities, which generate large amount of wastewater, should be carried out in a distance away from the waterfront, where practicable.
- Hoarding should be erected along the site boundary to protect the nearby watercourses.

Groundwater

6.8.21 No direct discharge of groundwater from contaminated areas should be adopted. Prior to any excavation works within the potentially contaminated areas, the baseline groundwater quality should be reviewed based on the relevant site investigation data and groundwater quality measurements with reference to Guidance Note for Contaminated Land Assessment and Remediation and the review results should be submitted to EPD for examination. If the review results indicate contamination for the groundwater to be generated from the excavation works, this contaminated groundwater should either be properly treated or properly recharged into the ground in compliance with the requirements of the TM-DSS. If wastewater treatment is to be deployed for treating the contaminated groundwater, the wastewater treatment unit shall deploy suitable treatment processes (e.g. oil interceptor / activated carbon) to reduce the pollution level to an acceptable standard and remove any prohibited substances to an undetectable range. All treated effluent from the wastewater treatment plant shall meet the requirements as stated in TM-DSS and should be tankered away for proper disposal.

6.8.22 If deployment of wastewater treatment is not feasible for handling the contaminated groundwater, groundwater recharging wells should be installed as appropriate for recharging the contaminated groundwater back into the ground. The recharging wells should be selected at places where the groundwater quality would not be affected by the recharge operation as indicated in Section 2.3 of the TM-DSS. The baseline groundwater quality should be determined prior to the selection of the recharge wells, and a working plan should be submitted to EPD for agreement. Pollution levels of groundwater to be recharged shall not be higher than pollutant levels of ambient groundwater at the recharge well. Groundwater monitoring wells should be installed near the recharge points to monitor the effectiveness of the recharge wells and to ensure that no likelihood of increase of groundwater

level and transfer of pollutants beyond the site boundary. Prior to recharge, free products should be removed as necessary by installing the petrol interceptor. The Contractor should apply for a discharge licence under the WPCO through the Regional Office of EPD for groundwater recharge operation or discharge of treated groundwater.

Operation Phase

Emergency Overflow

6.8.23 Standby treatment facilities, such as parallel trains in flash mixing basins, backwash pumps and pumps in the inter-stage booster pumping station, would be provided to prevent the occurrence of overflow as a result of equipment failure or maintenance.

6.8.24 Dual power supply should be provided. Dual power supply could be in the format of ring main, or an automatic-operated emergency generator with sufficient capacity to cope with the demand loading of the essential plant equipment. Inlet valve feeding raw water would be closed manually within 30 minutes by the operator-in-charge in case of equipment or power failure.

Summary of Mitigation Measures

6.8.25 The recommended mitigation measures are summarized as below:

Construction Phase

- The site practices outlined in ProPECC PN 1/94 “Construction Site Drainage” should be followed to minimise surface run-off and the chance of erosion. Effluent discharged from the construction site should comply with the standards stipulated in the TM-DSS.
- The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.
- All the sewage generated from the workforce should be properly treated by interim treatment facilities, such as chemical toilets.
- The practices outlined in ETWB TC (Works) No. 5/2005 “Protection of Natural Streams/rivers from Adverse Impacts arising from Construction Works” should be adopted where applicable, to minimize the potential water quality impacts from the construction works near any water courses,
- Contaminated groundwater, if any, should either be properly treated or properly recharged into the ground in compliance with the requirements of the TM-DSS.

Operation Phase

- Standby treatment facilities and dual power supply should be provided to prevent the occurrence of overflow.
- Inlet valve feeding raw water would be closed manually within 30 minutes by the operator-in-charge in case of equipment or power failure.

6.9 Evaluation of Residual Environmental Impacts

6.9.1 With the full implementation of the recommended mitigation measures for the construction and operation phases of the proposed Project, no adverse impact on water quality is anticipated.

6.10 EM&A Requirements

Construction Phase

6.10.1 Minimisation of water quality deterioration from land-based construction activities could be achieved through implementing adequate mitigation measures. To ensure no adverse water quality impact to the nearby water courses due to the discharge of surface runoff and drainage from the works areas, water quality monitoring of the two water courses along the Project boundary is recommended during site clearance and foundation works. Details of the recommended water quality monitoring requirements are provided in the stand-alone EM&A Manual for the Project. It is also recommended that regular site inspections should be undertaken to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented.

Operational Phase

6.10.2 No adverse water quality impact was identified during the operational phase with proper implementation of the recommended mitigation measures. Operation phase water quality monitoring is considered not necessary.

6.11 Conclusion

6.11.1 Potential water quality impact associated with land-based construction works for the Project would be generated from site run-off, wastewater from construction activities, and sewage from workforce. Provided that all the recommended mitigation measures are properly implemented, no adverse water quality impacts would be expected during the construction phase of the Project. Water quality monitoring of the two water courses along the Project boundary is recommended during site clearance and foundation works to ensure no adverse water quality impacts to these water courses. Regular site inspection is also recommended to ensure the recommended mitigation measures are properly implemented.

6.11.2 During operation phase of the Project, major sources of water quality impact would be washwater effluent and overflow from treatment works components. Proper mitigation measures will be implemented to avoid discharge of washwater effluent and overflow into the nearby water environment and hence no adverse water quality would be expected.

~End of Section 6 ~