5. Water Quality Impact

5.1 Introduction

This section presents an assessment of the potential water quality impacts associated with the construction and operation phases of the Project. Recommendations for mitigation measures have been made, where necessary, to reduce the identified water quality impacts to an acceptable level.

5.2 Environmental Legislation, Standards and Guidelines

5.2.1 Water Pollution Control Ordinance

The *Water Pollution Control Ordinance* (WPCO) (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, the whole Hong Kong waters are divided into ten Water Control Zones (WCZs). Water Quality Objectives (WQOs) were established to protect the beneficial uses of water quality in WCZs. Specific WQOs are applied to each WCZ. The proposed SIL(E) is located within the Victoria Harbour Phase Three, Western Buffer, Southern and Southern Supplementary WCZs and their corresponding WQOs are listed in **Tables 5.1, 5.2** and **5.3** respectively. The WQOs for the aforementioned WCZs would be used as the basis for assessment of water quality impacts in this EIA study.

Table 5.1: Water Quality Objectives for the Victoria Harbour WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Colour	Not to exceed 50 Hazen units, due to human activity	Inland waters
Visible foam, oil scum, litter	Not to be present	Whole zone
E. coli	Not to exceed 1000 per 100 mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals between 7 and 21 days	Inland waters
Depth-averaged DO	Not less than 4.0 mg L-1 for 90% of samples	Marine waters
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg L-1 for 90% of samples	Marine waters
Dissolved Oxygen	Not less than 4.0 mg L^{-1}	Inland waters
pH	To be in the range of 6.5 - 8.5, change due to waste discharge not to exceed 0.2	Marine waters
	Not to exceed the range of 6.0 – 9.0 due to waste discharge	Inland waters
Salinity	Change due to waste discharge not to exceed 10% of ambient	Whole zone
Temperature	Change due to waste discharge not to exceed 2 ^{o}C	Whole zone
Suspended solids	Waste discharge not to raise the natural ambient level by 30% nor cause the accumulation of suspended solids which may adversely affect aquatic communities	Marine waters
	Annual median not to exceed 25 mg L^{-1} due to human activity	Inland waters
Unionized Ammonia	Annual mean not to exceed 0.021 mg L^{-1} as unionised form	Whole zone
Nutrients	Not to be present in quantities that cause excessive growth of algae or other aquatic plants	Marine waters
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg L^{-1}	Marine waters
BOD5	Not to exceed 5 mg L^{-1}	Inland waters
Chemical Oxygen Demand	Not to exceed 30 mg L^{-1}	Inland waters

Parameters	Objectives	Sub-Zone
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Source: Statement of Water Quality Objectives (Victoria Harbour (Phases One, Two and Three) Water Control Zone).

Table 5.2: Water Quality Objectives for the Western Buffer WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Colour	Not to exceed 30 Hazen units, due to human activity	Water gathering ground subzones
	Not to exceed 50 Hazen units, due to human activity	Inland waters
Visible foam, oil scum, litter	Not to be present	Whole zone
E. coli	Not to exceed 610 per 100 mL, calculated as the geometric mean of all samples collected in a calendar year	Secondary contact recreation subzones and Fish culture subzones
	Not to exceed 180 per 100 mL, calculated as the geometric mean of all samples collected from March to October inclusive in 1 calendar year. Samples should be taken at least 3 times in 1 calendar month at intervals of between 3 and 14 days.	Recreation subzones
	Less than 1 per 100 mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals between 7 and 21 days	Water gathering ground subzones
	Not to exceed 1000 per 100 mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals between 7 and 21 days	Other Inland waters
Depth-averaged DO	Not less than 4.0 mg L^{-1} for 90% of samples	Marine waters except Fish culture subzones
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg L^{-1} for 90% of samples	Marine waters except Fish culture subzones
Depth-averaged DO	Not less than 5.0 mg L^{-1} for 90% of samples	Fish culture subzones
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg L^{-1} for 90% of samples	Fish culture subzones
Dissolved Oxygen	Not less than 4.0 mg L^{-1}	Water gathering ground subzones and other inland waters
pH	To be in the range of 6.5 - 8.5, change due to waste discharge not to exceed 0.2	Marine waters
	Not to exceed the range of 6.0 – 8.5 due to waste discharge	Water gathering ground subzones
	Not to exceed the range of 6.0 – 9.0 due to waste discharge	Inland waters
Salinity	Change due to waste discharge not to exceed 10% of natural ambient level	Whole zone
Temperature	Change due to waste discharge not to exceed 2 ^{o}C	Whole zone

Parameters	Objectives	Sub-Zone
Suspended solids	Waste discharge not to raise the natural ambient level by 30% nor cause the accumulation of suspended solids which may adversely affect aquatic communities	Marine waters
	Annual median not to exceed 20 mg L^{-1} due to human activity	Water gathering ground subzones
	Annual median not to exceed 25 mg L^{-1} due to human activity	Inland waters
Unionized Ammonia	Annual mean not to exceed 0.021 mg L^{-1} as unionised form	Whole zone
Nutrients	Not to be present in quantities that cause excessive growth of algae or other aquatic plants	Marine waters
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg L^{-1}	Marine waters
BOD5	Not to exceed 3 mg L^{-1}	Water gathering ground subzones
	Not to exceed 5 mg L^{-1}	Inland waters
Chemical Oxygen Demand	Not to exceed 15 mg L^{-1}	Water gathering ground subzones
	Not to exceed 30 mg L^{-1}	Inland waters
Toxicants	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Source: Statement of Water Quality Objectives (Western Buffer Water Control Zone).

Table 5.3: Water Quality Objectives for the Southern WCZ

Parameters	Objectives	Sub-Zone
E. coli	Annual geometric mean not to exceed 610/100 ml	Secondary contact recreation subzones; fish culture subzones
Dissolved Oxygen (DO) within 2 m of bottom	Not less than 2 mg/L for 90% samples	Marine waters
Depth averaged DO	Not less than 4 mg/L for 90% samples	Marine waters
pH	To be in the range of 6.5 to 8.5; change due to waste discharge not to exceed 0.2	Marine waters
Salinity	Change due to waste discharge not to exceed 10% of natural ambient level	Whole zone
Temperature	Change due to waste discharge not to exceed 2^{o}C	Whole zone
Suspended solids	Waste discharge not to raise the natural ambient level by 30% nor cause the accumulation of suspended solids which may adversely affect aquatic communities	Marine waters
Unionized Ammonia	Annual level should not exceed 0.021 mg/L	Whole zone
Nutrients	Not to be present in quantities that cause excessive growth of algae or other aquatic plants	Marine waters
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.1 mg/L	Marine waters
Toxicants	Not to be present at levels producing significant toxic effect	Whole zone

Source: Statement of Water Quality Objectives (Southern Water Control Zone).

5.2.2 Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters

Discharges of effluents are subject to control under the WPCO. The *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters* (TM-DSS) sets limits for effluent discharges. Specific limits apply for different areas and are different between surface waters and sewers. The limits vary with the rate of effluent flow. Sewage from the proposed construction activities should comply with the standards for effluent discharged into foul sewers, inshore waters or marine waters of the Victoria Harbour, Western Buffer, Southern and Southern Supplementary WCZs, as shown in Tables 9a, 9b, 10a and 10b of the TM-DSS.

5.2.3 Water Supplies Department (WSD) Water Quality Criteria

A set of water quality criteria for flushing water at seawater intakes specified by WSD as shown in **Table 5.4** would be followed during construction and operation of the proposed SIL(E).

Table 5.4: WSD's Water Quality Criteria for Flushing Water at Sea Water Intakes

Parameter (in mg/L unless otherwise stated)	Target Limit
Colour (HU)	< 20
Turbidity (NTU)	< 10
Threshold Odour Number (odour unit)	< 100
Ammonia Nitrogen (NH3-N)	< 1
Suspended Solids (SS)	< 10
Dissolved Oxygen (DO)	> 2
5-day Biochemical Oxygen Demand (BOD5)	< 10
Synthetic Detergents	< 5
E. coli (no. per 100 mL)	< 20,000

5.2.4 Practice Note for Professional Persons on Construction Site Drainage

A practice note for professional persons was issued by the EPD to provide guidelines for handling and disposal of construction site discharges. The *Practice Note for Professional Persons on Construction Site Drainage* (ProPECC Note PN 1/94) provides good practice guidelines for dealing with various types of discharge from a construction site. Practices outlined in ProPECC Note PN 1/94 should be followed as far as possible during construction to minimize the water quality impact due to construction site drainage.

5.2.5 Suspended Solids Criterion for Benthic Organisms

Benthic organisms, including corals, may be damaged by sediment deposition that blocks the respiratory and feeding organs of corals. According to Hawker and Connell[1], the sedimentation rate higher than 0.1kgm^{-2} per day would introduce moderate to severe impact upon corals. This has been adopted as the assessment criterion for protecting the marine ecological sensitive receivers in this EIA study. There are no established legislative criteria for water quality for corals. An elevation criterion of 10mgL^{-1} in suspended

[1] Hawker, D.W. and Connell, D.W. (1992), "Standards and Criteria for Pollution Control in Coral Reef Areas" in Connell, D.W. and Hawker, D.W. (eds.), *Pollution in Tropical Aquatic Systems*, CRC Press, Inc.

solids will be adopted as the critical value above which impacts to the habitat may occur, noting that this criterion has been accepted in a previously approved EIA[2].

5.2.6 Sediment Quality Criteria for the Classification of Sediment

The Dumping at Sea Ordinance (Cap. 466) is the major statutory legislation to control dumping of sediment at sea. This safeguards the water quality and ecology of Hong Kong waters. Marine disposal of dredged/excavated sediment of the proposed SIL(E) would be controlled under the Dumping at Sea Ordinance.

The *ETWB TC(W) No. 34/2002, Management of Dredged/Excavated Sediment* sets out the management framework for dredged/excavated sediment disposal and provide guidelines for the classification of sediment based on their contaminant levels with reference to the Chemical Exceedance Level. Dredged/excavated sediment destined for marine disposal of the Project would be classified according to the regulatory guidelines and sediment quality criteria and follow the requirements for marine disposal specified in *ETWB TC(W) No. 34/2002, Management of Dredged/Excavated Sediment*.

5.3 Assessment Area, Water Sensitive Receivers and Description of the Environment

5.3.1 Assessment Area

Water quality impact assessment has been carried out in the Victoria Harbour, Western Buffer, Southern Water and Southern Supplementary Water Control Zones and all areas within 500m from the project boundary. Locations of the water control zones are shown in **Figure 5.1**.

5.3.2 Water Sensitive Receivers

Key water sensitive receivers that may potentially be affected by the proposed Project include:

- WSD Ap Lei Chau Seawater Intake (WSR1)
- Aberdeen Typhoon Shelter (WSR2&3)
- Wong Chuk Hang Nullah (WSR4)
- WSD Brick Hill Seawater Intake (WSR5)
- Wah Fu Estate Cooling Water Intake (WSR6)
- Queen Mary Hospital Cooling Water Intake (WSR7)
- Coral Community in Sandy Bay (WSR8)

Locations of the key water sensitive receivers are shown in **Figure 5.2**.

[2] ERM Hong Kong Ltd. (2001), *Environmental Impact Assessment for the Proposed Submarine Gas Pipeline from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong - Final EIA Report*, For the Hong Kong and China Gas Co., Ltd.

5.3.3 Description of the Environment/ Baseline Conditions

5.3.3.1 Marine Water Quality in Aberdeen Typhoon Shelter

A summary of marine water quality data for EPD monitoring station at Aberdeen South and West Typhoon Shelter (WT1 and 3) extracted from EPD's publication "Marine Water Quality in Hong Kong 2007" is presented in **Table 5.5.** Locations of these monitoring stations are shown in **Figure 5.2**.

Table 5.5: Marine Water Quality at Aberdeen South and West Typhoon Shelter in 2007

Parameter		WT1	WT3	WPCO WQO (in marine waters)
Temperature (℃)		23.3 (19.5 – 27.5)	23.3 (19.5 – 27.7)	Not more than 2℃ in daily temperature range
Salinity		32.6 (30.2 – 33.7)	32.5 (29.4 – 33.6)	Not to cause more than 10% change
Dissolved Oxygen (DO) (% Saturation)	Depth average	5.9 (4.5 – 6.8)	5.6 (5.2 – 6.3)	Not available
	Bottom	5.7 (4.6 – 6.7)	5.5 (4.8 – 6.2)	Not available
Dissolved Oxygen (DO) (mg/l)	Depth average	84 (68 – 100)	79 (74 – 83)	Not less than 4mg/l for 90% of the samples
	Bottom	80 (68 – 90)	78 (70 – 85)	Not less than 2mg/l for 90% of the samples
pH		8.1 (7.5 – 8.7)	8.0 (7.4 – 8.5)	6.5 – 8.5 (±0.2 from natural range)
Secchi disc Depth (m)		2.0 (1.5 – 2.5)	1.9 (1.5 – 2.4)	Not available
Turbidity (NTU)		10.3 (8.1 – 13.1)	10.2 (4.3 – 14.3)	Not available
Suspended Solids (SS) (mg/l)		2.8 (1.5 – 4.7)	4.3 (2.8 – 7.8)	Not more than 30% increase
5-day Biochemical Oxygen Demand (BOD5) (mg/l)		0.6 (0.1 – 1.4)	0.7 (0.1 – 1.0)	Not available
Nitrite Nitrogen (NO2-N) (mg/l)		0.015 (0.004 – 0.029)	0.016 (0.004 – 0.030)	Not available
Nitrate Nitrogen (NO3-N) (mg/l)		0. 074 (0.028 – 0.130)	0.091 (0.014 – 0.230)	Not available
Ammonia Nitrogen (NH3-N) (mg/l)		0.07 (0.05 – 0.10)	0.09 (0.07 – 0.13)	Not available
Unionised Ammonia (UIA) (mg/l)		0.005 (<0.001 – 0.016)	0.005 (<0.001 – 0.012)	Not more than 0.021 mg/l for annual mean
Total Inorganic Nitrogen (TIN) (mg/l)		0.16 (0.09 – 0.23)	0.20 (0.10 – 0.35)	Not more than 0.4 mg/l for annual mean

Parameter	WT1	WT3	WPCO WQO (in marine waters)
Total Nitrogen (TN) (mg/l)	0.28 (0.19 – 0.42)	0.33 (0.17 – 0.53)	Not available
Orthophosphate Phosphorus (PO4) (mg/l)	0.013 (0.006 – 0.020)	0.017 (0.008 – 0.025)	Not available
Total Phosphorus (TP) (mg/l)	0.03 (0.02 – 0.04)	0.04 (0.02 – 0.05)	Not available
Chlorophyll-a (µg/l)	4.6 (0.8 – 21.5)	3.3 (0.7 – 13.7)	Not available
E. coli (cfu/100ml)	280 (48 – 1600)	1400 (660 – 2900)	Not available
Faecal Coliforms (cfu/100ml)	1600 (250 - 9500)	3900 (2600 – 5700)	Not available

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

Due to the embayment form and potentially reduced flushing capacity of the typhoon shelter, marine water within the typhoon shelter may be vulnerable to pollution. In 2007, high levels of *E.coli* were recorded at the Aberdeen Typhoon Shelter indicating faecal contamination.

5.4 Assessment Methodology

Pollutants from point discharges and non-point sources to surface water runoff, sewage or polluted discharge generated from the proposed SIL(E) and spent cooling water discharge that could affect the quality of surface water runoff and marine waters were identified. All the identified sources of potential water quality impact were then evaluated and their impact significance determined. The need for mitigation measures to reduce any identified adverse impacts in water quality to acceptable levels was determined.

5.5 Identification of Environmental Impact

5.5.1 Construction Phase

Potential sources of water quality impact associated with the proposed construction activities at the works areas of the proposed SIL(E) have been identified and include:

- Dredging/ excavation and seawall modification for the construction of piers/pier foundations of bridge in Aberdeen Channel
- Barging facilities and activities
- Wastewater discharge from tunnelling and open cut excavation
- Sewage effluent from construction workforce
- Construction site runoff and drainage

- General construction activities

Depending upon the construction methodology to be adopted, construction of piers/pier foundations of the railway bridge in Aberdeen Channel would involve dredging/ excavation of marine sediment. Key water quality concerns during dredging/ excavation of marine sediment include (i) dredging/ excavation works that would disturb the marine bottom sediment, causing an increase in suspended solid (SS) concentrations in the water column and forming sediment plume along the tidal flows and (ii) construction runoff and drainage, with effluents potentially contaminated with silt, oil and grease.

As dredging/ excavation of marine sediment would only be undertaken at one location within the Aberdeen Channel, it is predicted that sediment plume dispersion would be largely confined to within the dredging/ excavation area. Mitigation measures should be implemented to control plume dispersion thereby minimising the extent of any potential impact upon marine water quality downstream of the dredging/ excavation area.

Installation of marine piles would be required for the proposed barging point at Telegraph Bay. The presence of piles mainly on the seabed adjacent to the under-water sloping seawall would create forces on the tidal flow which result in energy loss of the flow and eventually impact the flushing capacity within the vicinity of the barging point. Change in flow regime and hydrology in other water bodies is not anticipated as no marine based construction works would be required for the proposed barging points at Lee Nam Road and Western District Public Cargo Working Area.

Specific to the tunnel sections, an identified potential source of water quality impact would be the discharge of tunnelling wastewater from groundwater inflows, drilling and wash down. Wastewater would also arise from groundwater pumping inside the cut and cover tunnel at Sham Wan Tower, transition box structure at Nam Fung Portal and cut and cover excavation for SOH Station.

5.5.2 Operation Phase

The assessment of operation phase water quality impacts of the proposed SIL(E) has addressed the following identified potential areas of concern:

- Change in flow regime and hydrology in the Aberdeen Channel (Typhoon Shelter) and the Wong Chuk Hang Nullah due to the railway bridge and viaduct structures
- Use of seawater in cooling system and discharge of spent cooling effluent into marine waters
- Sewage and wastewater effluents from stations and WCH depot
- Runoff from rail track and operation tunnel drainage

5.6 Prediction and Evaluation of Environmental Impact

5.6.1 Construction Phase

5.6.1.1 Dredging/ Excavation and Seawall modification for the construction of piers/pier foundations of the railway bridge in Aberdeen Channel

Dredging/excavation of marine sediment will cause disturbance to the seabed, and the release of marine mud and contaminants may affect the water quality in Aberdeen Channel. Seawall modification will involve excavation and placement of rocks and gravels which may also affect the water quality in Aberdeen Channel.

The key water quality concern of construction of piers/pier foundations of railway bridge in Aberdeen Channel is sediment dredging/ excavation and backfilling. Marine sediment would be dredged/ excavated during the construction of piles at the pier location at about centre of Aberdeen Channel. The proposed bridge pier construction method at about centre of Aberdeen Channel minimise the chance of release of SS into the surrounding water. Based on the engineering design, the pile in Aberdeen Channel for supporting the bridge sections would be constructed in the form of bored piles. Due to the rock base on the seabed, rock would be required to be removed prior to the piling works. The construction for piles would be through the placing of steel pile casing and construction of a watertight cofferdam at the pier site.

The seawater trapped inside the casing and cofferdam would be pumped out to generate a dry working environment. The seawater pumped out from the casing and cofferdam should be directed to sedimentation tank or settling devices before discharge to reduce the water quality impacts to the sea. The Contractor should ensure the effluent from the sedimentation tank meet the WPCO/TM requirements before discharge.

Excavation of material would be undertaken via an excavator working on the dry platform or use of closed grab in the confined and dry working environment. Sediment removal is therefore confined within the steel pile casing and cofferdam. This construction method of creating a confined and dry environment for sediment dredging/ excavation could minimise the release of contaminant into the water column.

The cofferdam would be constructed in the form of sheet piles. Sheet piles would be driven into position. However, this might still results in some disturbance to the sediments in the immediate vicinity of the sheet piles. The cofferdam would be removed upon completion of pier foundation works in Aberdeen Channel by cutting the sheet piles at about 1m below the seabed while sheet piles below the cutting point would be left intact. All equipment for decommissioning of cofferdam would be mounted on barges with no temporary support required off the seabed. Sediment loss due to the decommissioning operation is therefore not anticipated. Silt curtain should be deployed to completely enclose the cofferdam installation and removal works.

By adopting these preventive measures, it is considered that sediment dredging/ excavation for construction of the pier/pier foundation of the railway bridge in Aberdeen Channel would not cause adverse impact to the aquatic life and environment.

Construction of piles at the pier location at the south western corner of Aberdeen Channel would involve minor seawall modification. Existing seawall at the pier location at the south western corner of Aberdeen Channel would be excavated. The pile would then be constructed in the form of bored pile and the sloping seawall would be reinstated by placement of rocks and gravels. No dredging or excavation of marine sediment would be required. Nevertheless, this might still results in small amount of suspended solids released from the surface of the seawall. Silt curtain should be deployed to completely enclose the seawall modification and pile installation works. By adopting this preventive measure, it is considered that the seawall reconstruction for construction of the pier/pier foundation of the railway bridge in Aberdeen Channel would not cause adverse impact to the aquatic life and environment.

5.6.1.2 Barging Facilities and Activities

Barging point facilities are proposed at Telegraph Bay for spoil generated from works sites at Island South. Potential water quality impacts might arise from the installation of temporary marine piles for Telegraph Bay barging point. The general arrangement of the barging point is shown in **Figure 5.3**. The footing of the piles would mainly be in place on the seabed adjacent to the under-water sloping seawall. In order to support the tipping hall of the barging point and provide sufficient queuing spaces, there are in total about 53 marine piles (each with 1.3m diameter) to form an array with approximately 5m x 5m gaps between each pile. The pier has its length of about 60m and width of about 35m. Four marine piles with two on each side of the pier are also required for berthing and mooring of barges during the operation of the barging point.

The installation of the piles would include driving the piles mainly into the seabed adjacent to the under-water sloping seawall. No dredging or excavation of marine sediment is expected. Nevertheless, this might still results in small amount of suspended solids released from the surface of the seawall. Silt curtain should be deployed to completely enclose the pile installation works. By adopting this preventive measure, the impacts of the marine pile installation works on water quality is expected to be minimal.

The presence of the marine piles would create forces on the tidal flow which result in energy loss of the flow and eventually impact the flushing capacity within the vicinity of the barging point. In view of the orientation of the piles and their sizes, potential impacts of the provision of the marine piles on flushing capacity in the vicinity of the barging point is expected to be insignificant. Cumulative impact from the barging point of the Hong Kong West Drainage Tunnel project is also not anticipated.

It is also noted that the sewage submarine outfall of the Cyberport Sewage Treatment Plant is located near the proposed barging point. However, the proposed barging point would be in place at Telegraph Bay for about 3 years only. As the group of marine piles supporting the tipping hall of the barging point were located at about 50m from the sewage submarine outfall, dispersion of the effluent discharged from the sewage submarine outfall of Cyberport Sewage Treatment Plant by the group of marine piles supporting the tipping hall of barging point is therefore not anticipated. Moreover, the nearest water sensitive receivers are located at least 700m to the southeast (WSR6 Wah Fu Estate Cooling Water Intake) and 800m to the northwest (WSR7 Queen Mary Hospital Cooling Water Intake and WSR 8 Coral community in Sandy Bay) (**Figure 5.3**). As mentioned above, since the effect of the marine piles are expected to be very localized, significant impacts of the tidal flow speeds and directions further away from the proposed barging point is not anticipated. As such, significant change of water quality at the nearest water sensitive receiver WSR6 is not anticipated. The presence of the temporary marine piles would therefore result in insignificant impacts on water quality.

Barging point facilities proposed at Telegraph Bay would be removed upon completion of construction of the project. Marine piles would be decommissioned by cutting the driven piles at about 1m below the seabed while driven piles below the cutting point would be left intact. All equipment for decommissioning of marine piles would be mounted on barges with no temporary support required off the seabed. Sediment loss due to the decommissioning operation is therefore not anticipated. Nevertheless, silt curtain should be deployed to completely enclose the pile decommissioning works. By adopting this preventive measure, the impact on water quality is expected to be minimal. Barging activities might cause adverse impact on water quality if not handled properly. Mitigation measures are recommended to control any pollutant discharge into the sea due to barging activities. Impact due to barging activities is expected to be insignificant provided all recommended mitigation measures are properly implemented.

5.6.1.3 Sewage effluent from construction workforce

Domestic sewage would be generated from the workforce during the construction phase. However, portable chemical toilets could be installed within the construction site. The Contractor will have the responsibility to ensure that chemical toilets are used and properly maintained, and that licensed Contractors are employed to collect and dispose of the waste off-site at approved locations. Therefore water quality impacts are not anticipated.

5.6.1.4 Wastewater discharge from tunneling and open cut excavation

During tunnelling works, groundwater ingress water pumped out from the tunnel would have a high content of SS and on-site treatment would be required prior to off-site discharge. The water pumped out from the tunnel may be contaminated by bentonite and grouting materials that would be required for construction of the drill and blast tunnels, soft ground tunnels (for tunnel excavation and groundwater treatment), shafts, adits and diaphragm walls for cut and cover box at ADM station. Wastewater would also be generated from groundwater pumping inside the cut and cover excavation for SOH station, cut and cover tunnel at Sham Wan Tower and transition box structure at Nam Fung Portal. The quantity of wastewater produced daily would depend on the volume and type of excavation carried out. The maximum wastewater quantities during construction for treatment before discharge into stormwater drains have been estimated by the Design Consultant and are shown in **Table 5.6** for the various works sites

Table 5.6: Maximum Waste Water Quantities during Construction Phase

Works Site	Wastewater Quantity (L/s)
ADM - Cut-and-cover box station with diaphragm wall - Hong Kong Park Ventilation Shaft	9.9
Nam Fung Tunnel	14.1
Transition Box Structure at Nam Fung Portal	6.1
Cut-and-cover tunnel near Sham Wan Tower	3.5
LET - Station - Entrance adit - Lei Tung Tunnel - Construction Adit	3.4
SOH - Cut-and-cover station box	3.3

5.6.1.5 Construction site runoff and drainage

Runoff from the surface construction works areas may contain increased loads of sediments, other suspended solids (SS) and contaminants. Potential sources of pollution from site drainage include:

- Runoff from and erosion from site surfaces, drainage channels, earth working areas and stockpiles
- Release of any bentonite slurries, concrete washings and other grouting materials with construction run-off and storm water
- Wash water from dust suppression sprays and wheel wash facilities
- Fuel, oil, solvents and lubricants from maintenance of construction vehicles and mechanical equipment

Sediment laden runoff particularly from works areas subjected to excavation or earth works, if uncontrolled, may carry pollutants (adsorbed onto the particle surfaces) into any nearby stormwater drains. For the construction of the cut and cover box at ADM station, bentonite and chemical grouting may be required for diaphragm walling works and as a result may pollutant surface runoff.

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 any nearby stormwater drains. With the implementation of adequate construction site drainage and provision of sediment removal facilities, unacceptable water quality impacts is not anticipated. The construction phase discharge would be collected by the temporary drainage system installed by the Contractor and then treated or desilted on-site before discharge to stormwater drains. The Contractor would be required to obtain a license from EPD for discharge to the public drainage system.

No adverse water quality impacts are expected at the WSD seawater intakes at Brick Hill and Ap Lei Chau, given that marine piling and pier foundation works would be confined to Aberdeen Channel (Typhoon Shelter) (ATS) during the construction phase of the proposed SIL(E) with the implementation of good construction and site management practices to minimize release of sediment and other contaminants during installation of piers/pier foundations.

5.6.1.6 General construction activities

On-site construction activities may result in water pollution from the following:

- Uncontrolled discharge of debris and rubbish such as packaging, construction materials and refuse
- Spillages of liquids stored on-site, such as oil, diesel and solvents etc.

Good construction and site management practices should be observed to ensure that litter, fuels and solvents do not enter the public drainage system.

5.6.2 Operation Phase

5.6.2.1 Change in flow regime and hydrology in Aberdeen Channel (Typhoon Shelter) (ATS) due to railway bridge

In order for SIL(E) to connect between Aberdeen and Ap Lei Chau a bridge is required across the Aberdeen Channel. The bridge would be adjacent to and in parallel with the two existing highway bridges as depicted in **Figure 5.4**.

The proposed SIL(E) railway bridge pier foundation at Aberdeen Channel (Typhoon Shelter) (ATS) would be located to the east of the pier foundations of the two existing highway bridges as shown in **Figure 5.4**. Appropriate design measures has been adopted by the proposed SIL(E) railway bridge pier foundation at ATS such that:

- The width is similar to those of the two existing highway bridges; and
- It is aligned with the pier foundations of the two existing highway bridges with respect to the flood/ ebb tidal flow directions.

The pier foundations of the two existing highway bridges had defined the width of the narrowest section of the ATS near the two existing highway bridges. As the proposed SIL(E) railway bridge pier foundation would not noticeably change the existing total flow cross-sectional area of the ATS near the two existing highway bridges, it therefore would not noticeably change the flushing capacity and water quality within the ATS.

Geotechnical investigation works along the Aberdeen Channel for the alignment of SIL(E)[3] showed that the bed of ATS consist mainly of silt/ marine deposit which are easily eroded by tidal current. Potential reduction of flow cross-sectional area as a result of the proposed SIL(E) railway bridge pier foundation, if any, would result in erosion of the bed of the ATS of the immediate vicinity. Over a certain period of time, the erosion would increase the depth of the ATS and the flushing capacity of the ATS would be maintained at its original level.

As shown in **Figure 5.4**, the width of the proposed SIL(E) railway bridge pier foundation is about 7 to 9 percent of the width of the narrowest section of the ATS. Therefore, it is anticipated that the placement of the SIL(E) railway bridge pier foundation would result in a very local shift of the flow patterns (e.g. flow separation and lee wake vortex) near the pier foundations of the two existing highway bridges. As no change to the flow pattern further away from the proposed SIL(E) railway bridge pier foundation is anticipated, change of water quality at Aberdeen West Typhoon Shelter (WSR2), Aberdeen South Typhoon Shelter (WSR3) and WSD Brick Hill Seawater Intake (WSR5) is not anticipated.

The railway bridge piers/pier foundations at the ATS would therefore not result in changes in flushing capacity and water quality of ATS. Adverse impact on flushing capacity and water quality of the ATS is therefore not anticipated.

5.6.2.2 Change in flow regime and hydrology in Wong Chuk Hang Nullah due to viaduct structures

Drainage Services Department (DSD) had commissioned an Investigation and Detailed Design Assignment for converting the section of existing Staunton Creek Nullah between Nam Long Shan Road and Police School Road into a four-cell box culvert.

To accommodate the associated traffic improvement scheme at Wong Chuk Hang, the existing Staunton Creek Nullah (SCN) would be re-constructed for about 600m from the roundabout at Ocean Park Road (upstream end) to near the junction of Nam Long Shan Road and Heung Yip Road (downstream end). The location and extent of proposed decking is shown in **Figure 5.5** and the layout of proposed nullah re-construction is shown in **Figure 5.6**. **Table 5.7** summarizes the proposed SCN reconstruction scheme.

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[3] MTRCL Contract No. NEX/1024 Ground Investigation for the South Island Line, Preliminary Drillhole Records

Table 5.7: Proposed Staunton Creek Nullah Reconstruction Scheme

Location	Description
From the roundabout of Ocean Park Road to Police School Road	The existing SCN would be widened to the south side towards the Police Training School by about 3m (refer to Figure 5.9 for typical section)
From Police School Road to Nam Long Shan Road	The existing SCN would be widened to the south side by about 6m (refer to Figure 5.8 for typical section)
Downstream of Nam Long Shan Road	The existing SCN would be widened to the south side by about 3m (refer to Figure 5.7 for typical section)

The key features of the proposed SCN re-construction scheme are that it involves widening of the SCN at the southern side both upstream and downstream by about 3m, and widening of SCN at the southern side through the proposed WCH Station area by about 6m. Demolition of the existing nullah northern wall is minimized in order to avoid diversion of the existing Hongkong Electric Company Limited (HEC) extra-high voltage cables (275kV/ 132kV) located at north of Heung Yip Road. Such arrangements, after taking proper recognition of the actual site constraints and the land available, are devised with a view to compensate for the loss of hydraulic capacity in the SCN due to the obstructions imposed by the WCH Station, the viaduct and deck columns or foundations. Layout and location of piers for the viaduct of the railway line in relation to the SCN is shown in **Figures 5.10.1** to **5.10.4**.

These proposed columns or foundations represent discrete obstructions in the SCN and would inevitably induce local head losses and turbulences resulting in a reduction in hydraulic performance. Continuous concrete walls between separate columns have been proposed and incorporated into the design to eradicate or minimise such reduction.

Consequently, the design can achieve a hydraulically-efficient solution for the proposed SCN re-construction, effectively functioning as parallel semi-box culverts. The width of the internal walls for supporting the deck is designed as about 610mm, and the solids walls between station or viaduct columns are designed to be about 2800mm/2200mm wide. Adverse impact on the flow regime for the viaduct section at the Wong Chuk Hang Nullah is therefore not anticipated.

5.6.2.3 Use of seawater in cooling system and discharge of spent cooling effluent into marine waters

Seawater will not be used in the cooling system. Fresh water cooled chillers will be adopted throughout the proposed SIL(E). Air cooled chillers are also proposed to be adopted in some areas. For fresh water cooled chillers, the bleed off water from the chiller is recommended to be recycled for flushing use as far as practical. Unacceptable water quality impacts from the operation of the fresh water cooled chillers is not anticipated as there will be no discharge of spent cooling effluent into marine waters.

5.6.2.4 Sewage and wastewater effluents from stations and depot

Sewage and wastewater effluents generated from the staff at stations and food and beverage outlets, if any, would be connected to the existing foul sewerage system. Runoff from cleaning activities at the stations which would enter floor drains would also be connected to the foul sewer. Hence, no adverse water quality impact is anticipated to arise from sewage and wastewater effluents generated during the operation of the stations.

Liquid waste would be generated by the detergent wash plant used for external washing of trains. Heavy cleaning using heavy duty floor scrubbers with water extraction would also be undertaken on trains. Further detergent water would be generated by hand cleaning of cab fronts and windscreens. Sewage effluents would also be generated by the on site work force. These effluents could result in physical, chemical and biological impacts within any receiving water bodies if appropriate wastewater collection and treatment are not provided.

The routine operational activities of the Depot may release oil and grease residues. These oily and greasy residues can be dripped, washed or spilled onto the ground surface within a working area. In areas such as the maintenance facilities where runoff could be contaminated by oil and grease, oil interceptors are recommended for separating oil from water prior to discharge.

Wastewater generated by train washing, heavy cleaning and maintenance facilities should be collected and treated on-site according to TM-DSS standards before discharge to the Depot drainage system. On-site wastewater treatment facilities should be provided to remove oil and grit.

5.6.2.5 Runoff from rail tracks

For viaduct sections of the proposed SIL(E), the tracks are aboveground and hence rainwater runoff is anticipated. The tunnel sections would either be drained or undrained. Most of the tunnel sections would be drained which would allow groundwater inflow to the tunnel while tunnel sections located in sensitive areas (i.e. high inflow areas) would be undrained which would have a waterproofing membrane and geotextile fleece around the complete perimeter of the tunnel. A drainage system including line sumps would be provided to cater for groundwater, seepage, track washdown, fire test water and possible rainfall ingress.The amount of groundwater seepage into the tunnel would thus be minimal.

Discharge from rail tracks on the viaduct and any tunnel runoff could be contaminated with limited amount of grease from passing trains or from maintenance activities. Standard designed silt trap or grease trap (if necessary) and oil interceptor would be provided to remove the oil, lubricants, grease, silt and grit from the tunnel runoff before discharge into stormwater drainage. Unacceptable impact on marine water quality is not anticipated.

5.7 Mitigation of Adverse Environmental Impact

5.7.1 Construction Phase

5.7.1.1 Dredging/ Excavation and Seawall modification for construction of piers/pier foundations of bridge in Aberdeen Channel

To minimise the loss of fine sediment to suspension, steel pile casing and watertight cofferdam should be installed and seawater trapped inside the casing and cofferdam should be pumped out to generate a dry working environment prior to carrying out sediment dredging/ excavation.

During dewatering of the cofferdam, appropriate desilting or sedimentation device should be provided on site for treatment before discharge. The Contractor should ensure discharge water from the sedimentation tank meet the WPCO/TM requirements before discharge.

To minimise any adverse water quality impact during installation and removal of cofferdam at about centre of Aberdeen Channel and minor seawall modification at south western corner of Aberdeen Channel, silt curtains should be deployed to completely enclose the cofferdam installation and removal works and seawall modification and pile installation works respectively. The Contractor should be responsible for the design, installation and maintenance of the silt curtain to minimize the impacts on water quality. The design and specification of the silt curtains should be submitted by the Contractor to the Engineer for approval.

5.7.1.2 Barging Facilities and Activities

To minimise the release of suspended solids to marine waters, silt curtain should be deployed to completely enclose the marine piles works during installation and decommissioning. The design and specification of the silt curtains should be submitted by the Contractor to the Engineer for approval.

Adverse impacts related to marine water quality are not expected to arise from operation of the proposed barging points, provided that good site practices are strictly followed. Recommendations for good site practices during operation of the proposed barging points include:

- all vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;
- loading of barges and hoppers should be controlled to prevent splashing of material into the surrounding water. Barges or hoppers should not be filled to a level that will cause the overflow of materials or polluted water during loading or transportation;
- all hopper barges should be fitted with tight fitting seals to their bottom openings to prevent leakage of material; and
- construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site.

5.7.1.3 Sewage Effluent from Construction Workforce

Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets and be responsible for appropriate disposal and maintenance.

5.7.1.4 Wastewater Discharge from Tunnelling and Open Cut Excavation

Wastewater with a high level of suspended solids should be treated before discharge by settlement in tanks with sufficient retention time. Oil interceptors would be required to remove the oil, lubricants and grease from wastewater. Should the level of suspended solids be very high, an on-site pre-packaged treatment plant might be required with the addition of flocculants to improve the settlement of solids. A discharge licence under the WPCO would be required for discharge to stormwater drain. The Contractor might be stipulated under the discharge license to monitor the quantity and quality of discharge to ensure compliance with the conditions of the discharge license.

5.7.1.5 Construction Site Runoff and Drainage

The site practices outlined in ProPECC Note PN 1/94 should be followed as far as practicable in order to minimise surface runoff and the chance of erosion. The following measures are recommended to protect water quality and sensitive uses of the coastal area i.e. WSD seawater intakes along the Aberdeen

Channel, and when properly implemented should be sufficient to adequately control site discharges so as to avoid water quality impacts:

- At the start of site establishment (including the barging facilities), perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works and erosion and sedimentation control facilities implemented. Channels (both temporary and permanent drainage pipes and culverts), earth bunds or sand bag barriers should be provided on site to direct stormwater to silt removal facilities. The design of the temporary on-site drainage system should be undertaken by the Contractor prior to the commencement of construction.
- The dikes or embankments for flood protection should be implemented around the boundaries of earthwork areas. Temporary ditches should be provided to facilitate the runoff discharge into stormwater drainage system through a sediment/silt trap. The sediment/silt traps should be incorporated in the permanent drainage channels to enhance deposition rates, if practical.
- Sand/silt removal facilities such as sand/silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the TM standards under the WPCO. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC Note PN 1/94. Sizes may vary depending upon the flow rate. The detailed design of the sand/silt traps should be undertaken by the Contractor prior to the commencement of construction.
- All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit should be regularly removed, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times.
- Measures should be taken to minimize the ingress of site drainage into excavations. If excavation of trenches in wet periods is necessary, they should be dug and backfilled in short sections wherever practicable. Water pumped out from foundation excavations should be discharged into storm drains via silt removal facilities.
- If surface excavation works cannot be avoided during the wet season (April to September), temporarily exposed slope/soil surfaces should be covered by tarpaulin or other means, as far as practicable, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Interception channels should be provided (e.g. along the crest/edge of the excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC Note PN 1/94.
- The overall slope of the site should be kept to a minimum to reduce the erosive potential of surface water flows.
- All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing facility should be provided at construction site exit where practicable. Wash-water should have sand and silt settled out and removed regularly to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains.
- Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.

- Manholes (including newly constructed ones) should be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and stormwater runoff being directed into foul sewers.
- Precautions should be taken at any time of the year when rainstorms are likely. Actions should be taken when a rainstorm is imminent or forecasted and actions to be taken during or after rainstorms are summarized in Appendix A2 of ProPECC Note PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events, especially for areas located near steep slopes.
- Bentonite slurries used in piling or slurry walling should be reconditioned and reused wherever practicable. Temporary enclosed storage locations should be provided on-site for any unused bentonite that needs to be transported away after all the related construction activities are completed. The requirements in ProPECC Note PN 1/94 should be adhered to in the handling and disposal of bentonite slurries.

5.7.1.6 General Construction Activities

Construction solid waste, debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering any nearby stormwater drain. Stockpiles of cement and other construction materials should be kept covered when not being used.

Oils and fuels should only be stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to any nearby stormwater drain, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.

5.7.2 Operation Phase

5.7.2.1 Change in flow regime and hydrology in Aberdeen Channel (Typhoon Shelter) (ATS) due to railway bridge

Although impact on flushing capacity and water quality of the ATS is not anticipated, streamline shaped bridge pier to reduce friction to the tidal flows across the Aberdeen Channel has been considered in the conceptual design of the bridge form.

5.7.2.2 Change in flow regime and hydrology in Wong Chuk Hang Nullah due to viaduct structures

Impact on flow regime for the viaduct section at the Wong Chuk Hang Nullah is not anticipated. Recommendation of mitigation measures is not necessary.

5.7.2.3 Sewage and wastewater effluents from stations and depot

Runoff and spillage prevention measures should conform to relevant engineering and design standards. Any opportunities for the recycling of water within the automatic washing facilities should be sought to minimise discharge requirements. Bio-degradable detergents should be selected to minimise the impact on water quality and associated ecosystems of the receiving water bodies.

Plant maintenance areas should be bunded and constructed on an impermeable floor, and provided with petrol interceptors. Traps and interceptors should be regularly cleaned and maintained, especially after any accidental spillages. Layers of sawdust, sand or equivalent material should be laid underneath and around any plant and equipment that may possibly leak oil.

An emergency spillage action plan should be developed for the Depot to ensure that any accidental spillage event is treated immediately and does not impact on any water bodies.

All fuel tanks and storage areas within the Depot should be provided with locks and be located on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank, to prevent the escape of spilled fuel oils.

The disposal of waste oil and other chemicals is controlled by the Waste Disposal (Chemical Waste) (General) Regulation (Cap 354). Waste oil and other chemicals must be disposed by a licensed contractor to either the approved Chemical Waste Treatment Centre, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation (Cap 354).

Appropriate drainage and effluent collection and treatment systems should be specified to meet the discharge limits as stipulated in the TM-DSS at the detailed design stage.

5.7.2.4 Runoff from rail tracks

Mitigation measures are required to mitigate runoff from track during the operation phase. With the implementation of the following mitigation measures, no residual impact during operation phase is anticipated:

- Track drainage channels discharge should pass through oil/grit interceptors/chambers to remove oil, grease and sediment before being pumped to the public stormwater drainage system
- Silt traps and oil interceptors should be cleaned and maintained regularly
- Oily contents of the oil interceptors should be transferred to an appropriate disposal facility, or to be collected for reuse, if possible

5.8 Evaluation of Residual Impact

With the implementation of the recommended mitigation measures for the construction and operation phases of the proposed SIL(E), no residual water quality impact is anticipated.

5.9 Environmental Monitoring and Audit

Adverse water quality impact was not predicted during the construction and operation phase of the Project. Nevertheless, appropriate mitigation measures are recommended to minimize potential water quality impacts.

Water quality monitoring is recommended during the course of marine construction works at Aberdeen Channel to obtain a robust, defensible database of baseline information of marine water quality before construction, and thereafter, to monitor any variation of water quality from the baseline conditions and exceedances of WQOs at sensitive receivers during construction and to ensure the recommended mitigation measures are properly implemented.

Regular audit of the implementation of the recommended mitigation measures during the construction phase at the work areas should also be undertaken during the construction phase to ensure the recommended mitigation measures are properly implemented.

Details of the water quality monitoring and audit programme and the Event and Action Plan are provided in the stand-alone EM&A Manual.

5.10 Conclusion

5.10.1 Construction Phase

The key issue in terms of water quality during the construction phase of the Project would be the potential for release of SS into the surrounding water from construction of pier/pier foundation of the railway bridge and potential for release of sediment-laden water from surface works areas, open cut excavation and tunnelling works.

Deterioration in water quality could be minimised to acceptable levels through implementing adequate mitigation measures such as control measures on sediment release, on site runoff and drainage from the works areas to minimise sediment spillage, construction runoff, and on-site treatment of tunnelling wastewater prior to discharge. Proper site management and good housekeeping practices would also be required to ensure that construction wastes and other construction-related materials would not enter the public drainage system and coastal waters. Sewage effluent arising from the construction workforce would also be handled through provision of portable toilets.

With the implementation of these recommended mitigation measures, no unacceptable impacts on water quality from the construction works for the Project are anticipated. Water quality monitoring during the course of marine construction works and site inspections during construction phase should be undertaken routinely to inspect the construction activities and works areas to ensure the recommended mitigation measures are properly implemented.

5.10.2 Operation Phase

Water quality impact from the railway bridge and viaduct structures in Aberdeen Channel (Typhoon Shelter) (ATS) and Wong Chuk Hang Nullah is not anticipated. The operational water quality impact for track run-off and tunnel seepage would have no adverse water quality impact provided that mitigation measures are incorporated in the design. Water quality impact from the fresh water cooling system for the SIL(E) is not anticipated. Sewage and wastewater arisings from the operation of the stations and depot would be treated so that all treated effluent would meet the TM-DSS before discharge to the foul sewer and would not cause adverse water quality impact.