Marine Water Quality in Hong Kong in 2018

Environmental Protection Department
The Government of the Hong Kong Special Administrative Region

Our Mission

To conduct a comprehensive and scientific monitoring programme that helps safeguard the health of Hong Kong's marine environment and achieve the Water Quality Objectives.

Acknowledgements

We acknowledge the following parties for their contribution to this report: Government Laboratory for undertaking chemical analyses of water and sediment samples; Marine Department for managing and operating the monitoring vessel *Dr. Catherine Lam* in conducting field sampling and measurement; Agriculture, Fisheries and Conservation Department for providing photos and information on marine parks, fish culture zones and red tides; Lands Department for providing information on geography and aerial photography of Hong Kong.

Content

List of Figures

List of Appendices

Appendix C Level of compliance with key Water Quality Objectives at individual marine station in the ten Water Control Zones in 2018

Appendix D Results of the Seasonal Kendall Test for water quality trends of individual marine stations for each Water Control Zone

Appendix G Phytoplankton monitoring

Appendix H Overall marine water quality in Hong Kong waters

1. Introduction

The Hong Kong Special Administrative Region (HKSAR) has a land area of 1 107 km^2 and sea area of 1 648 km^2. It has coastlines of 1 197 km long. Excluding Hong Kong Island and Lantau Island, there are 261 islands in the territory, each with an area greater than 500m^2. In addition to various leisure activities, Hong Kong's marine waters also support a variety of marine life and habitats.

To protect the marine environment of Hong Kong for various beneficial uses, the Environmental Protection Department (EPD) has been implementing a comprehensive marine water quality monitoring programme since 1986. The aims and objectives of the programme are to:

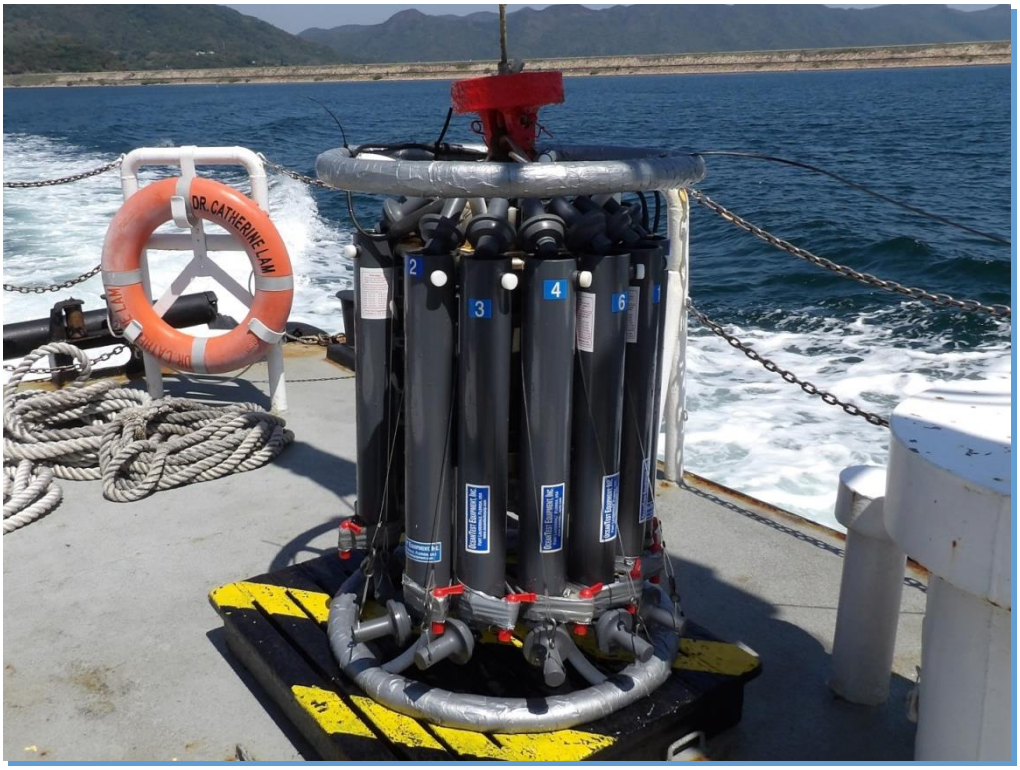
- evaluate the state of marine waters;
- monitor long-term changes in water quality;
- provide a scientific basis for planning water pollution control strategies; and
- assess the compliance with the key statutory Water Quality Objectives (WQOs).

Every month, the EPD monitors the marine water quality at 76 open waters monitoring stations and collects and examines phytoplankton samples from 26 of these stations. We also monitor the water quality of 18 sheltered waters monitoring stations located at 14 typhoon shelters, three sheltered anchorages and the Government Dockyard bimonthly. In addition, sediment samples are collected and analysed at 60 stations, including 45 in open waters and 15 in sheltered waters, twice a year.

EPD's marine monitoring vessel *"Dr. Catherine Lam"*

The EPD has a dedicated marine monitoring vessel "*Dr. Catherine Lam*". It is equipped with an

advanced conductivity-temperature-depth (CTD) profiler linked to a computer-controlled rosette water sampler which takes field measurements and collects water samples simultaneously. Marine sediments are sampled and collected using a Van Veen sediment grab sampler. The water and sediment samples are analysed by the EPD's in-house laboratory and the Government Laboratory for over 80 physical, chemical and biological parameters. More details of the water quality parameters, their analytical methods as well as information of monitoring stations and WQOs are given in the Appendices.



The water sampling process using a computer-controlled rosette water sampler.

2. The State of Hong Kong Marine Waters in 2018

2.1 Overall Compliance Rate of Marine Water Quality Objectives (WQOs)

The calculation of the overall WQO compliance rate of the whole territory is based on the combined individual compliance rates of all stations with the marine WQOs for four key parameters namely Dissolved Oxygen (DO), Total Inorganic Nitrogen (TIN), Unionised Ammonia Nitrogen (NH_3-N) as well as *E. coli* bacteria. The overall marine water quality compliance with the WQOs in Hong Kong was 88% in 2018, compared with 85% in 2017 as shown in Figure 1.

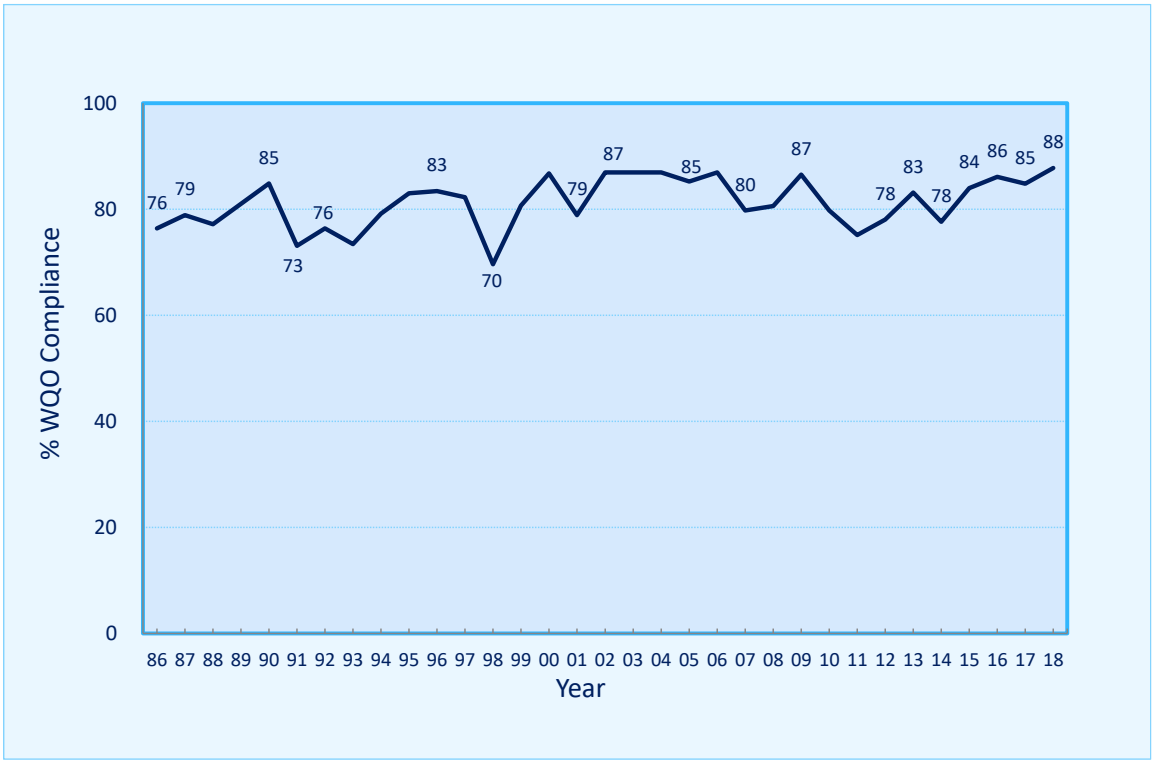


Figure 1. Overall compliance with the marine Water Quality Objectives (WQOs) in Hong Kong, 1986-2018

The compliance rates for the four parameters and the overall compliance rates for the ten water control zones (WCZ) are shown in the Figure 2 – 3. Notably, full compliance of *E. coli* and NH_3-N WQOs have been achieved for four consecutive years since 2015 in all applicable WCZs. The compliance rate of DO WQO was 90.8%, compared with 93.4% in 2017, while that of TIN WQO was 68.1% in 2018 as compared with 55.1% in 2017.

For the DO WQO, the non-compliance was mainly observed in the Tolo Harbour and Channel WCZ, Western Buffer WCZ and Deep Bay WCZ. For the TIN WQO, non-compliance was observed in the Deep Bay WCZ, Southern WCZ, North Western WCZ and, to a lesser extent, the Victoria Harbour WCZ. More details about the compliance rates in individual WCZs are addressed in Chapter 3.

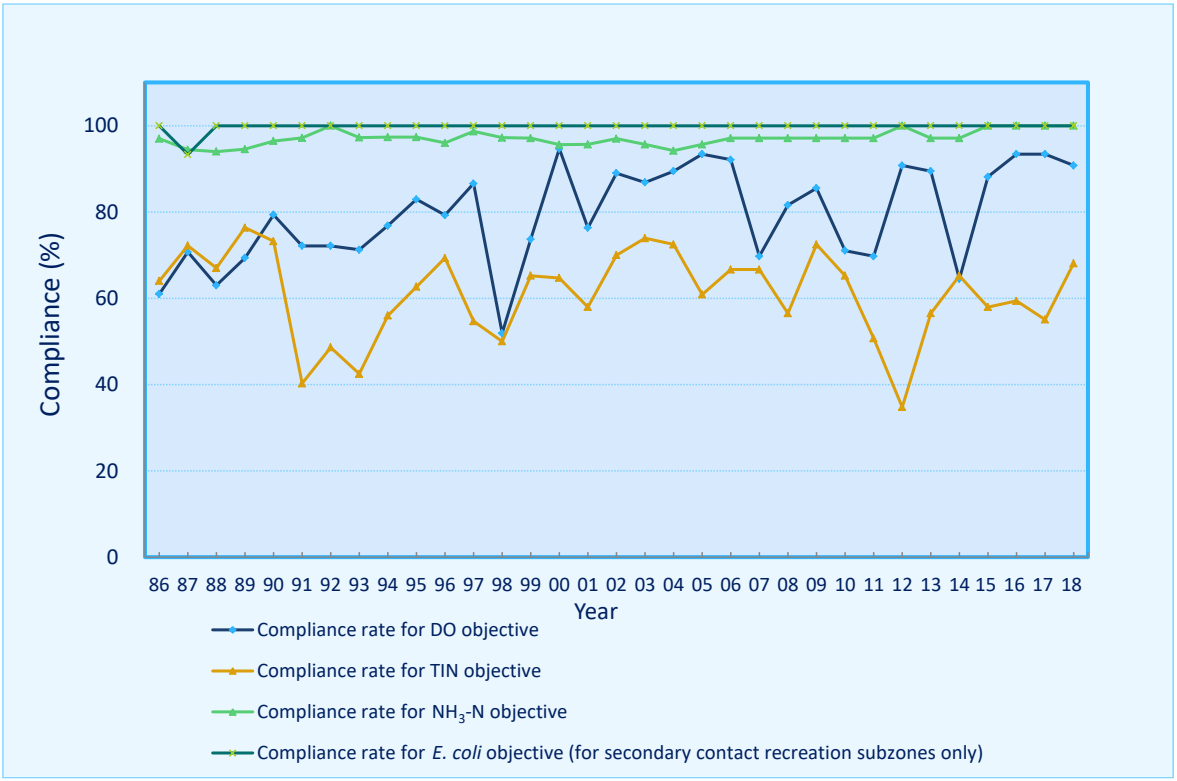


Figure 2. Compliance rates for the four key WQOs in Hong Kong, 1986-2018

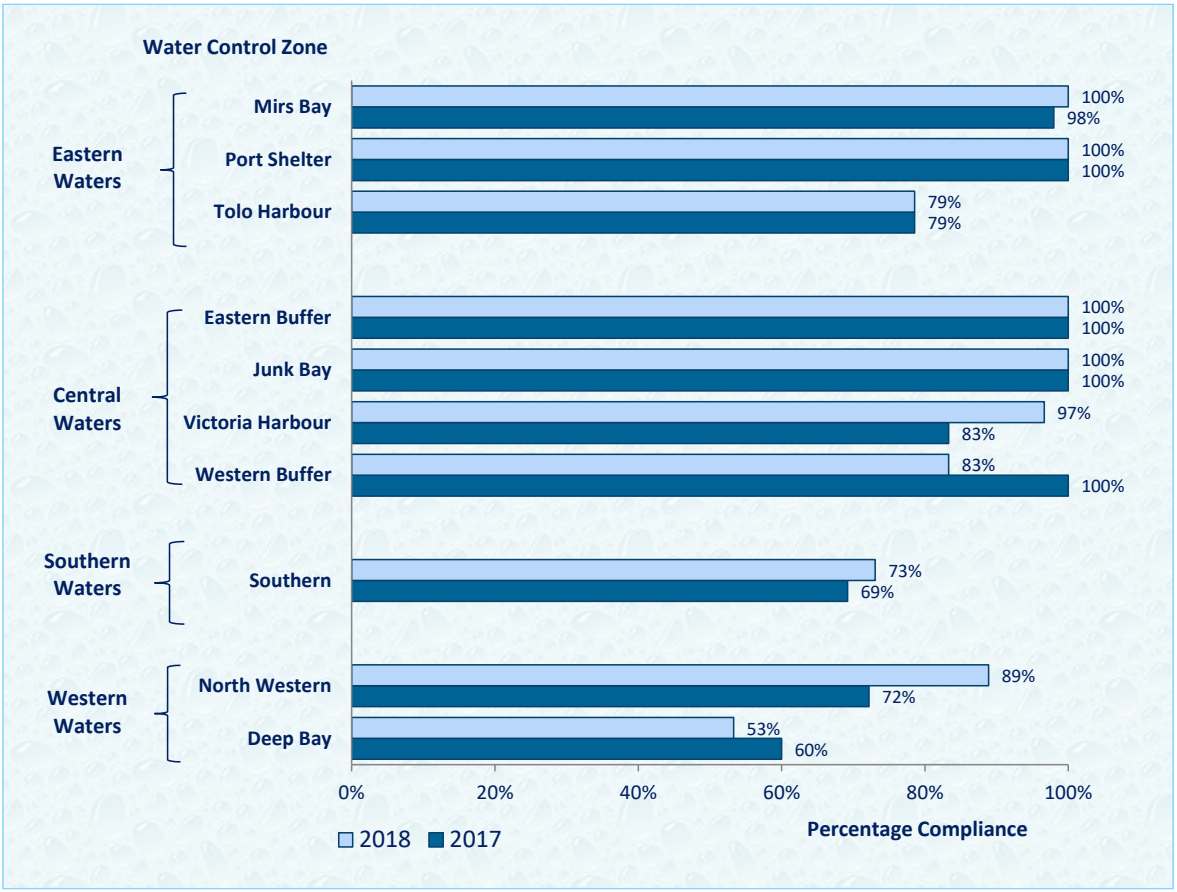


Figure 3. Overall levels of compliance with the WQOs in the ten Water Control Zones in 2017 and 2018

2.2 Highlight in 2018 – Water Quality of Victoria Harbour

Through the continuous efforts of the Government, particularly in enforcing environmental law and implementing sewerage projects, the state of Hong Kong marine waters is gradually improving.

In Victoria Harbour, the water quality has seen significant improvement upon implementation of the Harbour Area Treatment Scheme (HATS), particularly after the commissioning of HATS Stage 2A in December 2015. Amelioration can be seen in the levels of key water quality parameters at various stages of the HATS implementation, as shown in Figure 4. While there is no bacteriological WQO stipulated for the Victoria Harbour WCZ, the overall geometric mean *E. coli* level of the WCZ in 2016-2018 has greatly reduced to about 350 counts per 100mL, representing about 90% reduction from that before HATS Stage 1, which met the WQO for secondary contact recreation subzones, i.e. *E. coli* annual geometric mean not exceeding 610 count per 100 mL. For details of the state of water quality and WQO compliance rates of the WCZ, please refer to Section 3.2.

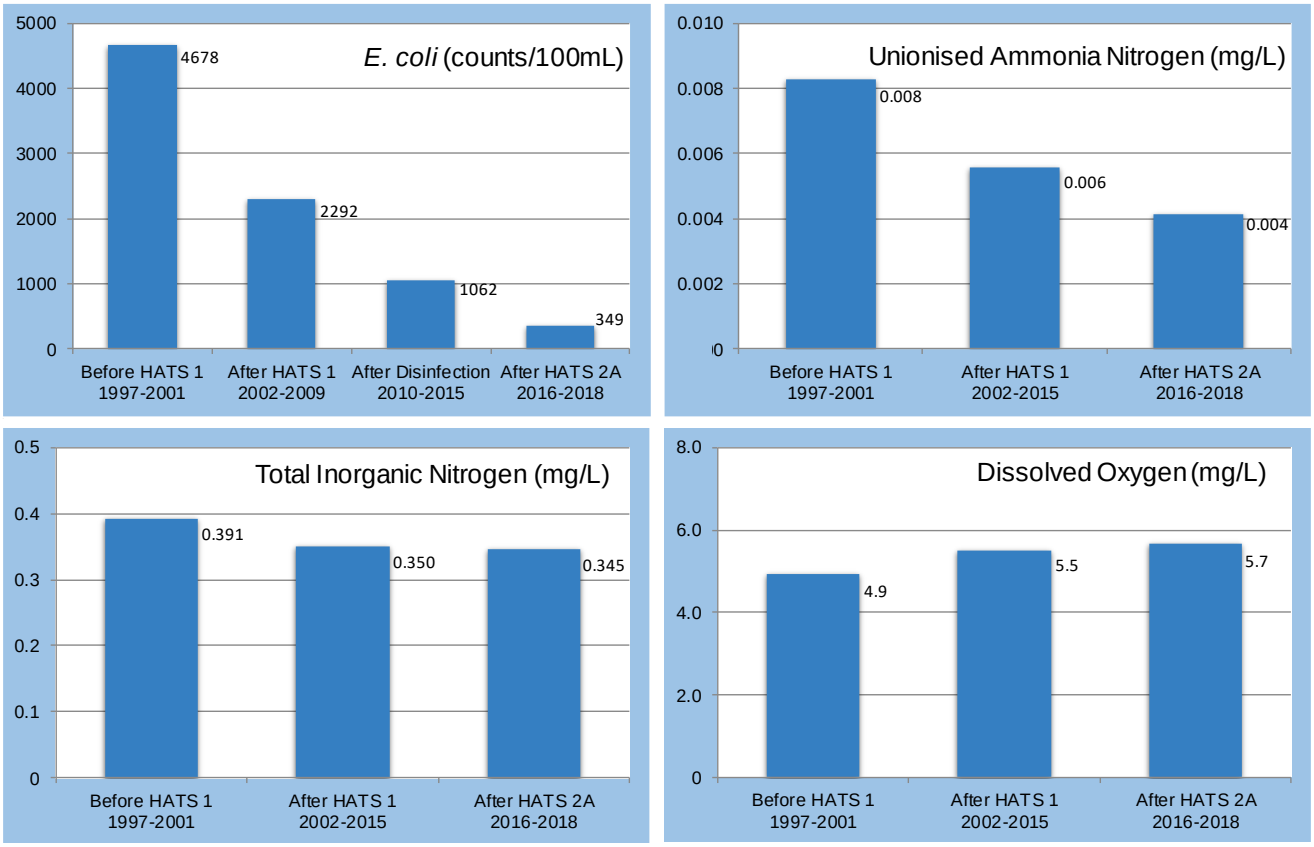
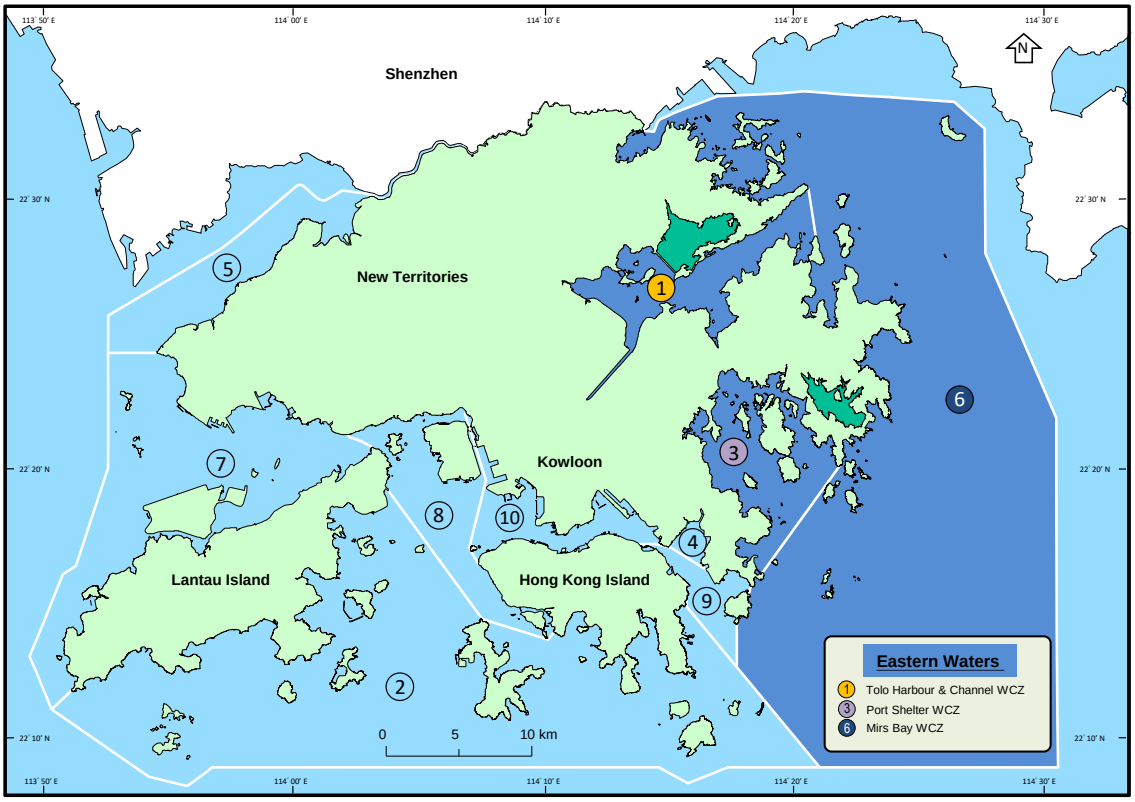


Figure 4. Improvement in water quality in Victoria Harbour since the implementation of Harbour Area Treatment Scheme (HATS)

3. Water Quality of the Ten Water Control Zones

Based on the hydrographical conditions of Hong Kong waters and the proximity to the Pearl River Estuary, the ten WCZs are broadly grouped into four main areas (Eastern, Central, Western and Southern Waters) and their detailed water quality conditions in 2018 are reported in the following sections.

3.1 Eastern Waters



The eastern waters comprise three WCZs, namely the Mirs Bay WCZ, the Port Shelter WCZ, and the Tolo Harbour and Channel WCZ. These waterbodies cover six gazetted beaches, three marine parks and 20 fish culture zones, and have beautiful coastlines and good water quality that support a high diversity of marine life, fisheries and recreational activities.

Mirs Bay Water Control Zone

In 2018, the overall WQO compliance rate of the Mirs Bay WCZ was 100%. The water quality was good in 2018 with high DO and low TIN levels. Furthermore, it complied with the bacteriological WQO for secondary contact recreation activities.

The WQO compliance rates and long-term trends of some key water quality parameters during 1986-2018 for the Mirs Bay WCZ are illustrated in Figure 5 – 6.

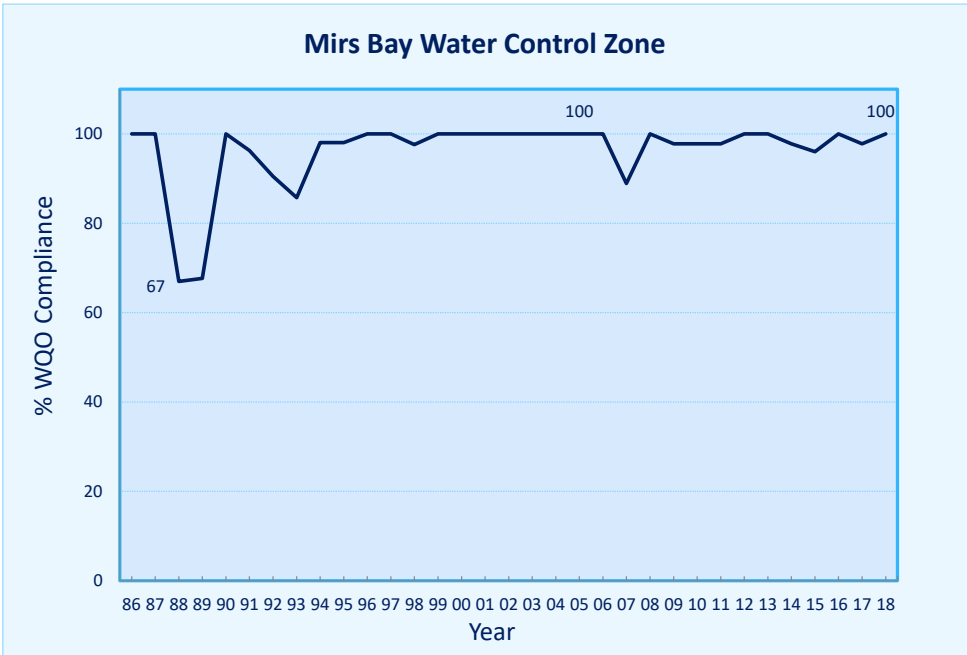


Figure 5. Overall compliance with the WQOs in the Mirs Bay Water Control Zone, 1986-2018

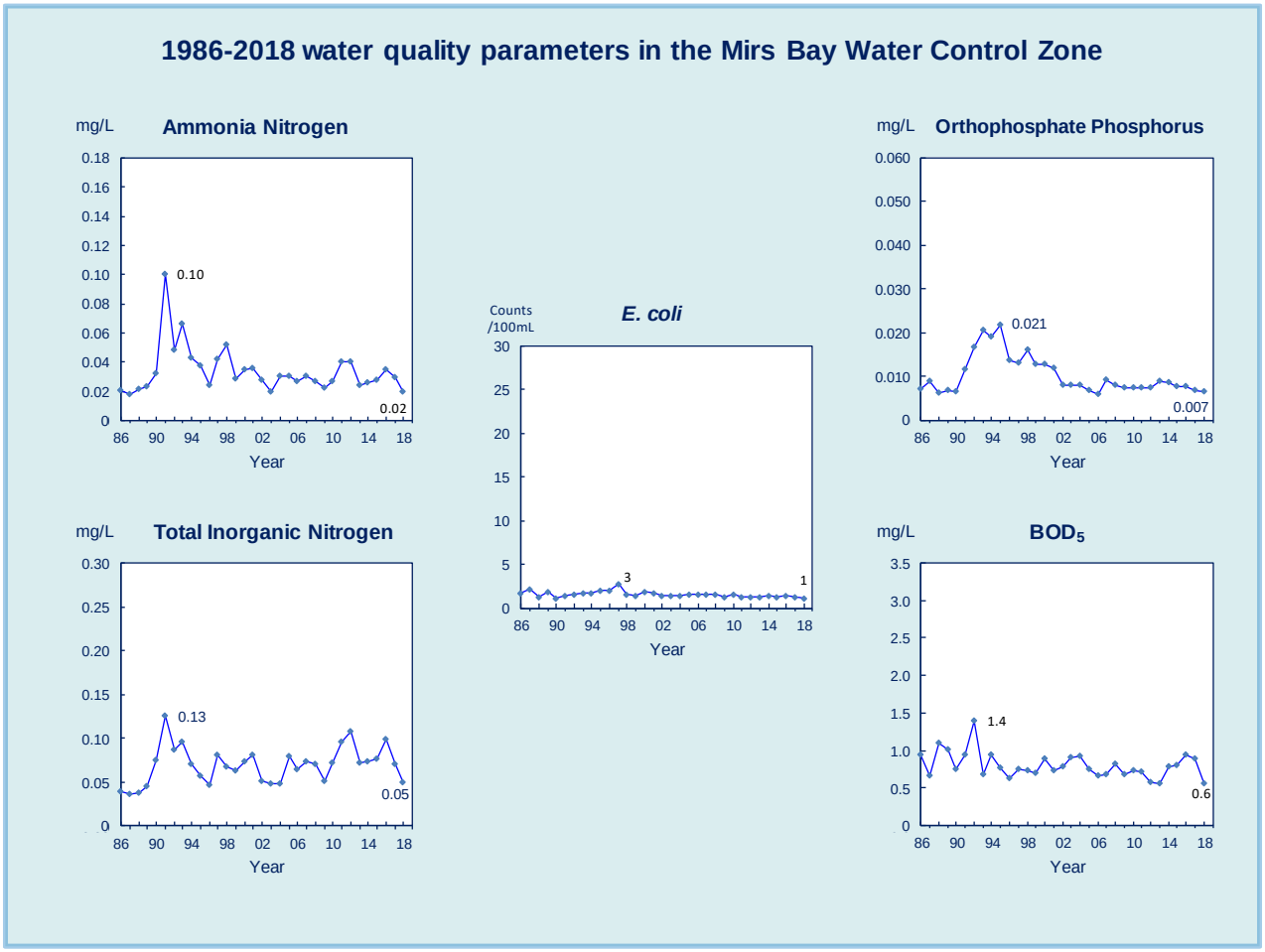


Figure 6. Long-term trends of water quality in the Mirs Bay Water Control Zone, 1986-2018

Port Shelter Water Control Zone

Port Shelter is a popular destination for various water sports activities, including leisure fishing, swimming, yachting, water-skiing and diving. In 2018, the water quality of the Port Shelter WCZ was good, meeting the WQOs for *E. coli*, DO, TIN and NH_3-N and achieving an overall 100% WQO compliance rate since 2015.

The WQO compliance rates and long-term trends of some key water quality parameters for the Port Shelter WCZ are illustrated in Figure 7 – 8. In general, the water quality in recent years was better than that in the late 1980's. The levels of key water quality parameters, such as TIN and orthophosphate phosphorus (PO_4-P), remain steady and low in recent years.

A view of Port Shelter WCZ water from Sai Kung

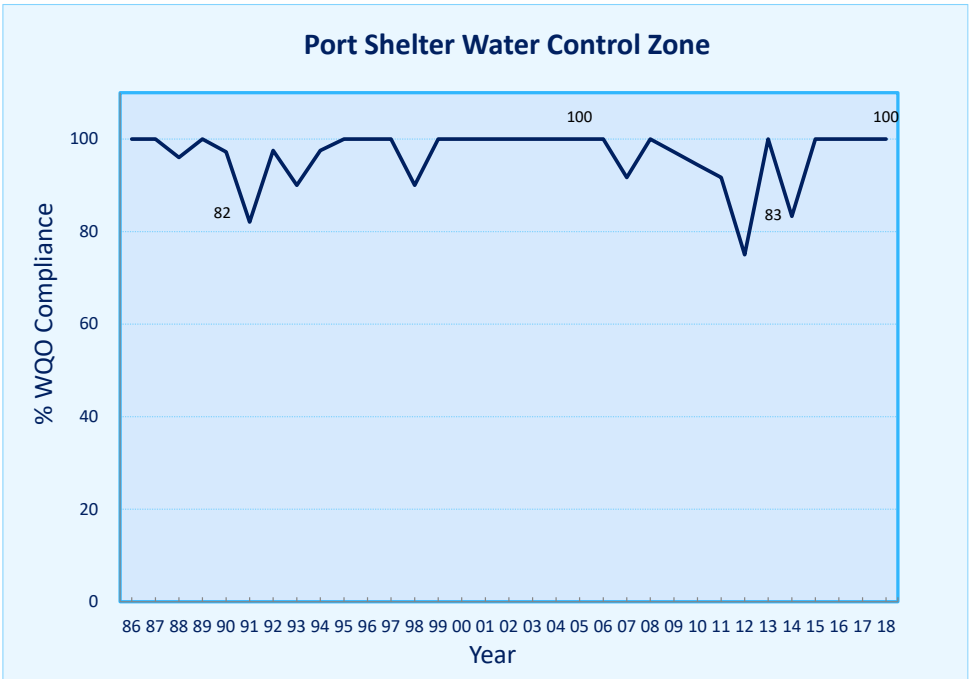


Figure 7. Overall compliance with the WQOs in the Port Shelter Water Control Zone, 1986-2018

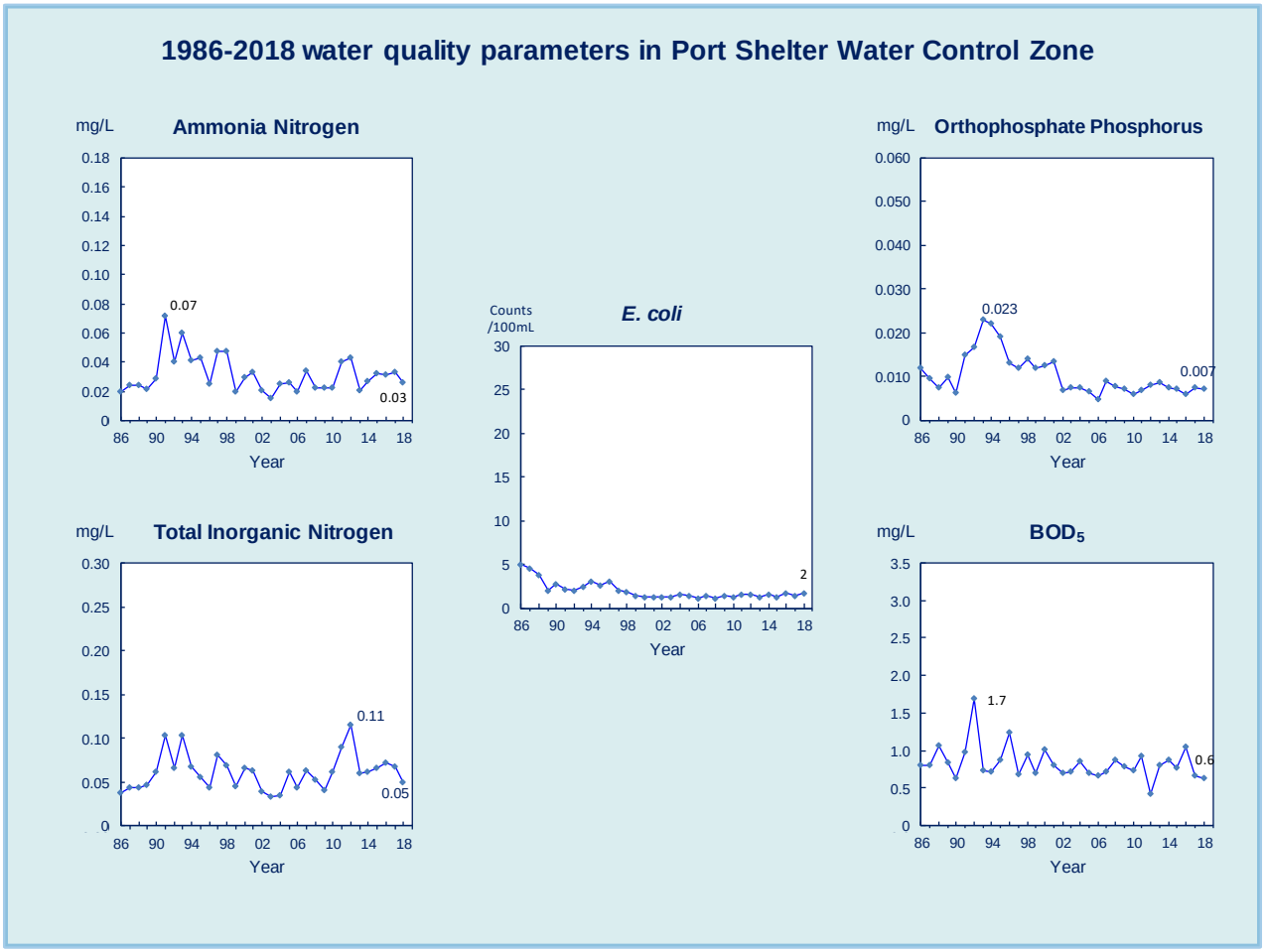


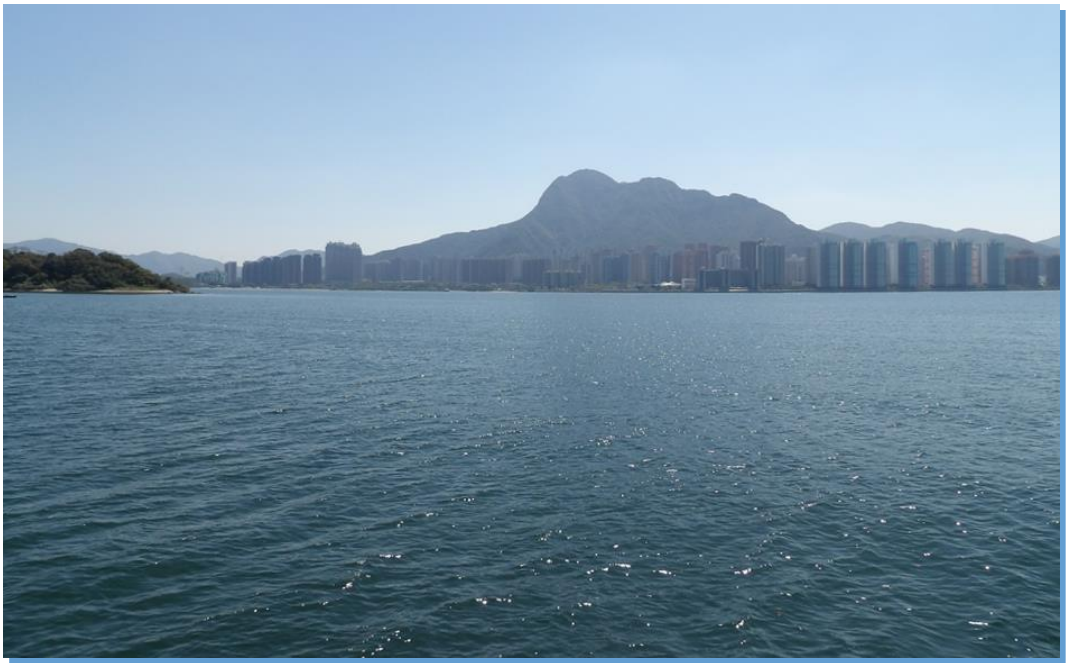
Figure 8. Long-term trends of water quality in the Port Shelter Water Control Zone, 1986-2018

Tolo Harbour and Channel Water Control Zone

The monitoring results of key water quality parameters indicate that the overall WQO compliance rate of the Tolo Harbour and Channel WCZ in 2018 was 79%, same as 2017. The compliance rate for the DO WQO maintained at 57%, same as 2017 and 2016. Furthermore, the Tolo Harbour and Channel WCZ also complied with the bacteriological WQO for the secondary contact recreation subzone.

Tolo Harbour is a shallow and semi-enclosed water body which is essentially landlocked. Such hydrological setting often leads to natural stratification of the water column and the associated lower bottom DO levels, particularly during the hot summer months with high rainfall. As such, occassional non-compliance with the DO WQO may take place during summer. For example, in 2018, monitoring stations located in the Channel Subzone with water depths of some 10 to 20 metres had low bottom DO levels detected.

In the mid-1980s, with the implementation of the Tolo Harbour Action Plan, which includes the control of livestock waste, the provision and improvement of sewerage, the export of treated sewage effluent from Sha Tin and Tai Po Sewage Treatment Works outside Tolo Harbour for discharging into Victoria Harbour via Kai Tak River, as well as the extension of village sewerage in the catchment area, there has been a steady improvement in water quality in Tolo Harbour in the past three decades. The WQO compliance rates and long-term trends of some key water quality parameters during 1986-2018 for the Tolo Harbour and Channel WCZ are illustrated in Figure 9 – 10.



A view of Ma On Shan from the Tolo Harbour and Channel Water Control Zone

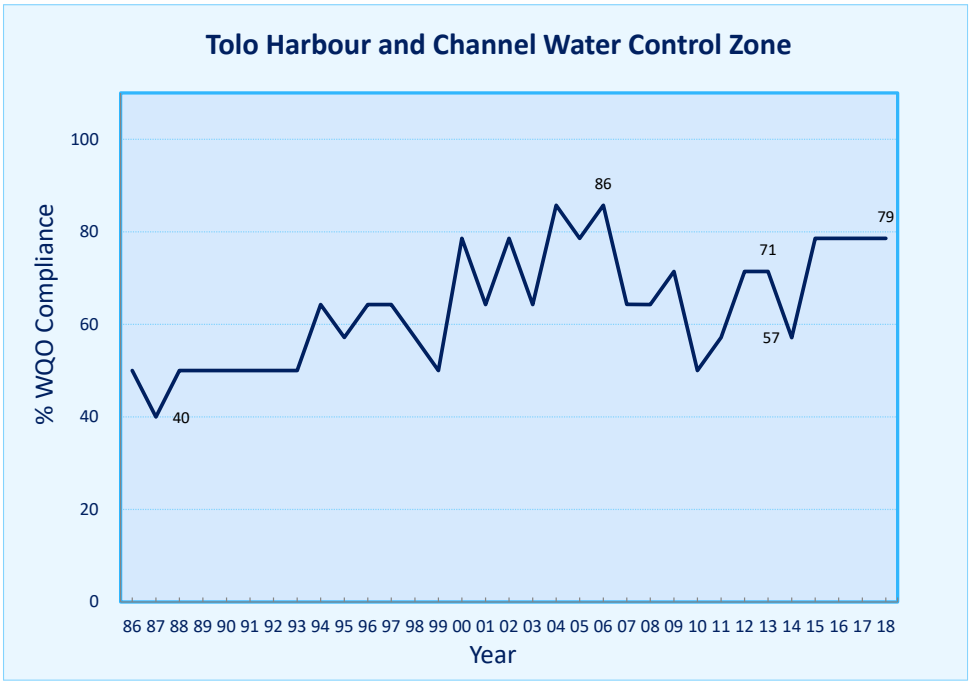


Figure 9. Overall compliance with the WQOs in the Tolo Harbour and Channel Water Control Zone, 1986-2018

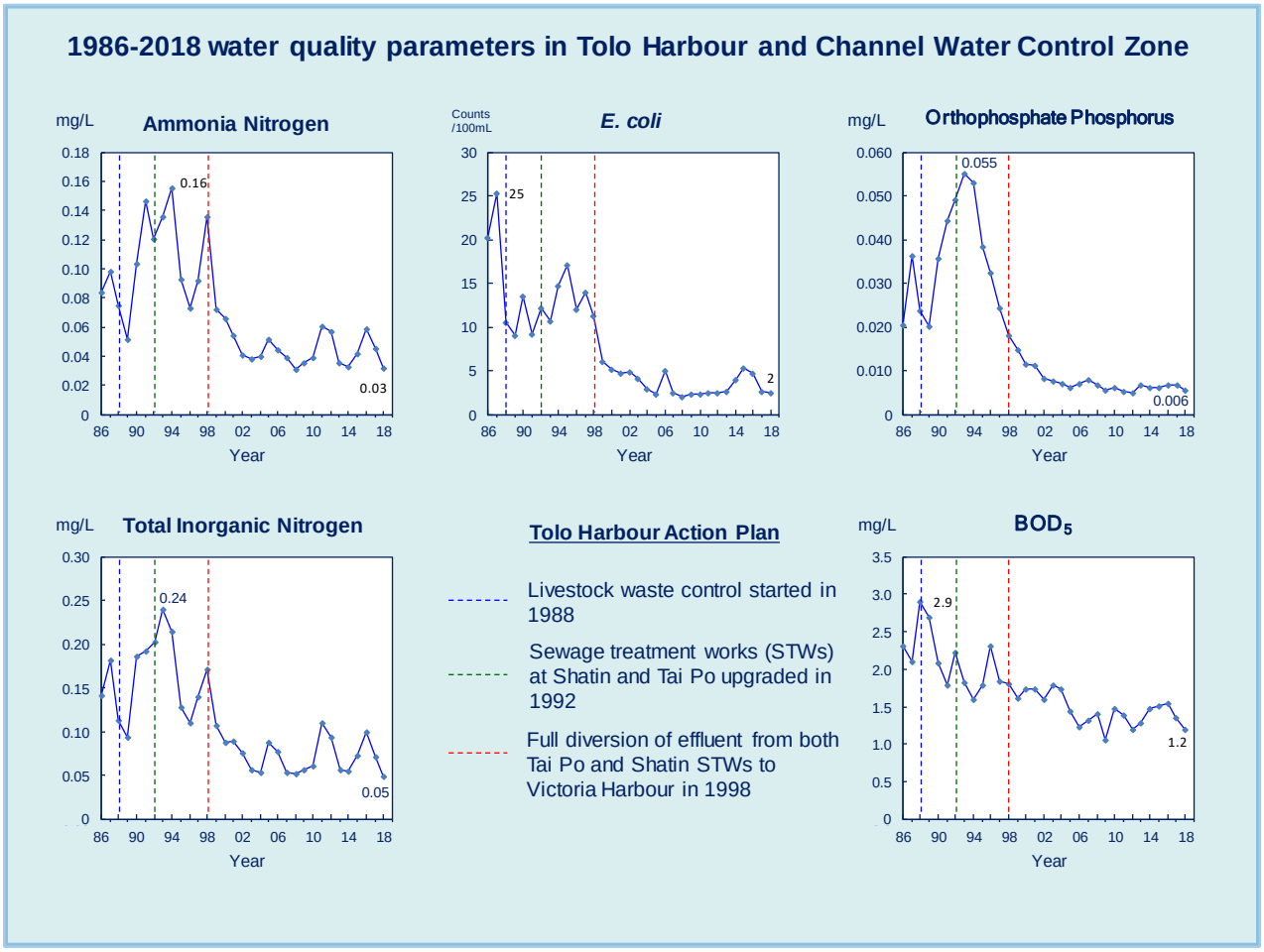
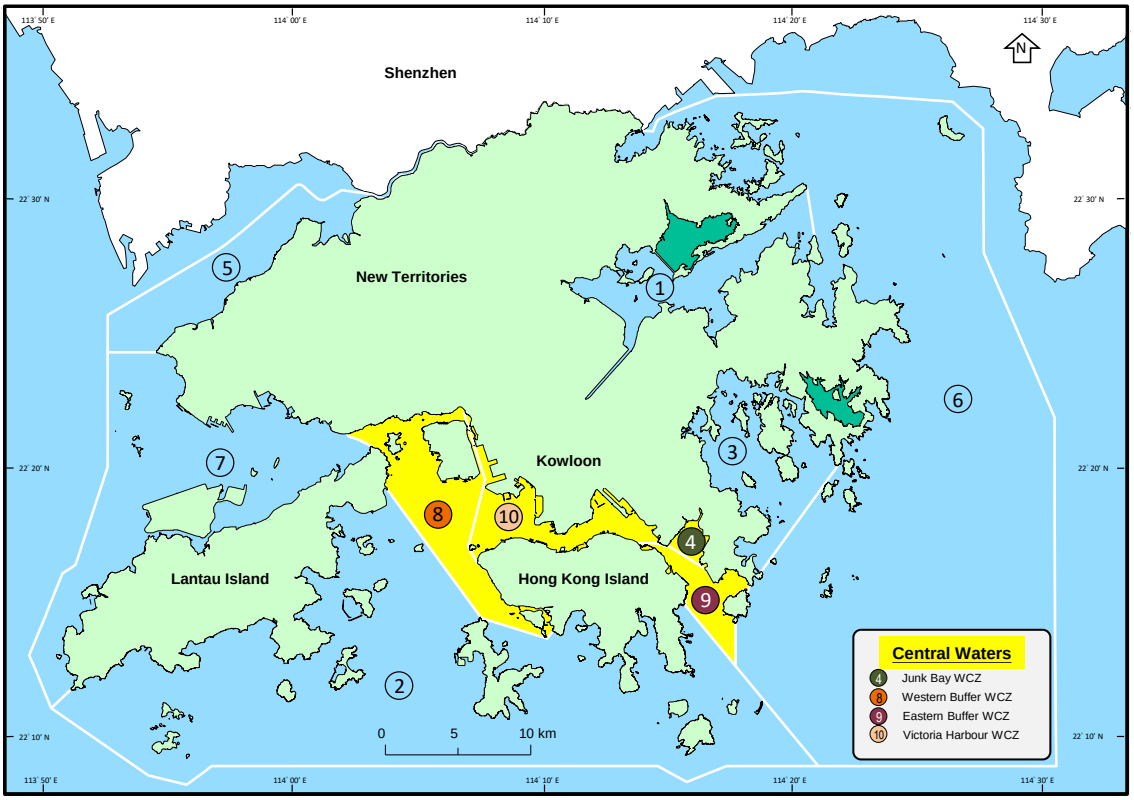


Figure 10. Long-term trends of water quality in the Tolo Harbour and Channel Water Control Zone, 1986-2018

3.2 Central Waters



The central waters of Hong Kong are important navigational channels and port areas, covering four WCZs, i.e. the Victoria Harbour WCZ, the Eastern Buffer WCZ, the Western Buffer WCZ and the Junk Bay WCZ.

Upon the commissioning of the Stonecutters Island Sewage Treatment Works (SCISTW) under the HATS Stage 1 in December 2001, about 75% of the sewage generated around Victoria Harbour receives chemically enhanced primary treatment (CEPT), resulting in a 70% reduction of the pollution load (in terms of organic pollutants) discharged into the harbour. This has improved the water quality in the harbour particularly in the Eastern Buffer and Junk Bay WCZs. With the Advance Disinfection Facilities (ADF) of the HATS Stage 2A commissioned in March 2010, the *E. coli* removal efficiency at the SCISTW has increased to over 99%. The *E. coli* level in the western harbour area has been substantially reduced since then.

Since HATS Stage 2A was commissioned in December 2015, all sewage generated from both sides of Victoria Harbour is transported to the SCISTW via deep tunnels for centralised CEPT and disinfection, and discharged into the western harbour area. Further improvement in water quality has been observed, as evident in *E. coli* level reduction.

Victoria Harbour Water Control Zone

The overall WQO compliance rate of Victoria Harbour WCZ in 2018 was 97%. The WQO compliance rate for DO and NH_3-N in 2018 were both 100%. The WQO compliance rate for TIN was 90% with only one among the ten monitoring stations not meeting standard.

The TIN compliance rate is affected by year-to-year natural fluctuations of discharges from surface run-off, SCISTW discharges, as well as the higher background TIN level under the influence of Pearl River catchment as also reflected in many stations in the North Western, Southern and Western Buffer WCZs. On the other hand, NH_3-N, *E. coli,* PO_4-P and BOD_5 levels showed decreasing trends over the past 30 years.

The *E. coli* level in the eastern side of Victoria Harbour has markedly decreased since the HATS Stage 1 commissioned in December 2001 (Figure 11). The Cross Harbour Swim, suspended as from 1979 because of poor water quality, resumed in October 2011 as an annual event on the eastern side of the harbour. Thanks to full commissioning of the HATS Stage 2A in December 2015, the *E. coli* level of the central harbour area has also dropped significantly, and the course of the Cross Harbour Swim was moved back to the central harbour area in 2017.

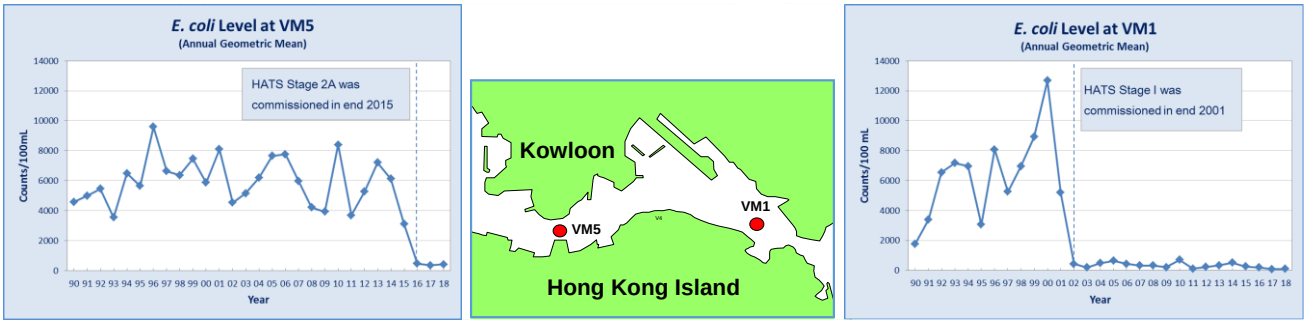


Figure 11. The *E. coli* level at the central (VM5) and eastern (VM1) parts of Victoria Harbour Water Control Zone, 1990-2018

Figure 12 – 13 indicate the WQO compliance rates and long-term trends of important water quality parameters for the Victoria Harbour WCZ since 1986.

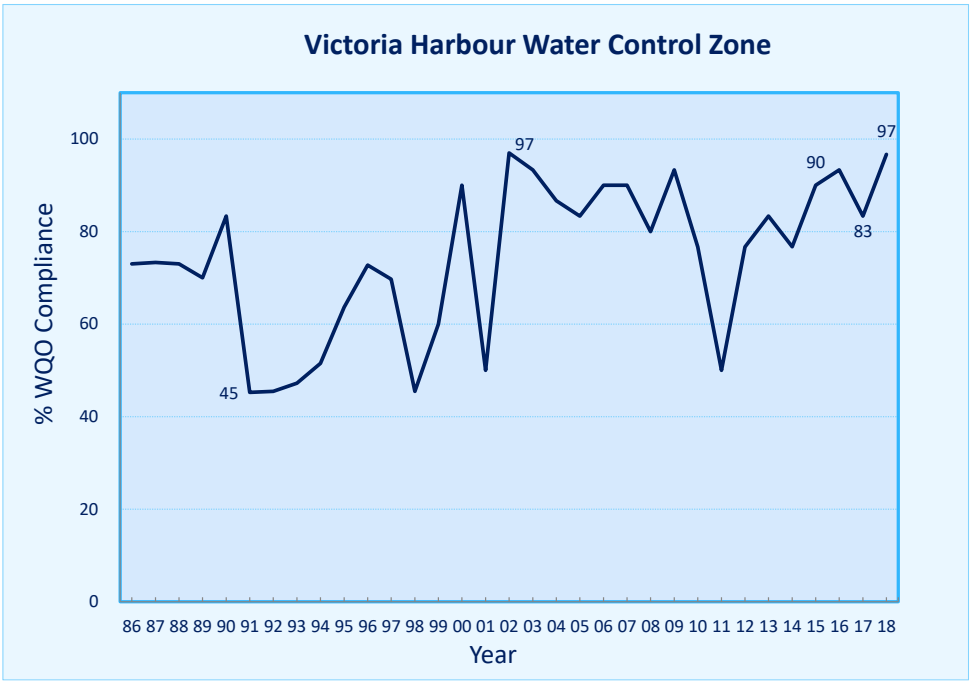


Figure 12. Overall compliance with the WQOs in the Victoria Harbour Water Control Zone, 1986-2018

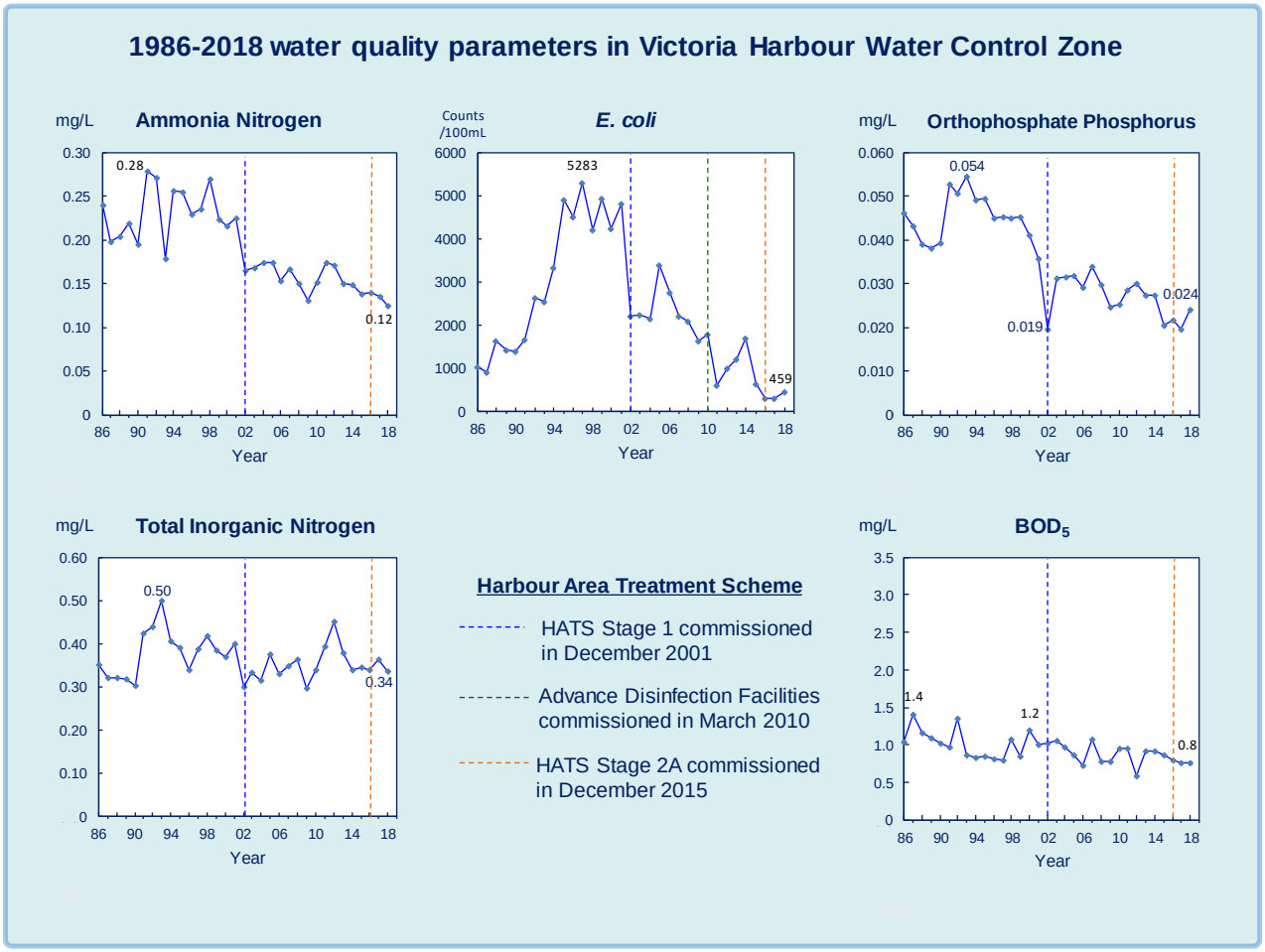


Figure 13. Long-term trends of water quality in the Victoria Harbour Water Control Zone, 1986-2018

Eastern Buffer Water Control Zone and Junk Bay Water Control Zone

As at 2018 both the Eastern Buffer WCZ and the Junk Bay WCZ have achieved full compliance (100%) with the WQOs for the last 19 years. Indeed, since the implementation of the HATS Stage 1 in December 2001 by which all sewage generated from Junk Bay (Tseung Kwan O), the Kowloon Peninsula and the eastern part of Hong Kong Island (Chai Wan) was diverted to and treated at the SCISTW, the water quality of these two WCZs has improved markedly with increased DO and decreased nutrient and bacterial levels.

A view of Tseung Kwan O Industrial Estate from the Junk Bay Water Control Zone

Figure 14 – 17 illustrate the WQO compliance rates and long-term improving trends of some important water quality parameters for the Eastern Buffer WCZ and the Junk Bay WCZ since 1986.

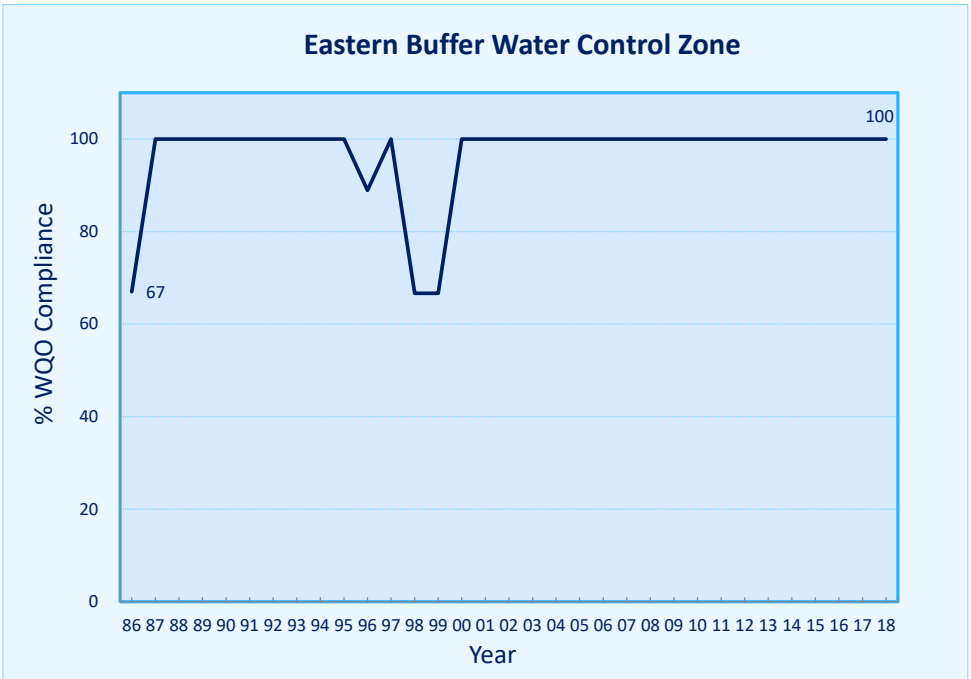


Figure 14. Overall compliance with the WQOs in the Eastern Buffer Water Control Zone, 1986-2018

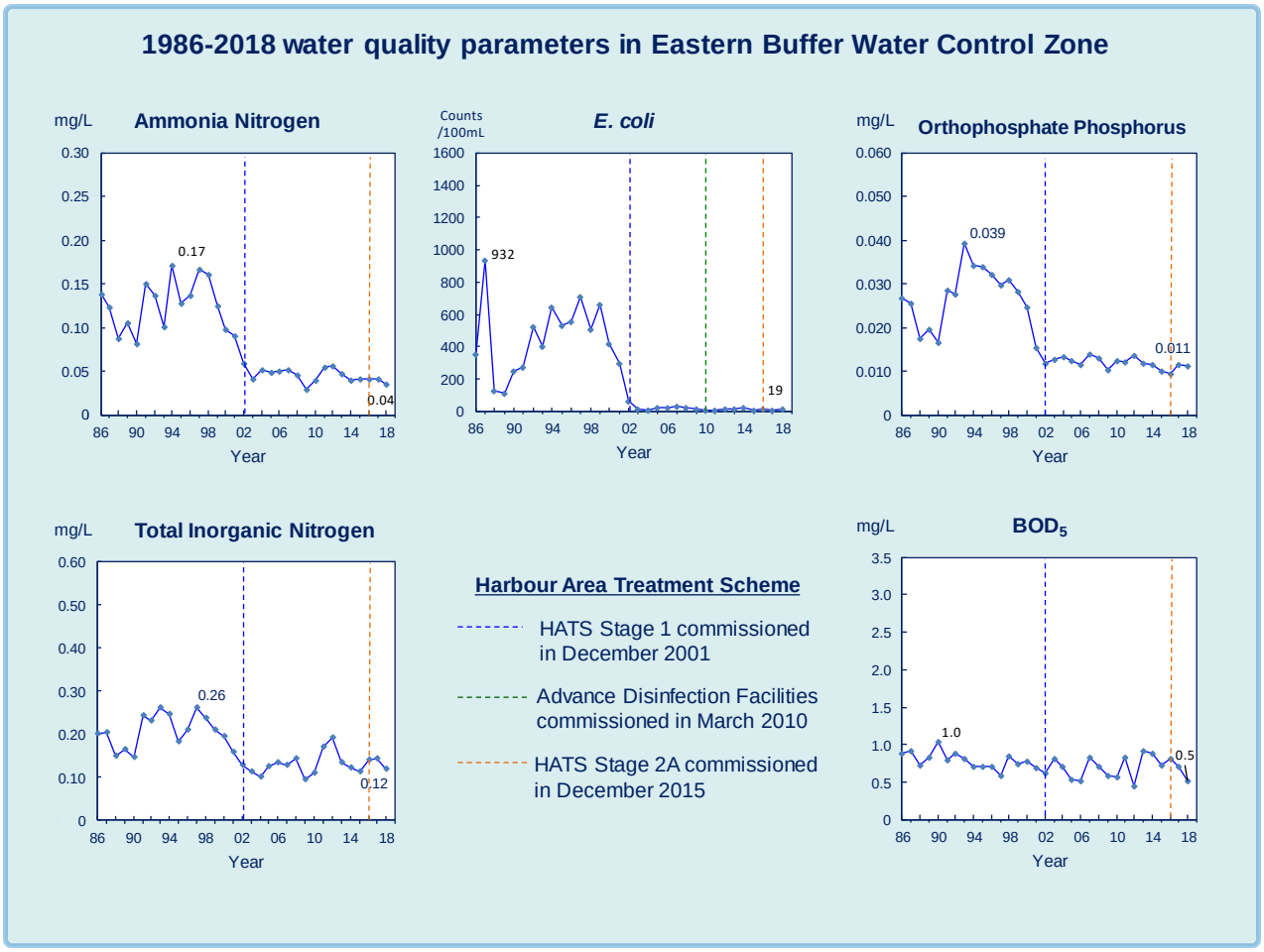


Figure 15. Long-term trends of water quality in the Eastern Buffer Water Control Zone, 1986-2018

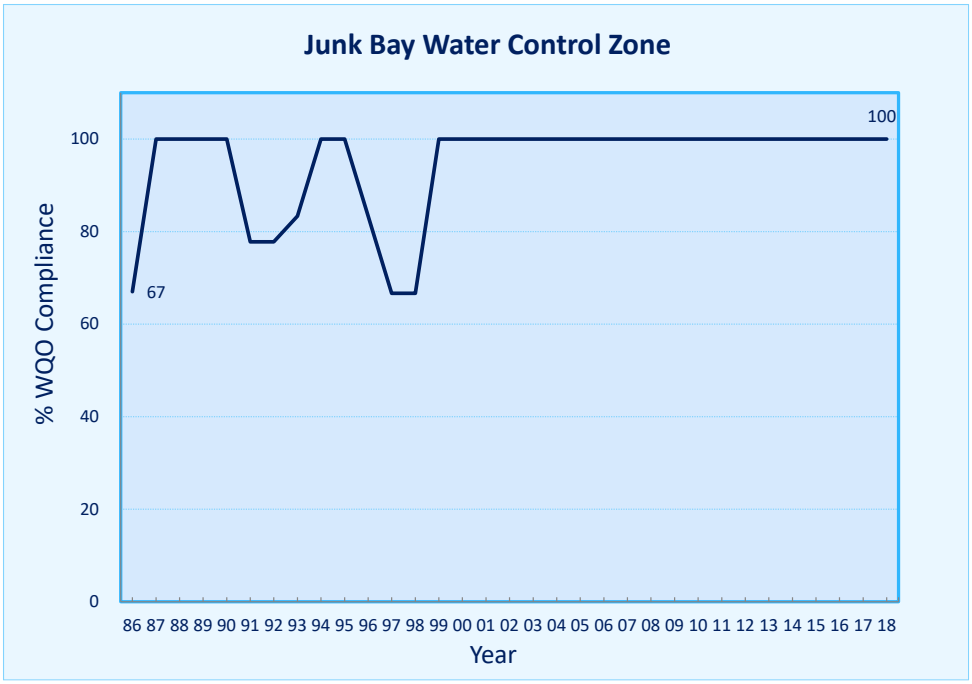


Figure 16. Overall compliance with the WQOs in the Junk Bay Water Control Zone, 1986-2018

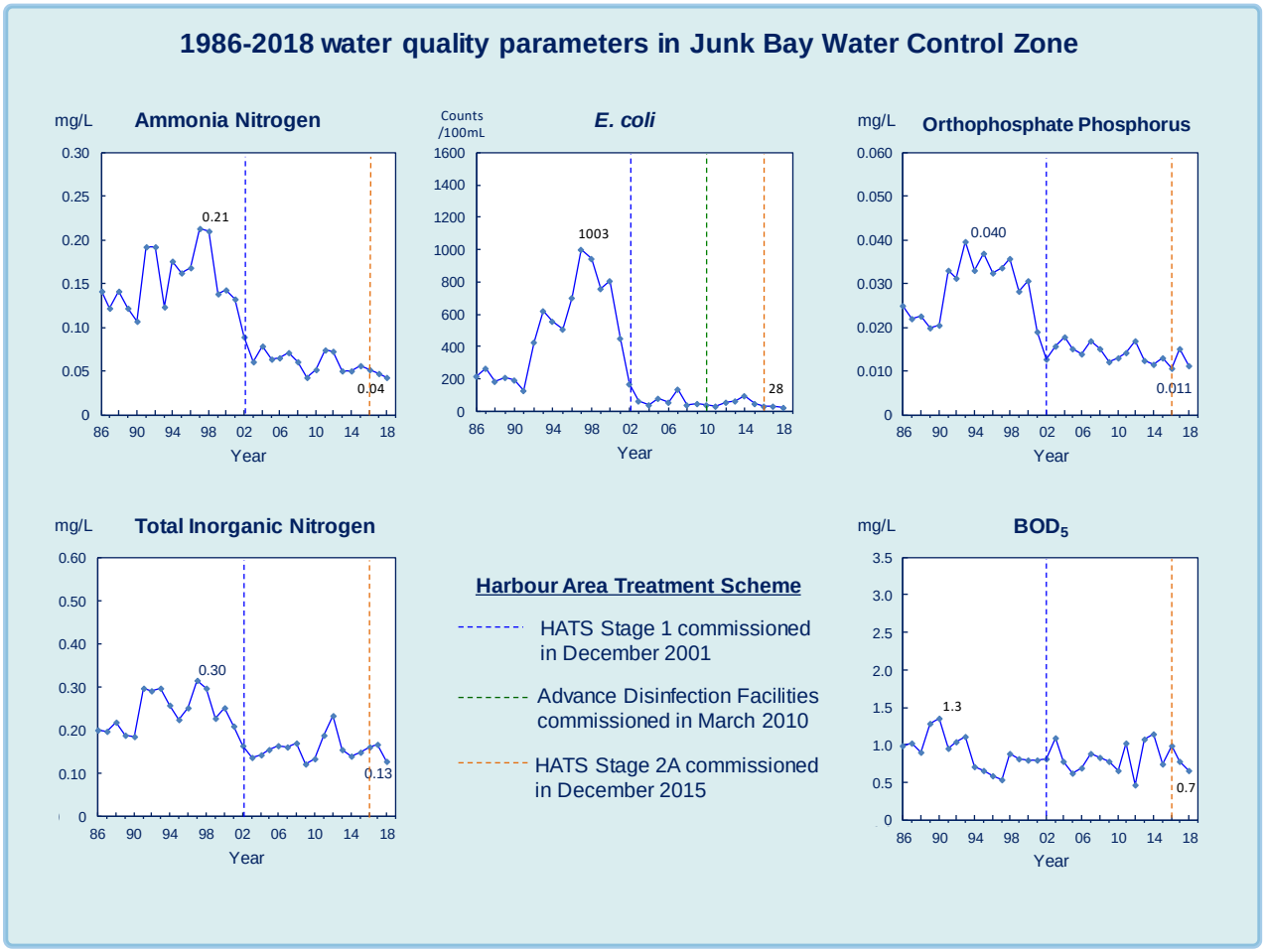


Figure 17. Long-term trends of water quality in the Junk Bay Water Control Zone, 1986-2018

Western Buffer Water Control Zone

The Western Buffer WCZ achieved 83% overall compliance with the WQOs in 2018, with full compliance with the WQOs for TIN and NH_3-N. Similar to the Victoria Harbour WCZ, the TIN level in the Western Buffer WCZ was influenced by high background level under the influence of Pearl River catchment, the year-to-year fluctuation of surface run-off as well as the discharge from the SCISTW. The overall DO compliance rate in Western Buffer WCZ has been fluctuating between 25% and 100% in the past 10 years while the compliance rate was at 50% in 2018.

Since the commissioning of the ADF at the SCISTW in March 2010, the *E. coli* level in the WCZ decreased by over 90% in 2011, as compared with that of 2009. In 2018, all eight gazetted beaches located in the Tsuen Wan District of this WCZ complied with the bacteriological WQO for bathing, which was the ninth consecutive year since 2010 as reported in the *2018 Beach Water Quality in Hong Kong*.

Kap Shui Mun Bridge in the Western Buffer Water Control Zone

Figure 18 – 19 illustrate the WQO compliance rate and long-term trends of some important water quality parameters for the Western Buffer WCZ since 1986. Similar to other WCZs in the central waters, significant improvement of water quality in terms of *E. coli* and PO_4-P has been observed.

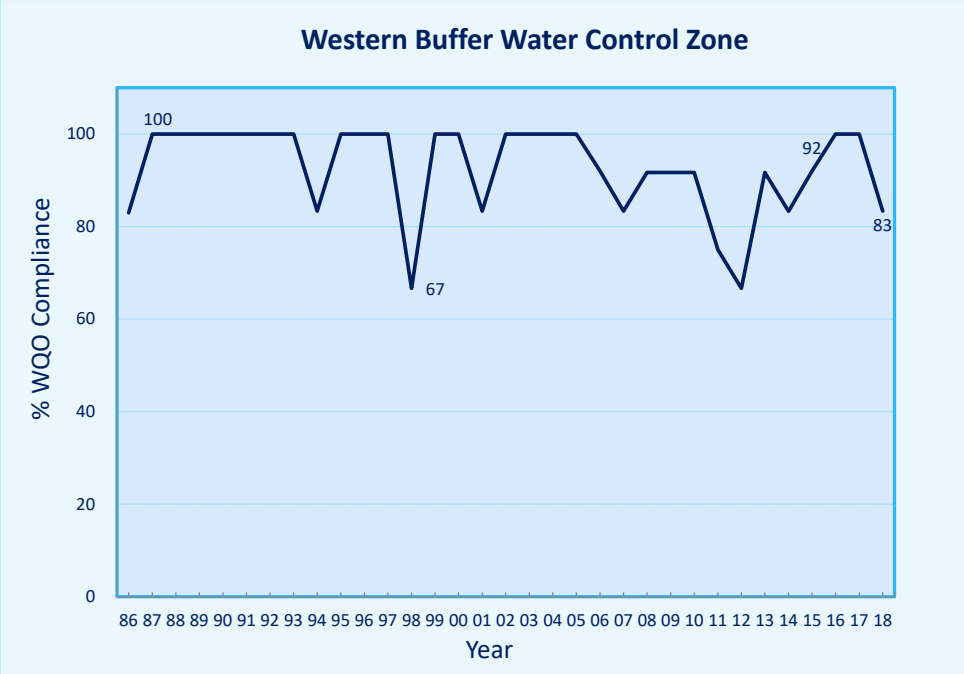


Figure 18. Overall compliance with the WQOs in the Western Buffer Water Control Zone, 1986-2018

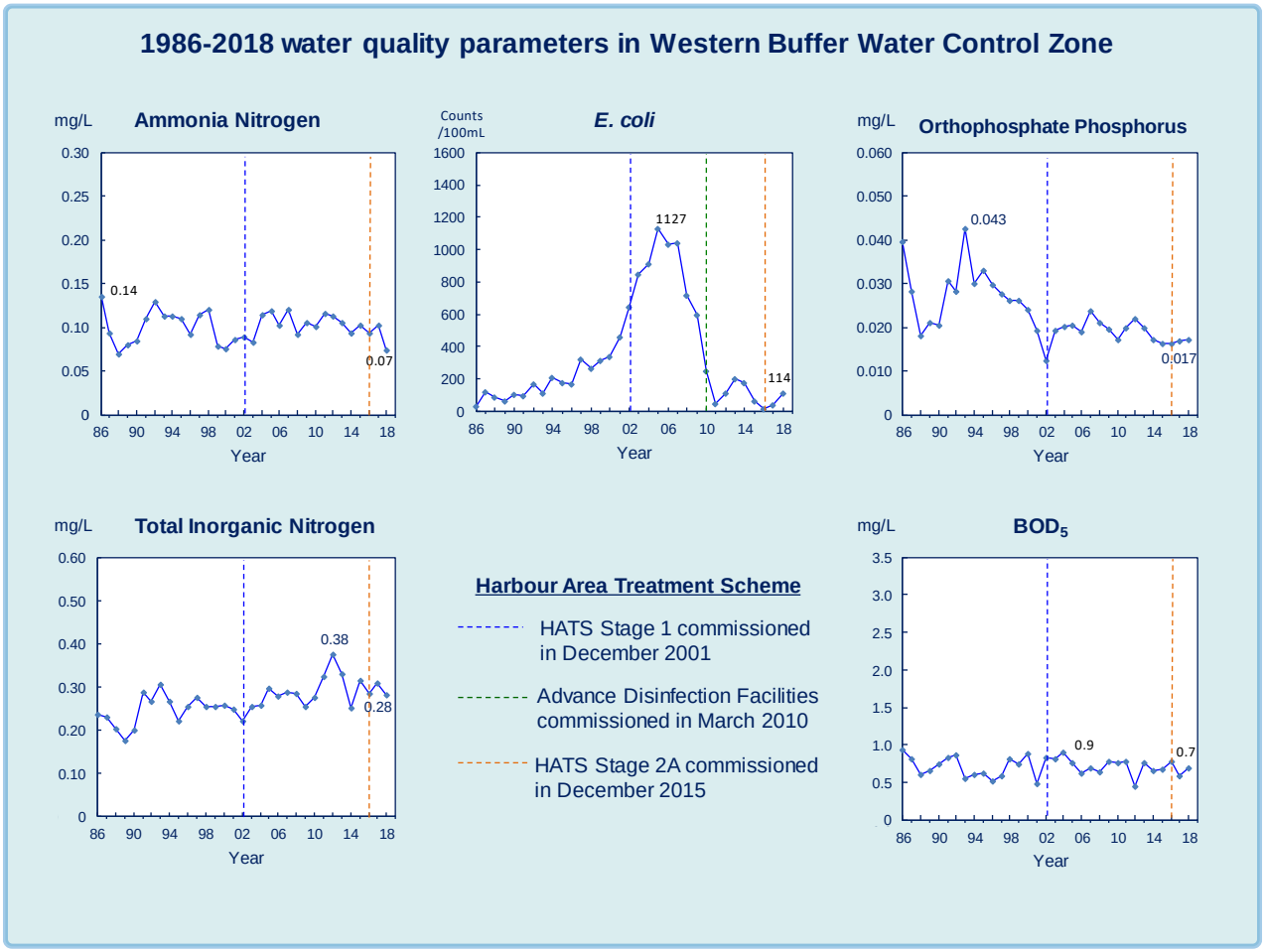
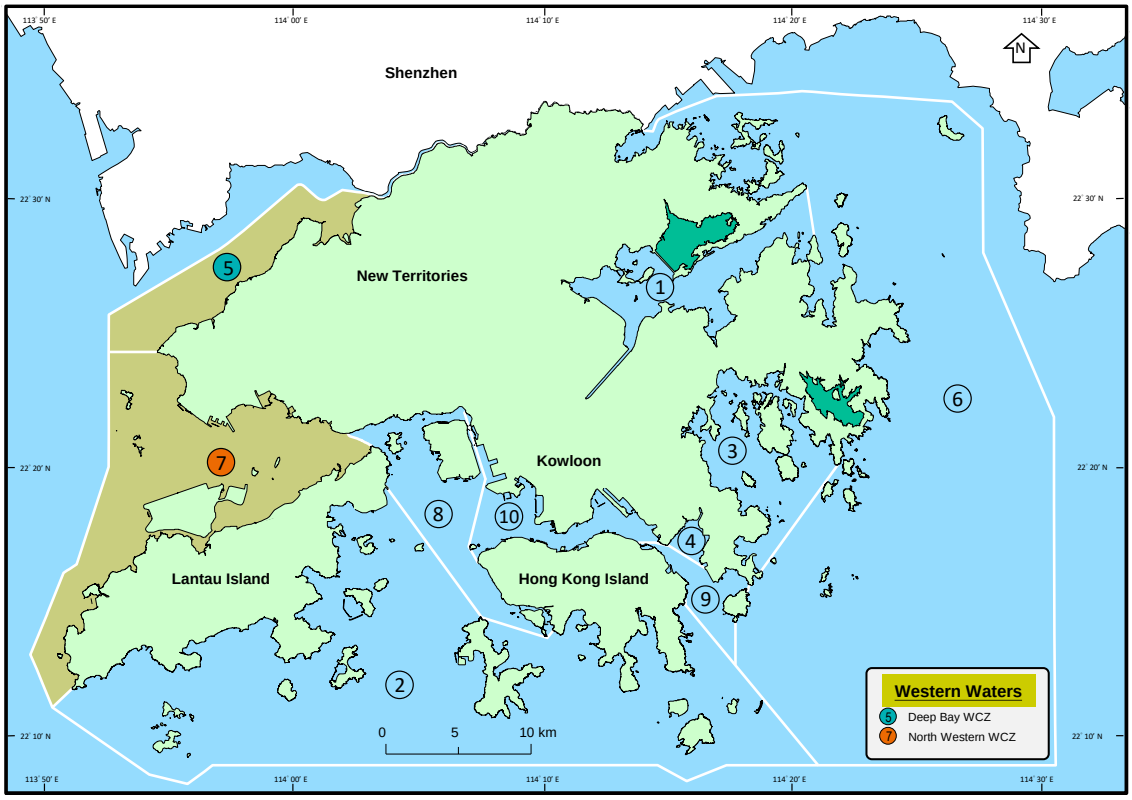


Figure 19. Long-term trends of water quality in the Western Buffer Water Control Zone, 1986-2018

3.3 Western Waters



The Deep Bay WCZ and the North Western WCZ are located in the western part of Hong Kong. Apart from local discharges, both WCZs are also affected by the discharges from Pearl River catchment, particularly during the wet season under the influence of the southwest monsoon. The Deep Bay WCZ also receives discharges from Shenzhen River.

The Deep Bay WCZ includes the ecologically sensitive Mai Po Inner Deep Bay Ramsar Site, and areas of oyster culture. The mudflat and mangroves associated flora and fauna in the Ramsar Site support a high diversity of local and seasonally migrating birds, and constitutes an important feeding and resting ground for a number of globally threatened species, such as Black-faced Spoonbill, Saunders's Gull and Nordmann's Greenshank.

The North Western WCZ covers the waters around Lantau Island, Tuen Mun, Sha Chau and Lung Kwu Chau where Chinese white dolphins are commonly spotted. The Sha Chau and Lung Kwu Chau Marine Park as well as the Brothers Marine Park are located in the western waters of Hong Kong.

Deep Bay Water Control Zone

Deep Bay is a large shallow and semi-enclosed bay on the eastern side of the Pearl River Estuary with an average depth of about 3m. Deep Bay has the largest and most important mangrove habitat in Hong Kong. The mudflats of inner Deep Bay also have high conservation value as an important feeding ground for a huge number of resident and wintering birds. The water body's shallowness, presence of muddy habitats as well as the strong riverine inputs from within and outside, have contributed to its naturally high level of suspended solids.

The overall WQO compliance rate of the Deep Bay WCZ was 53% in 2018 as compared with a ten-year average of 46% in 2008-2017. Similar to previous years, the Deep Bay WCZ had relatively high nutrient levels. The Deep Bay WCZ is further divided into two subzones with different TIN objectives. The annual depth-averaged TIN levels in the Deep Bay Inner Marine Subzone and Deep Bay Outer Marine Subzone were higher than their respective TIN WQO. Although the TIN levels are relatively high in this WCZ as compared with other WCZs, there were few reported cases of red tides in Deep Bay because the high background suspended solid level has limited the photosynthesis and growth of phytoplankton in water. In 2018, all five stations had NH_3-N WQO full compliance, while two of the stations in Inner Subzone of Deep Bay (DM1 and DM2) did not meet the DO WQO.

Despite that the TIN level in Deep Bay is relatively high, there are noticeable signs of water quality improvement since the mid-2000s as a result of joint efforts by both Hong Kong and Shenzhen Governments in reducing pollution loads, e.g., the voluntary farm surrender schemes for poultry and pig farms implemented in 2005-2008. Figure 20 – 22 illustrate the WQO compliance rate and long-term trends of some important water quality parameters for the Deep Bay WCZ.

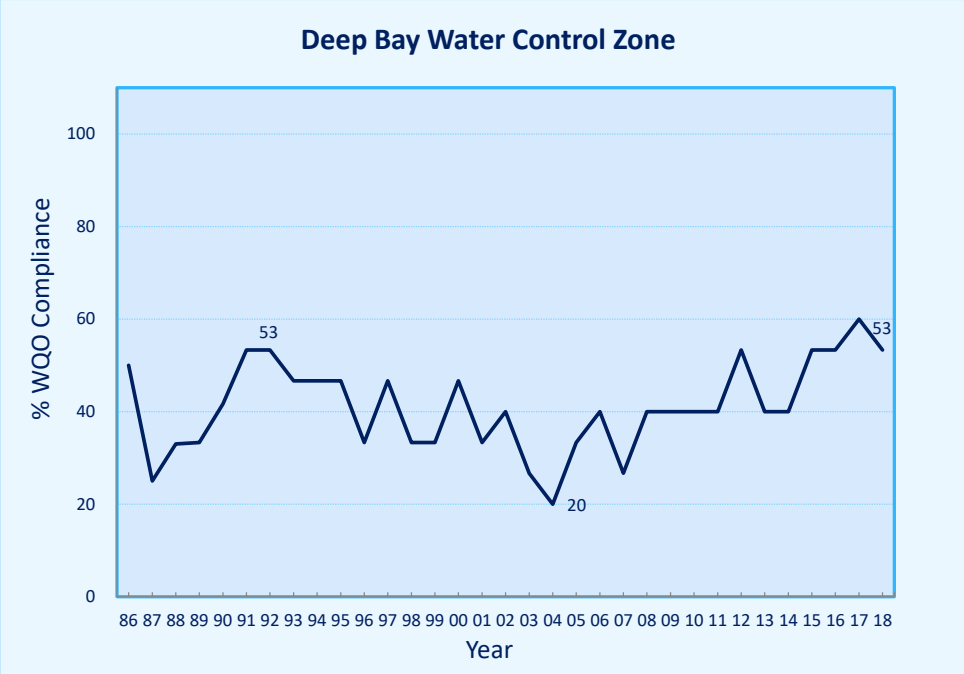


Figure 20. Overall compliance with the WQOs in the Deep Bay Water Control Zone, 1986-2018

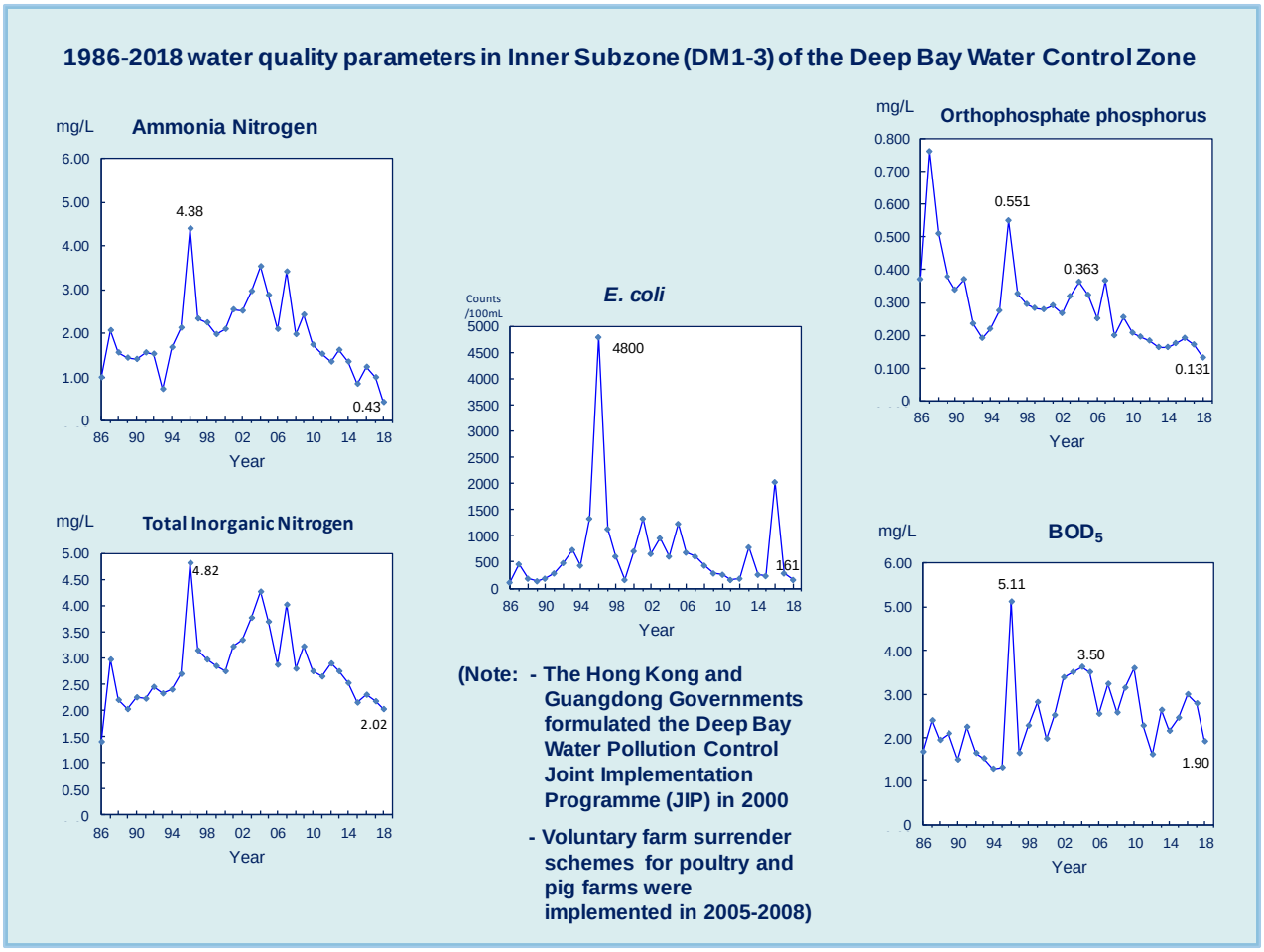


Figure 21. Long-term trends of water quality in Inner Subzone of the Deep Bay Water Control Zone, 1986-2018

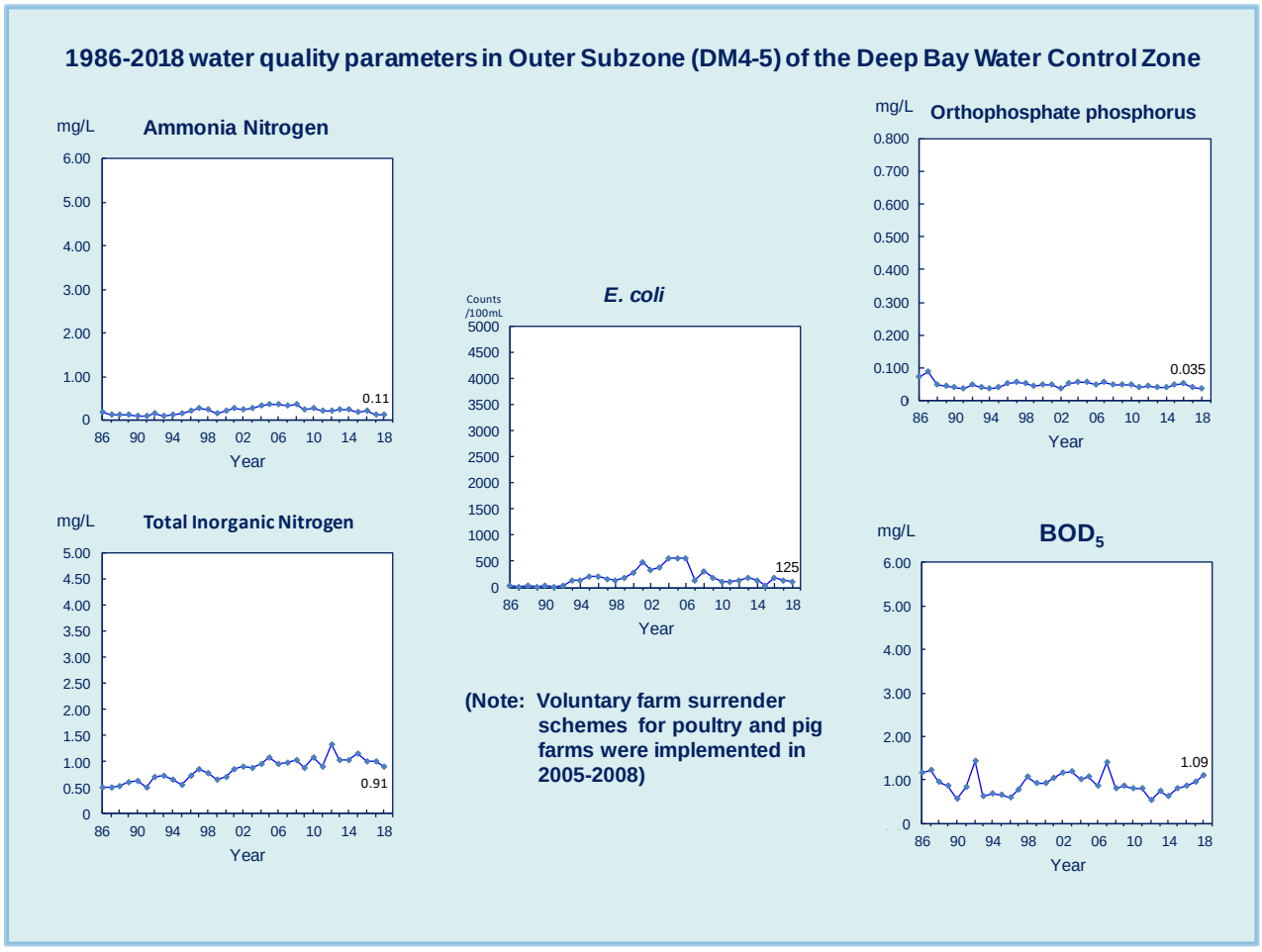


Figure 22. Long-term trends of water quality in the Outer Subzone of the Deep Bay Water Control Zone, 1986-2018

Oyster culture rafts in the Outer Subzone of the Deep Bay Water Control Zone

North Western Water Control Zone

In 2018, the North Western WCZ attained an overall WQO compliance rate of 89%, improved from 72% in both 2017 and 2016. Compliance with the NH_3-N and TIN objectives in this WCZ was 100% and 67%, respectively. The relatively high levels of TIN recorded at the six monitoring stations in the WCZ in 2018 were likely attributed to the higher background level of the Pearl River, and some local discharges and surface run-off from both the Northwest New Territories and North Lantau.

Chinese white dolphin in the North Western Water Control Zone

The WQO compliance rate and long-term trends of some key water quality parameters for the North Western Water WCZ are illustrated in the Figure 23 – 24.

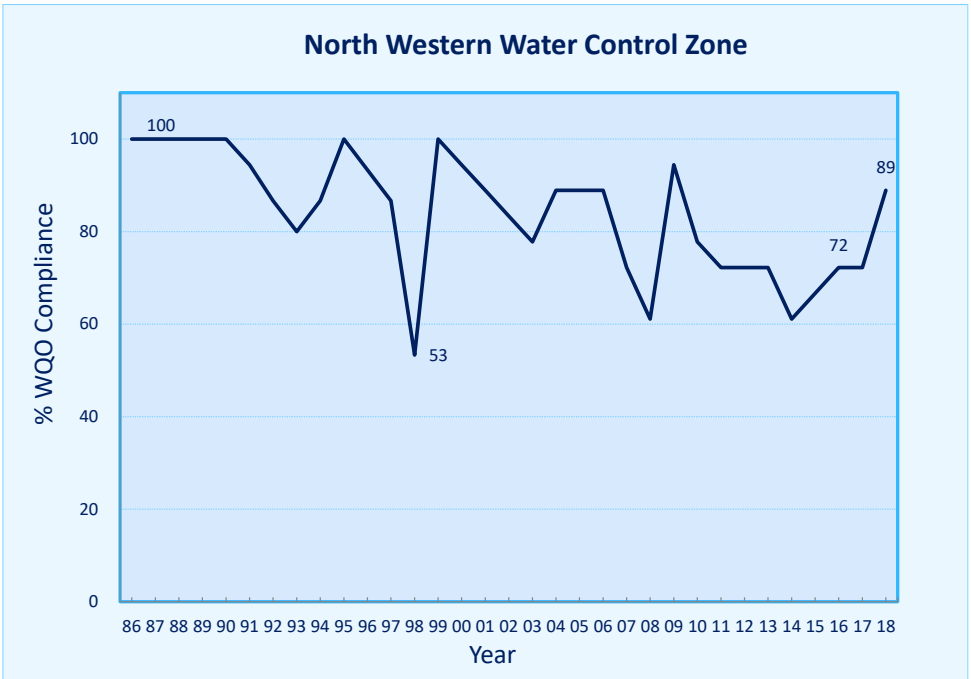


Figure 23. Overall compliance with the WQOs in the North Western Water Control Zone, 1986-2018

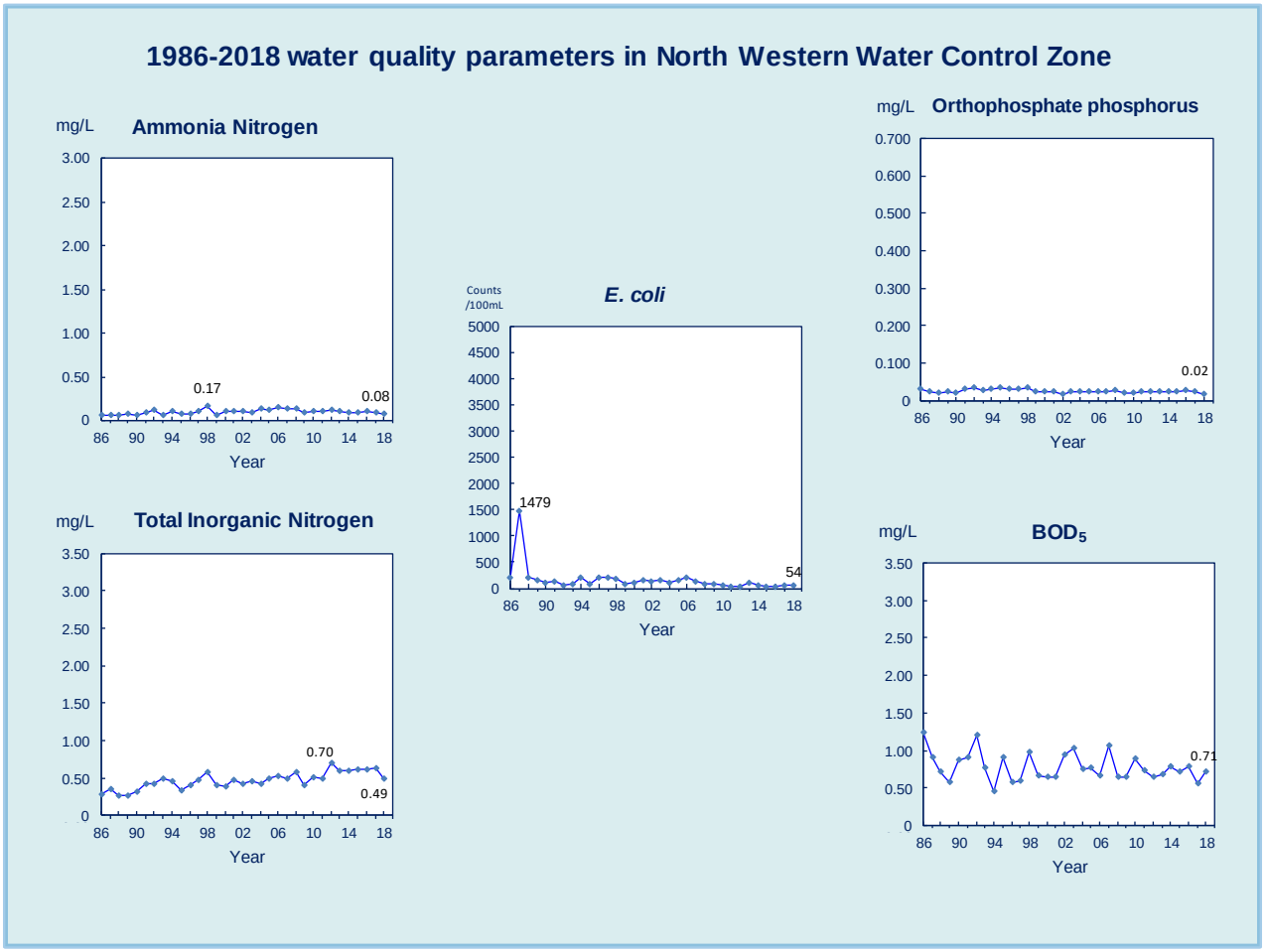
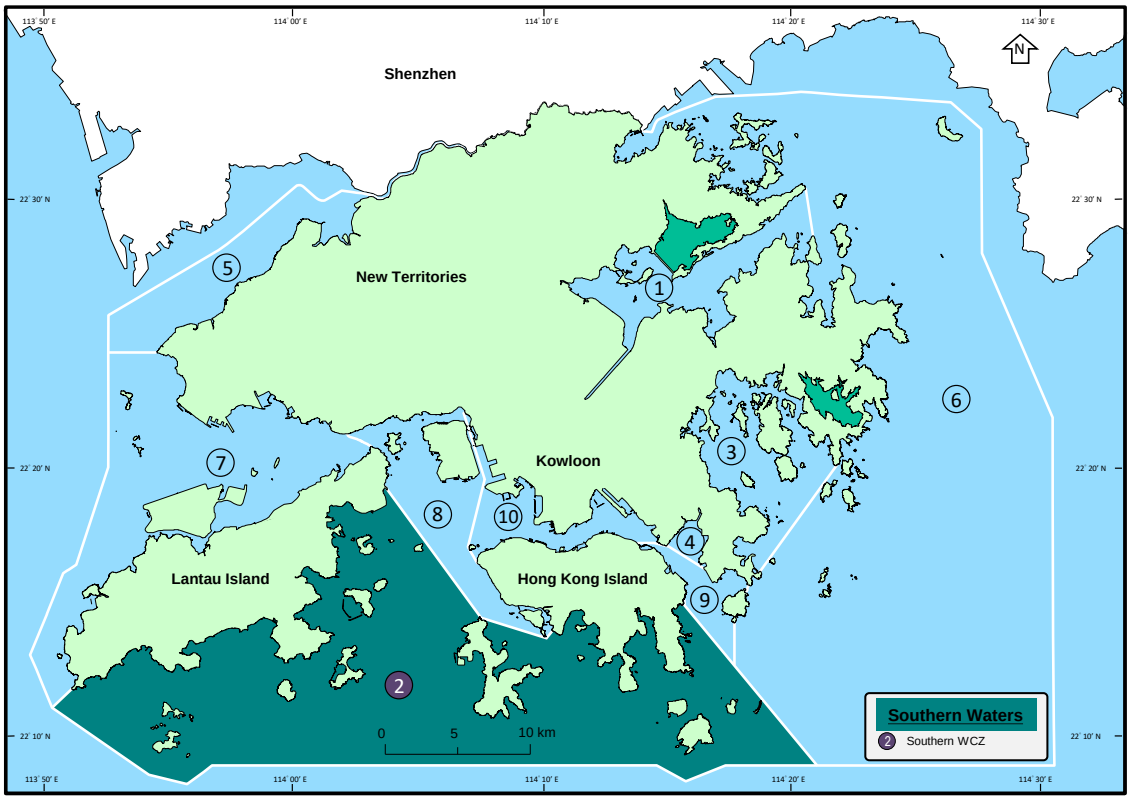


Figure 24. Long-term trends of water quality in the North Western Water Control Zone, 1986-2018

3.4 Southern Waters



The southern waters consist of only one WCZ - the Southern WCZ. It stretches from south of Hong Kong Island to Lantau Island, facing the South China Sea. The western and central parts of the WCZ are affected seasonally by the Pearl River and the effect diminishes gradually towards the east.

Southern Water Control Zone

The Southern WCZ has attained an overall 73% compliance with the WQOs in 2018. All 16 stations in the WCZ fully complied with the DO and NH_3-N WQOs. Due to the combined effect of Pearl River and the South China Sea, most of the stations at south Lantau waters and to the south of the Hong Kong Island continued to have non-compliance of the TIN WQO in 2018.

Lamma Island in the Southern Water Control Zone

The Southern WCZ also covers a number of secondary contact recreation subzones which are mainly located along the southern coast of Hong Kong Island and the outlying islands. In 2018, full compliance (100%) with the *E. coli* WQO was attained in all secondary contact recreation subzones. The WQO compliance rates and long-term trends of some key water quality parameters for the Southern WCZ are illustrated in Figure 25 – 26.

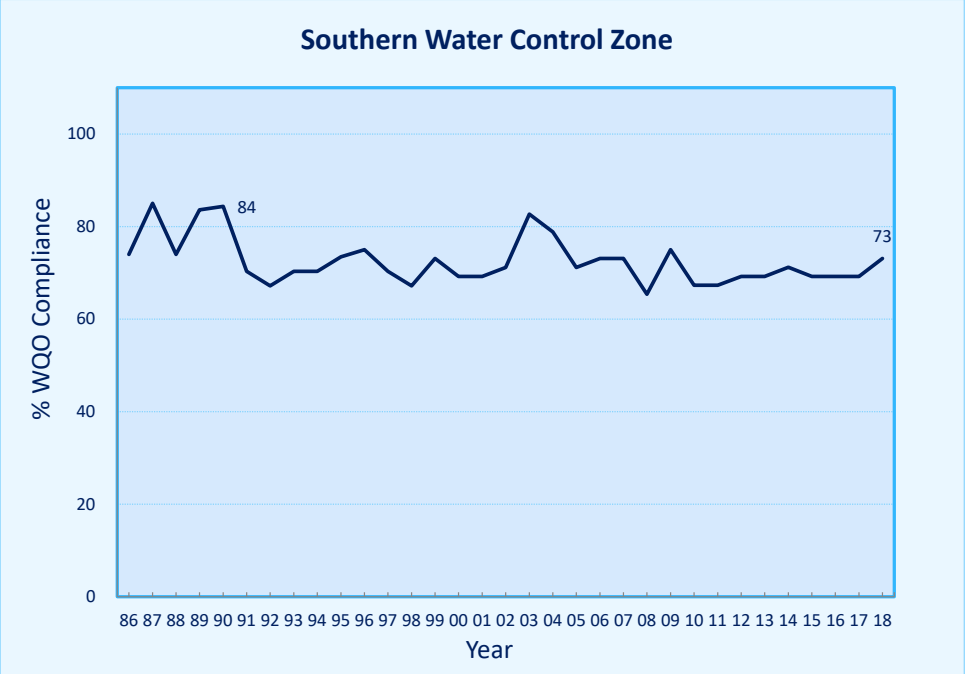


Figure 25. Overall compliance with the WQOs in the Southern Water Control Zone, 1986-2018

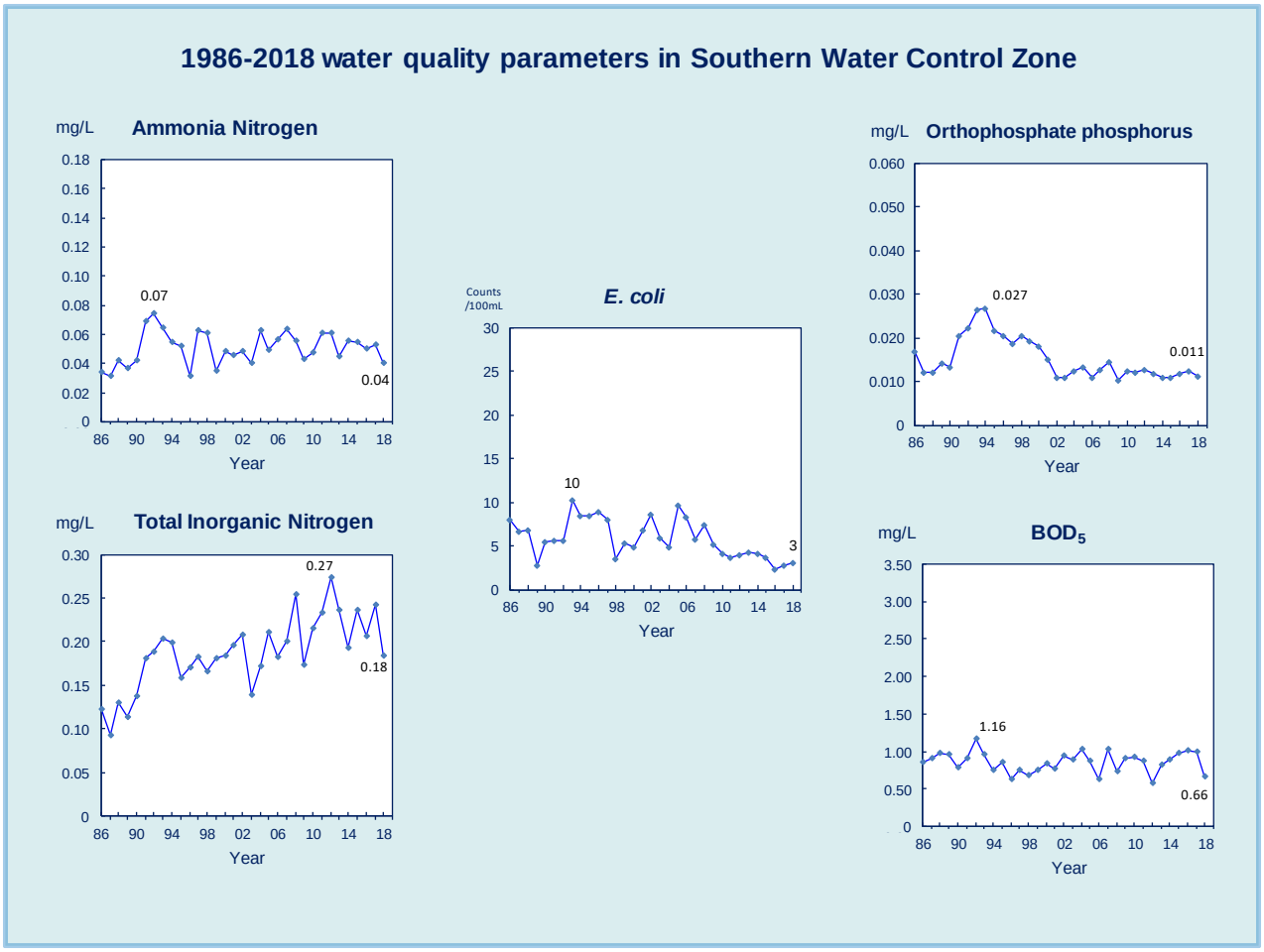


Figure 26. Long-term trends of water quality in the Southern Water Control Zone, 1986-2018

4. Sediment Quality

In addition to water quality parameters, the marine environment can be assessed through the quality of sediments since they are the ultimate sink of many pollutants. The quality of marine sediments can, therefore, reflect the historical and long-term health of the marine environment.

The EPD analyses sediment samples taken in different parts of Hong Kong for over 60 physical, chemical and biological parameters. Due to industrial pollution discharges in 1960s to 1980s before systematic pollution control was introduced, elevated levels of some heavy metals, in particular copper and silver, and some trace organic pollutants, could be detected in the sediments in Victoria Harbour and Tsuen Wan Bay in the past. Through EPD's efforts over the years in enforcing relevant pollution control ordinances, i.e. the Water Pollution Control Ordinance and Waste Disposal Ordinance, and removing various industrial pollution sources, the level of these pollutants in the marine sediments had gradually decreased. As an example, Figure 27 illustrates the decreasing pattern of silver in the marine sediments of the Victoria Harbour WCZ since 1997.

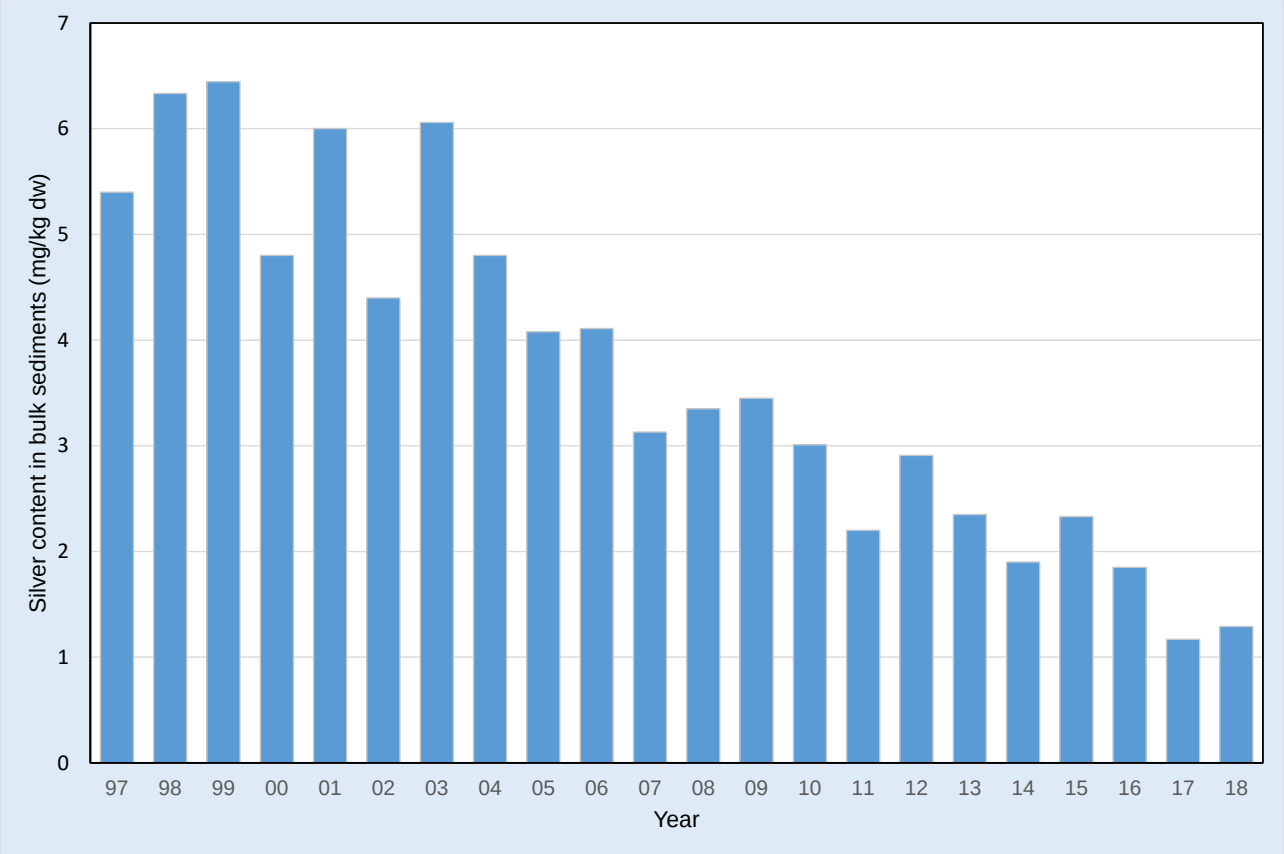


Figure 27. Levels of annual averaged silver content in bulk sediments of the Victoria Harbour WCZ in 1997-2018

5. Typhoon Shelters

Typhoon shelters in Hong Kong provide protection for small to medium vessels against strong winds and rough sea conditions, particularly during the typhoon season. For this reason, typhoon shelters are often located in semi-enclosed water bodies. Since typhoon shelters are designed with breakwaters, the water circulation between the typhoon shelters and open waters is restricted, and consequently more vulnerable to pollution impact from both land-based sources through the storm drain outlets and discharges from vessels moored at the typhoon shelters.

In 2018, the EPD monitored the water quality of 14 typhoon shelters, as well as three sheltered anchorages and the Government Dockyard. Some of these typhoon shelters are located adjacent to populated residential and/or industrial areas, e.g. Causeway Bay Typhoon Shelter and Kwun Tong Typhoon Shelter. Others are located in outlying islands or far away from the urban areas, e.g. Cheung Chau Typhoon Shelter and Shuen Wan Typhoon Shelter. The status of compliance with the WQOs for stations in typhoon shelters was checked mainly with the DO, the TIN and the NH_3-N WQOs. The NH_3-N WQO of these water bodies could be fully complied with in 2018. There is no bacteriological WQO for typhoon shelters since their beneficial uses are mainly for vessel mooring.

Due to restricted water circulation, and their proximity to densely populated areas and/or high utilisation by marine vessels, most typhoon shelters in urban areas, as well as a few at remote sites like Cheung Chau, Hei Ling Chau and Habe Haven cannot comply with the DO and/or the TIN WQOs. Nevertheless, the water quality of all typhoon shelters in Hong Kong as a whole was improving in general during the last decade. Figure 28 shows the long-term improving trend of the depth-averaged/ bottom DO level at Kwun Tong Typhoon Shelter.

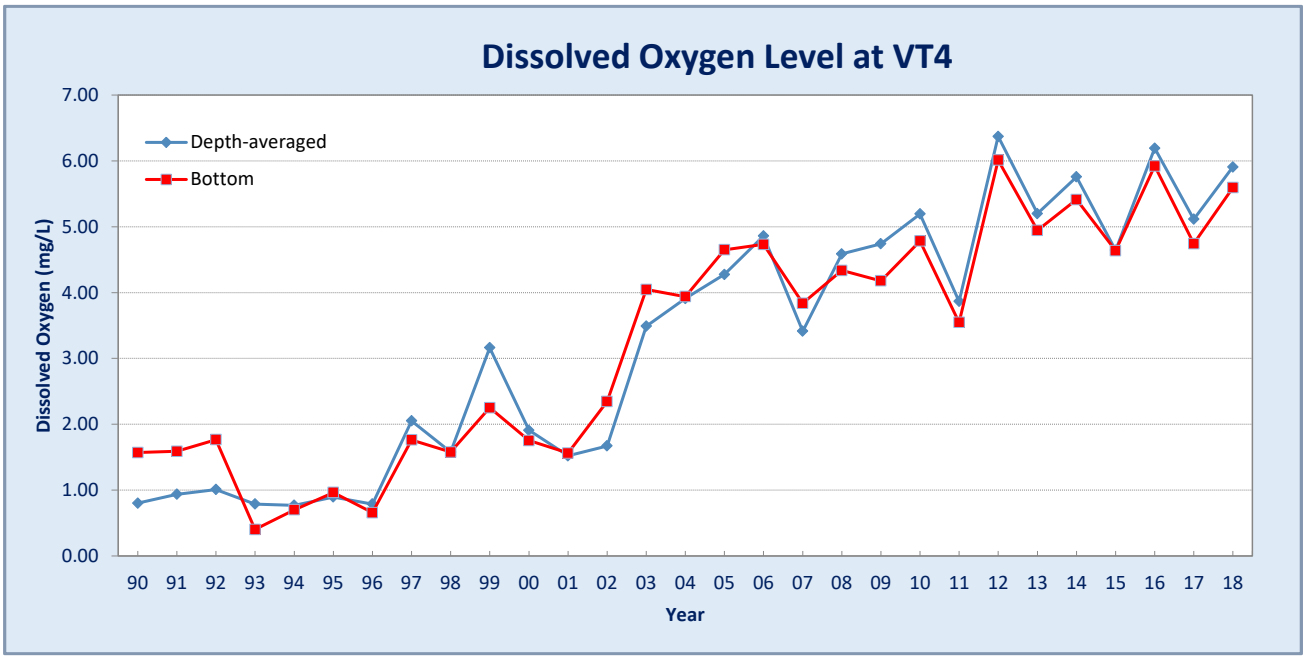


Figure 28. The long-term improvement of the dissolved oxygen level at the Kwun Tong Typhoon Shelter (VT4), 1990-2018

6. Phytoplankton and Red Tides

Phytoplankton is a vast, highly diversified group of tiny plants that lives in the surface layer of the aquatic environment. Like terrestrial plants, majority of them carry out photosynthesis and require sunlight, carbon dioxide, minerals and nutrients for their growth. Phytoplankton plays a vital role in ecosystems, particularly in aquatic environment as key primary producer to produce oxygen and serve as food for many aquatic lives ranging from tiny zooplankton to large fish. Under favourable conditions (including nutrients level, water temperature, sunlight, water current and wind speed), phytoplankton can proliferate quickly and discolour the waters with their pigment, leading to a natural phenomenon commonly known as "red tide". Most red tides have no harmful impacts to the marine community, while a few species could be hazardous due to certain attributes (e.g., tiny spines on the cell wall which may irritate fish gills; producing mucus that may clog fish gills; or producing toxin) and scale of bloom (e.g., excessive growth of algal biomass can lower the dissolved oxygen level in the water column during its decomposition). Those blooms that can cause harm to aquatic animals, human or local ecology are regarded as "harmful algal blooms (HABs)".

The EPD conducts monthly monitoring of phytoplankton at 26 stations to determine the changes and trends in their composition and densities in Hong Kong open marine waters. A total of 93 phytoplankton species was recorded in Hong Kong waters in 2018. Of these, 50 were diatoms (54%), 30 were dinoflagellates (32%) and 13 were from other seven minor algal groups[1] (14%). As in previous years, diatom was the dominant group in all WCZs both in terms of species richness (number of species) and population (cell density). The most abundant diatoms were *Chaetoceros* spp. which constituted 11-52% of the diatom population in the WCZs. The most abundant dinoflagellates were *Gymnodinium* spp. comprising 34-74% of the dinoflagellate populations in Hong Kong. In 2018, the total phytoplankton densities were generally higher at the stations in the Tolo Harbour and Channel WCZ and the Southern WCZ. The densities of diatoms, dinoflagellates and other minor phytoplankton groups largely followed the similar pattern with the total phytoplankton density.

In Hong Kong, red tides occur throughout the year and generally peak during the spring months. They are also more common in semi-enclosed bays (e.g., Tolo Harbour) with low turbidity and water exchange rate. In 2018, the total number of red tide incidents reported in Hong Kong

[1] Phytoplankton can be classified into different groups based on their morphological characteristics, photosynthetic pigments and nutrition modes. In this report, phytoplankton other than the two major groups, i.e., diatoms and dinoflagellates, are collectively regarded as other minor phytoplankton groups to facilitate the data presentation.

waters was 12, as compared with 15 incidents in 2017. Of these, 11 incidents involved only one WCZ and one incident involved two WCZs. The 12 red tide incidents in 2018 were caused by seven red tide species. Except *Takayama tuberculate*, *Cyclotella choctawhatcheeana* and *Prorocentrum balticum* which are less common, the other four are commonly found non-toxic species in Hong Kong waters. No fish kill was recorded in Hong Kong waters in 2018. The following table shows the details of red tide incidents of 2018.

Incident No.	Sighting Period	Red Tide Species
1	9/2/2018 - 12/2/2018	*Mesodinium rubrum*
2	5/3/2018	*Noctiluca scintillans*
3	20/3/2018 - 3/4/2018	*Noctiluca scintillans*
4	27/3/2018 - 3/4/2018	*Akashiwo sanguinea*
5	17/4/2018 - 17/5/2018	*Takayama tuberculata*
6	24/4/2018 - 17/5/2018	*Scrippsiella trochoidea* *Takayama tuberculata*
7	25/4/2018	*Noctiluca scintillans*
8	12/5/2018	*Noctiluca scintillans*
9	1/6/2018 - 10/6/2018	*Takayama tuberculata*
10	1/8/2018 - 16/8/2018	*Scrippsiella trochoidea*
11	4/9/2018 - 6/9/2018	*Cyclotella choctawhatcheeana*
12	30/11/2018 - 4/12/2018	*Prorocentrum balticum*

Red tide incidents in 2018 (Source: Agriculture, Fisheries and Conservation Department)

Historically, Tolo Harbour had the highest frequency of red tide incidents. Following the implementation of the "Tolo Harbour Action Plan" in mid-1980s, there has been a steady improvement in water quality in Tolo Harbour in the past decades. The nutrient (i.e., nitrogen and phosphorus) levels have greatly reduced and the number of red tide incidents in Tolo Harbour has also dropped significantly from the record high of 43 in 1988 to an annual average of about only five incidents for the past ten years (2008-2017). Figure 29 illustrates the reductions of key nutrient parameters as well as the average annual occurrences of red tides in the Tolo Harbour.

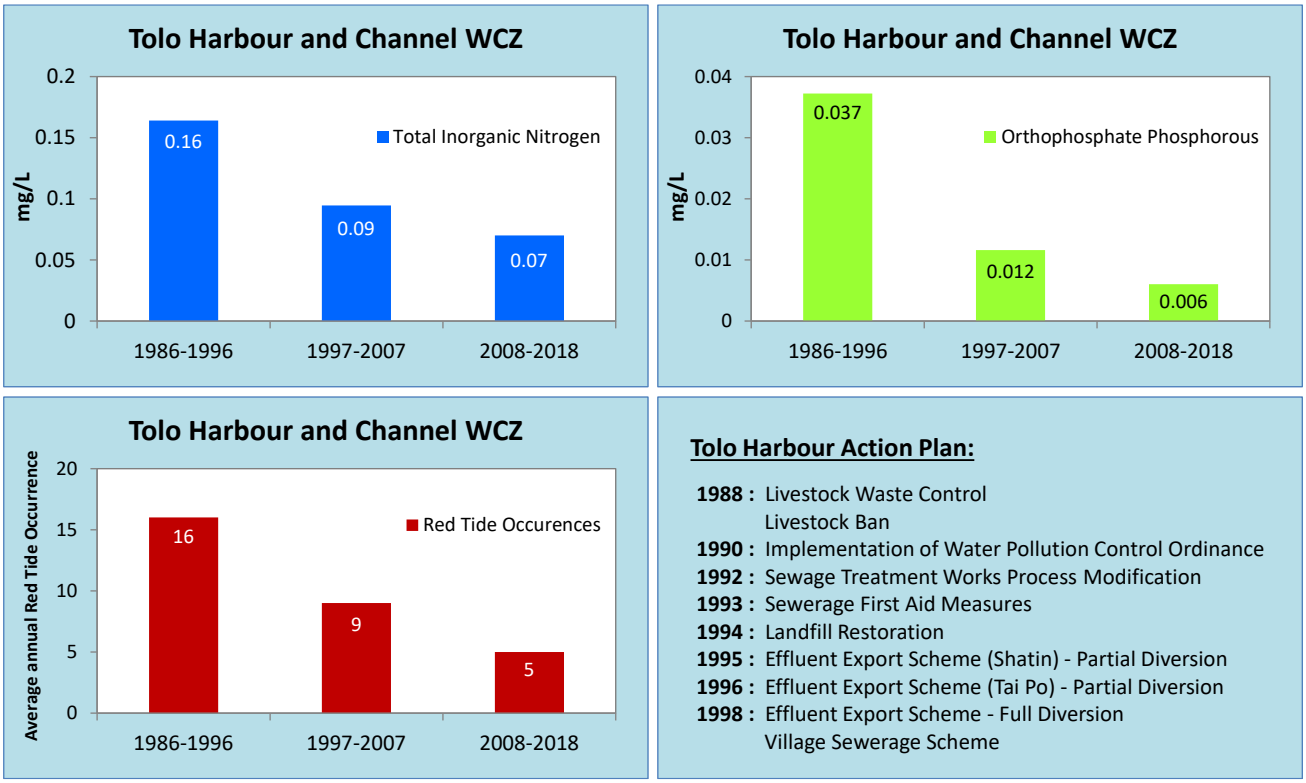
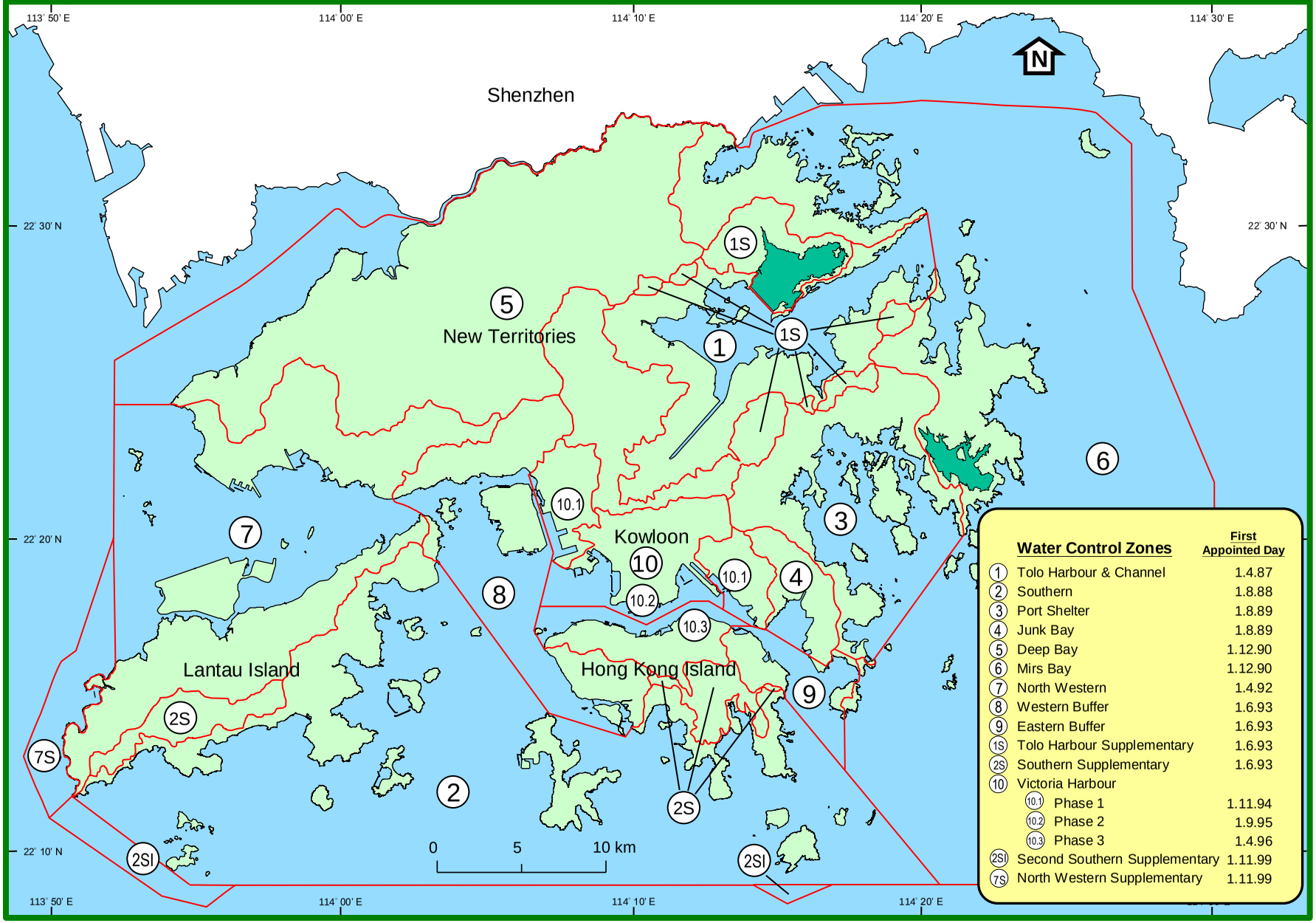


Figure 29. Reductions of total inorganic nitrogen and orthophosphate phosphorus levels with the average annual red tide occurrences in the Tolo Harbour and Channel WCZ, 1986-2018

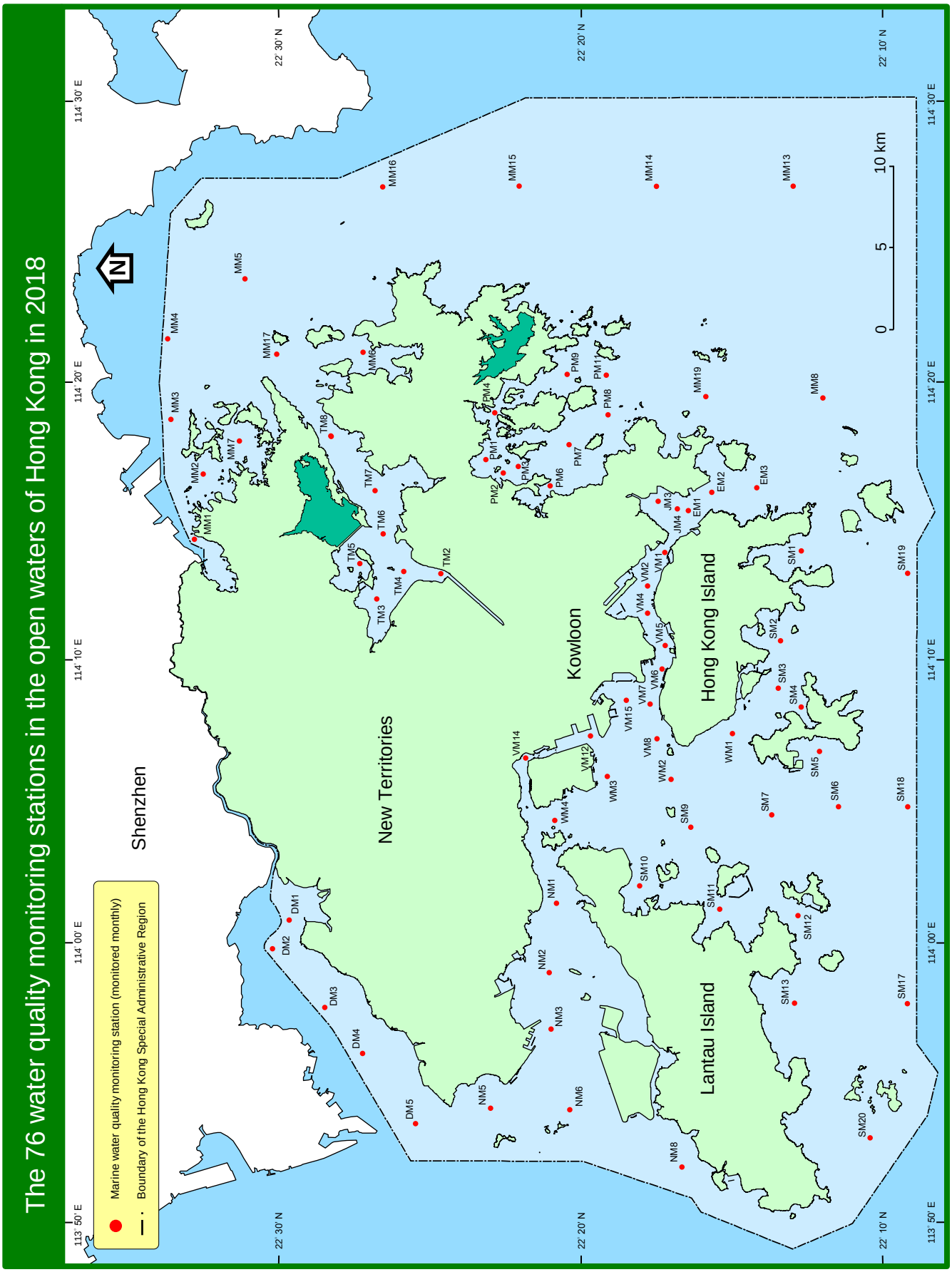
Appendices

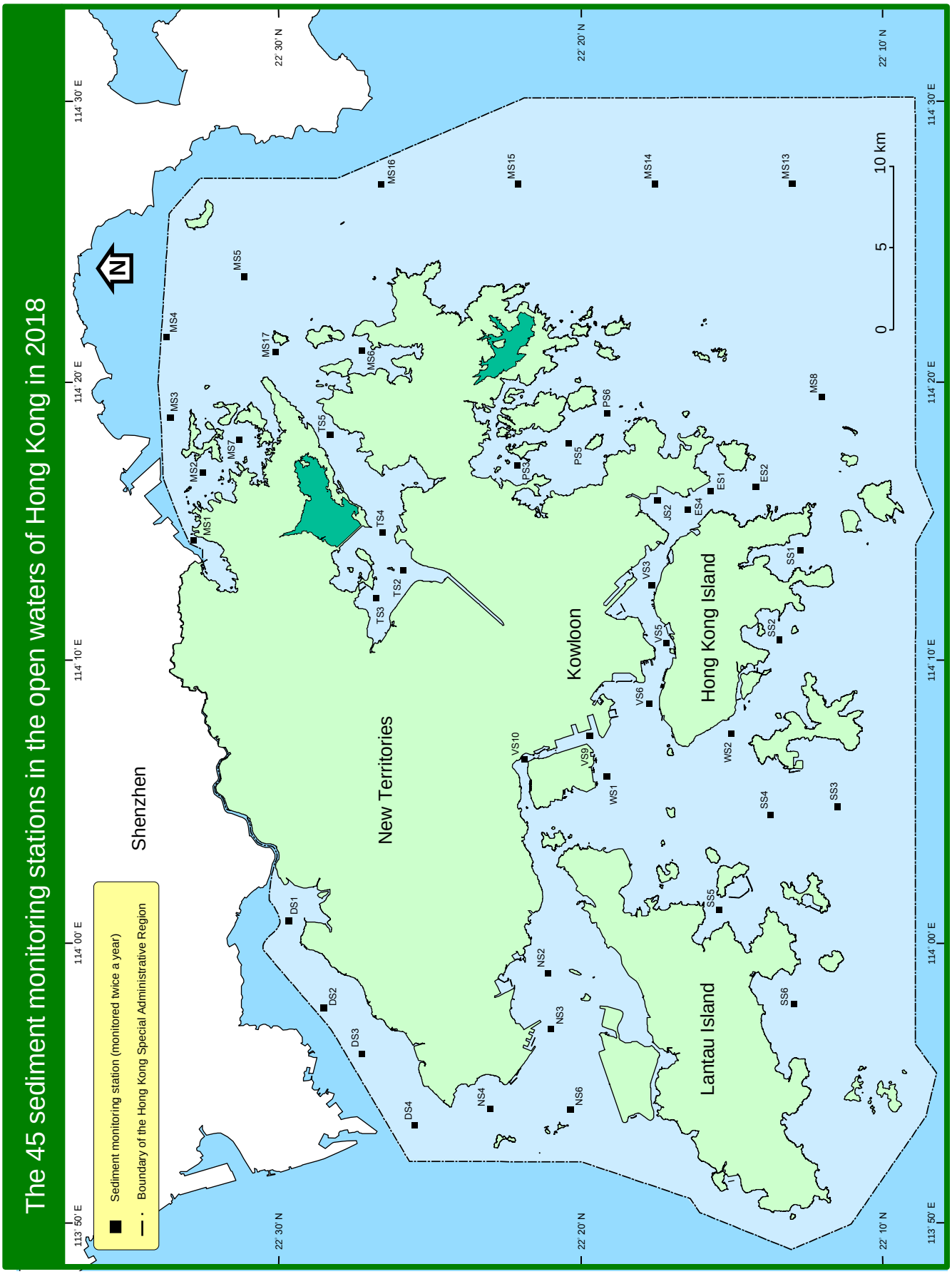
The Water Control Zones in Hong Kong

(Source: Environment Bureau– Plan No. WP/WP4/75, Oct 1999)

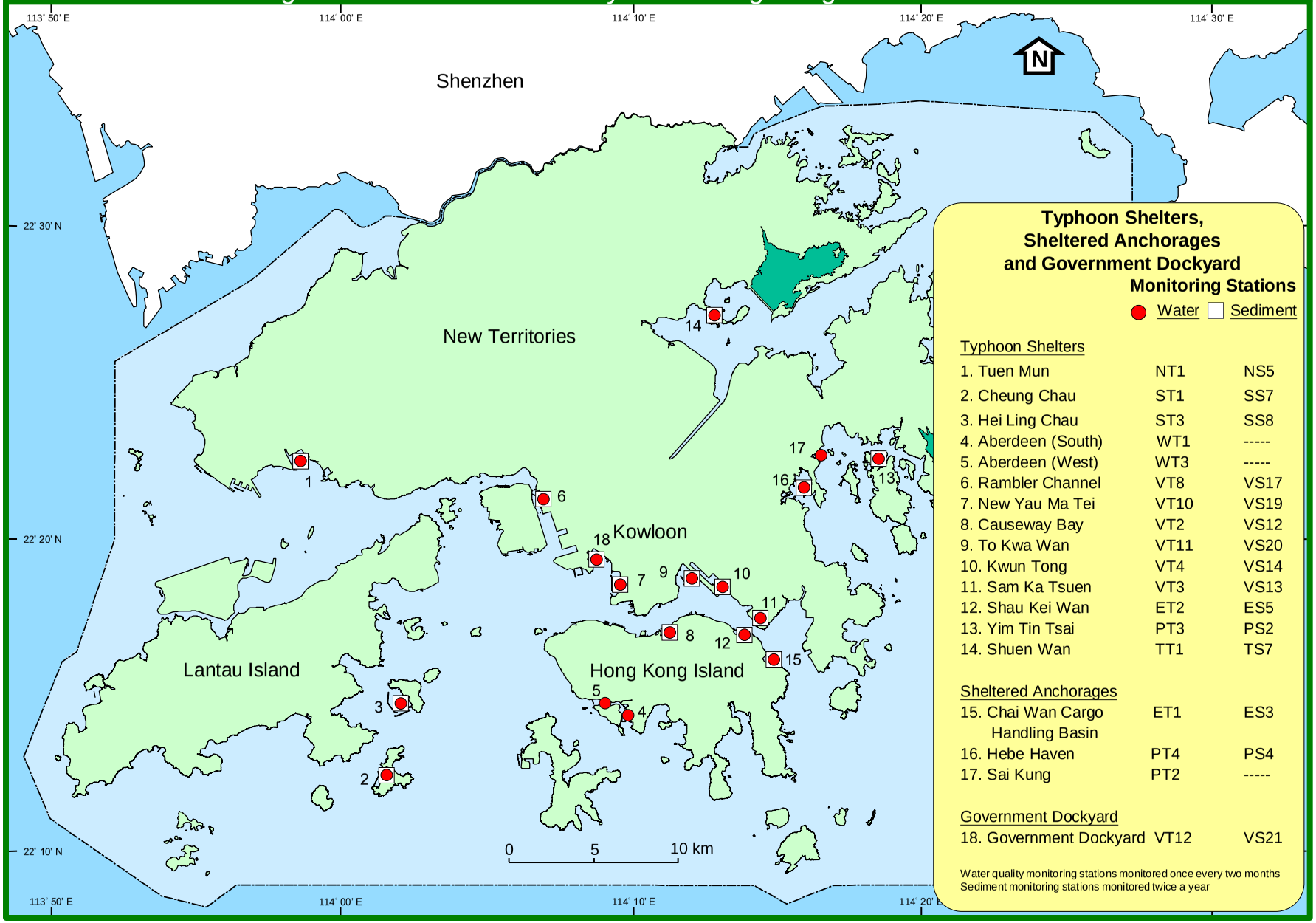


Water Control Zones		First Appointed Day
1	Tolo Harbour & Channel	1.4.87
2	Southern	1.8.88
3	Port Shelter	1.8.89
4	Junk Bay	1.8.89
5	Deep Bay	1.12.90
6	Mirs Bay	1.12.90
7	North Western	1.4.92
8	Western Buffer	1.6.93
9	Eastern Buffer	1.6.93
1S	Tolo Harbour Supplementary	1.6.93
2S	Southern Supplementary	1.6.93
10	Victoria Harbour	
10.1	Phase 1	1.11.94
10.2	Phase 2	1.9.95
10.3	Phase 3	1.4.96
2SI	Second Southern Supplementary	1.11.99
7S	North Western Supplementary	1.11.99


The 76 water quality monitoring stations in the open waters of Hong Kong in 2018
Marine water quality monitoring station (monitored monthly)
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
N
0
5
10 km
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N


The 45 sediment monitoring stations in the open waters of Hong Kong in 2018
Sediment monitoring station (monitored twice a year)
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
N
0
5
10 km
MS1
MS2
MS3
MS4
MS5
MS6
MS7
MS8
MS13
MS14
MS15
MS16
MS17
TS1
TS2
TS3
TS4
TS5
PS3
PS5
PS6
ES1
ES2
ES4
JS2
VS3
VS5
VS6
VS9
VS10
WS1
WS2
SS1
SS2
SS3
SS4
SS5
SS6
DS1
DS2
DS3
DS4
NS2
NS3
NS4
NS6
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N

The 18 water quality monitoring stations and 15 sediment monitoring stations in the typhoon shelters, sheltered anchorages and Government Dockyard of Hong Kong in 2018



Typhoon Shelters, Sheltered Anchorages and Government Dockyard Monitoring Stations

● Water ☐ Sediment

Typhoon Shelters		
1. Tuen Mun	NT1	NS5
2. Cheung Chau	ST1	SS7
3. Hei Ling Chau	ST3	SS8
4. Aberdeen (South)	WT1	-----
5. Aberdeen (West)	WT3	-----
6. Rambler Channel	VT8	VS17
7. New Yau Ma Tei	VT10	VS19
8. Causeway Bay	VT2	VS12
9. To Kwa Wan	VT11	VS20
10. Kwun Tong	VT4	VS14
11. Sam Ka Tsuen	VT3	VS13
12. Shau Kei Wan	ET2	ES5
13. Yim Tin Tsai	PT3	PS2
14. Shuen Wan	TT1	TS7
Sheltered Anchorages		
15. Chai Wan Cargo Handling Basin	ET1	ES3
16. Hebe Haven	PT4	PS4
17. Sai Kung	PT2	-----
Government Dockyard		
18. Government Dockyard	VT12	VS21

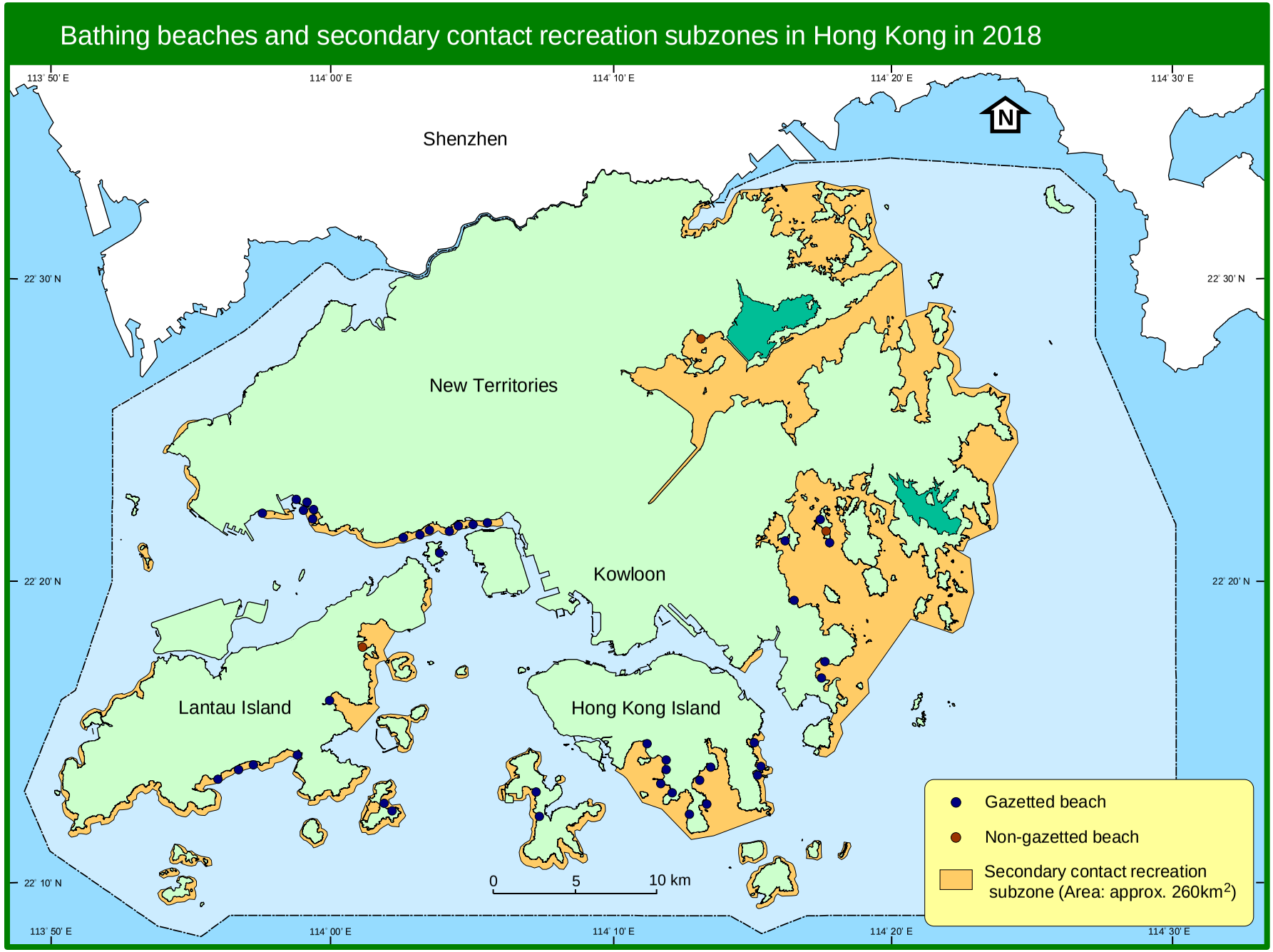
Water quality monitoring stations monitored once every two months
Sediment monitoring stations monitored twice a year

Location of marine water and sediment monitoring stations

Water Control Zone	Station		Location		Depth (m) approx.
	Water	Sediment	Latitude	Longitude	
Tolo Harbour and Channel	TM2		22° 24.744' N	114° 13.085' E	4
	TM3	TS3	22° 26.857' N	114° 12.181' E	7
	TM4	TS2	22° 25.964' N	114° 13.176' E	8
	TM5		22° 27.426' N	114° 13.456' E	4
	TM6	TS4	22° 26.631' N	114° 14.506' E	12
	TM7		22° 26.907' N	114° 16.057' E	11
	TM8	TS5	22° 28.392' N	114° 18.003' E	22
	* TT1	* TS7	22° 27.270' N	114° 12.717' E	6
Southern	SM1	SS1	22° 12.738' N	114° 13.885' E	14
	SM2	SS2	22° 13.447' N	114° 10.691' E	14
	SM3		22° 13.527' N	114° 8.980' E	33
	SM4		22° 12.758' N	114° 8.315' E	11
	SM5		22° 12.141' N	114° 6.728' E	8
	SM6	SS3	22° 11.500' N	114° 4.743' E	14
	SM7	SS4	22° 13.740' N	114° 4.473' E	8
	SM9		22° 16.420' N	114° 4.024' E	8
	SM10		22° 18.125' N	114° 1.919' E	5
	SM11	SS5	22° 15.443' N	114° 1.078' E	8
	SM12		22° 12.861' N	114° 0.869' E	7
	SM13	SS6	22° 12.957' N	113° 57.724' E	6
	SM17		22° 9.211' N	113° 57.727' E	12
	SM18		22° 9.211' N	114° 4.746' E	21
	SM19		22° 9.211' N	114° 13.077' E	24
	SM20		22° 10.448' N	113° 52.932' E	7
	* ST1	* SS7	22° 12.517' N	114° 1.493' E	5
	* ST3	* SS8	22° 14.734' N	114° 1.928' E	6
Port Shelter	PM1		22° 23.242' N	114° 17.145' E	6
	PM2		22° 22.643' N	114° 16.687' E	8
	PM3	PS3	22° 22.156' N	114° 16.910' E	13
	PM4		22° 22.940' N	114° 18.819' E	6
	PM6		22° 21.102' N	114° 16.213' E	11
	PM7	PS5	22° 20.453' N	114° 17.703' E	17
	PM8	PS6	22° 19.168' N	114° 18.745' E	20
	PM9		22° 20.529' N	114° 20.196' E	15
	PM11		22° 19.240' N	114° 20.163' E	21
	* PT2		22° 22.798' N	114° 16.540' E	3
	* PT3	* PS2	22° 22.790' N	114° 18.400' E	6
	* PT4	* PS4	22° 21.728' N	114° 15.879' E	5
Junk Bay	JM3	JS2	22° 17.490' N	114° 15.657' E	10
	JM4		22° 16.873' N	114° 15.378' E	16
Deep Bay	DM1	DS1	22° 29.769' N	114° 0.644' E	2
	DM2		22° 30.454' N	113° 59.549' E	2
	DM3	DS2	22° 28.600' N	113° 57.551' E	3
	DM4	DS3	22° 27.335' N	113° 55.937' E	4
	DM5	DS4	22° 25.561' N	113° 53.388' E	8
North Western	NM1		22° 20.877' N	114° 1.286' E	34
	NM2	NS2	22° 21.130' N	113° 58.815' E	11
	NM3	NS3	22° 20.783' N	113° 56.783' E	14
	NM5	NS4	22° 23.051' N	113° 53.972' E	20
	NM6	NS6	22° 20.366' N	113° 53.908' E	8
	NM8		22° 16.695' N	113° 51.886' E	8
	* NT1	* NS5	22° 22.475' N	113° 58.353' E	4
Mirs Bay	MM1	MS1	22° 32.984' N	114° 14.271' E	6
	MM2	MS2	22° 32.626' N	114° 16.648' E	11
	MM3	MS3	22° 33.714' N	114° 18.615' E	16
	MM4	MS4	22° 33.817' N	114° 21.483' E	18
	MM5	MS5	22° 31.233' N	114° 23.633' E	20
	MM6	MS6	22° 27.334' N	114° 20.997' E	12
	MM7	MS7	22° 31.409' N	114° 17.824' E	13
	MM8	MS8	22° 12.021' N	114° 19.345' E	31
	MM13	MS13	22° 13.000' N	114° 26.920' E	28
	MM14	MS14	22° 17.560' N	114° 26.920' E	25
	MM15	MS15	22° 22.120' N	114° 26.920' E	24
	MM16	MS16	22° 26.670' N	114° 26.920' E	22
	MM17	MS17	22° 30.192' N	114° 20.960' E	17
	MM19		22° 15.921' N	114° 19.411' E	28
Western Buffer	WM1	WS2	22° 15.044' N	114° 7.363' E	35
	WM2		22° 17.074' N	114° 5.730' E	13
	WM3	WS1	22° 19.203' N	114° 5.826' E	20
	WM4		22° 20.940' N	114° 4.256' E	26
	* WT1		22° 14.494' N	114° 9.737' E	7
	* WT3		22° 14.811' N	114° 8.918' E	10
Eastern Buffer	EM1	ES4	22° 16.506' N	114° 15.335' E	16
	EM2	ES1	22° 15.732' N	114° 15.971' E	21
	EM3	ES2	22° 14.237' N	114° 16.144' E	21
	* ET1	* ES3	22° 16.203' N	114° 14.624' E	6
	* ET2	* ES5	22° 17.078' N	114° 13.783' E	12
Victoria Harbour	VM1		22° 17.280' N	114° 13.839' E	38
	VM2		22° 17.862' N	114° 12.619' E	12
		VS3	22° 17.631' N	114° 12.526' E	8
	VM4		22° 17.860' N	114° 11.654' E	12
	VM5		22° 17.266' N	114° 10.510' E	11
		VS5	22° 17.077' N	114° 10.600' E	8
	VM6		22° 17.371' N	114° 9.665' E	14
	VM7	VS6	22° 17.771' N	114° 8.416' E	10
	VM8		22° 17.564' N	114° 7.175' E	11
	VM12	VS9	22° 19.757' N	114° 7.278' E	14
	VM14	VS10	22° 21.935' N	114° 6.527' E	11
	VM15		22° 18.579' N	114° 8.539' E	11
	* VT2	* VS12	22° 17.194' N	114° 11.304' E	5
	* VT3	* VS13	22° 17.448' N	114° 14.250' E	5
	* VT4	* VS14	22° 18.734' N	114° 12.814' E	6
	* VT8	* VS17	22° 21.360' N	114° 6.867' E	5
	* VT10	* VS19	22° 18.590' N	114° 9.430' E	5
	* VT11	* VS20	22° 18.981' N	114° 11.814' E	6
	* VT12	* VS21	22° 19.429' N	114° 8.587' E	5

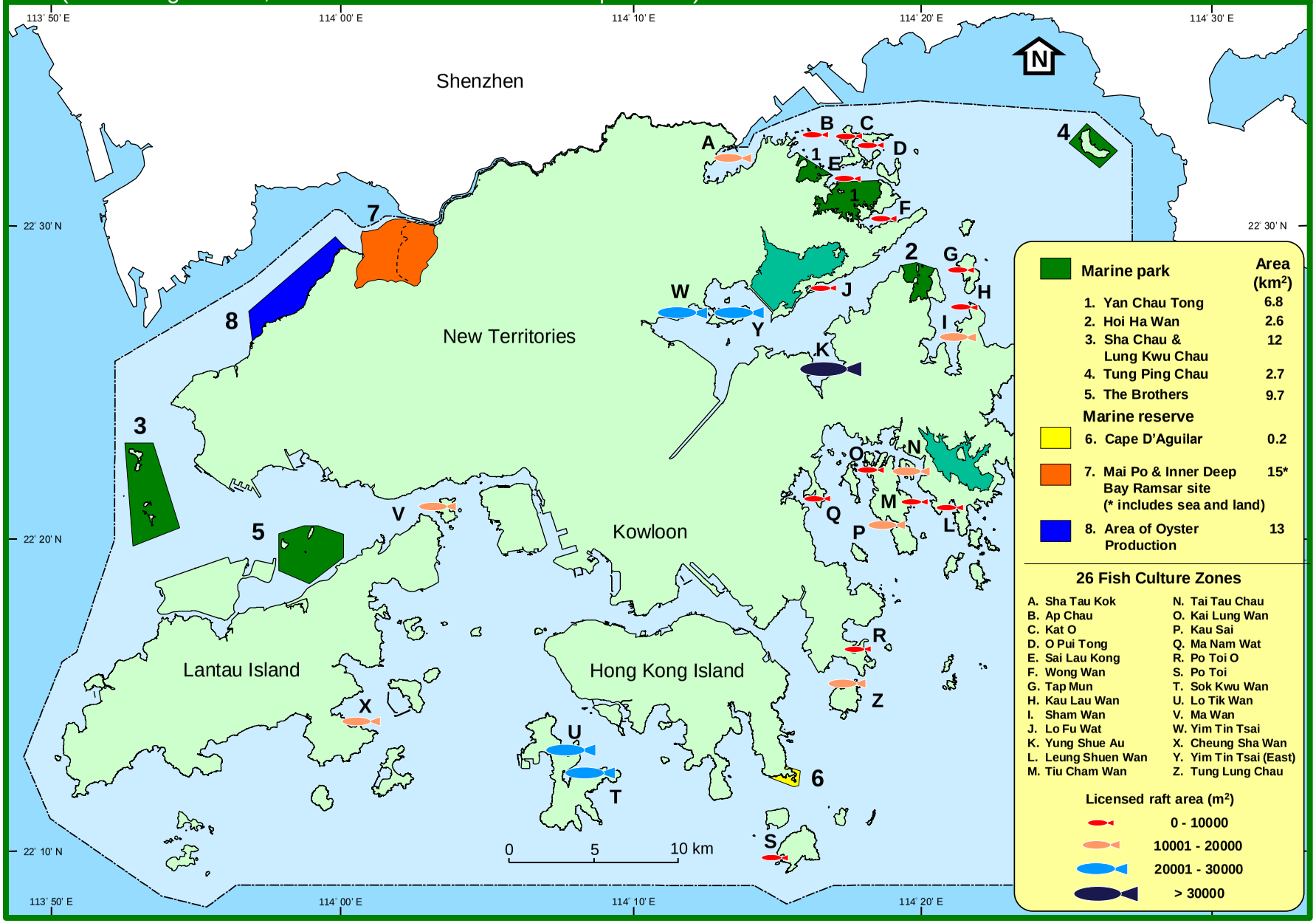
Note: 1. All locations are based on WGS84 datum

2. Water quality and sediment monitoring stations in typhoon shelters are marked with an asterisk *

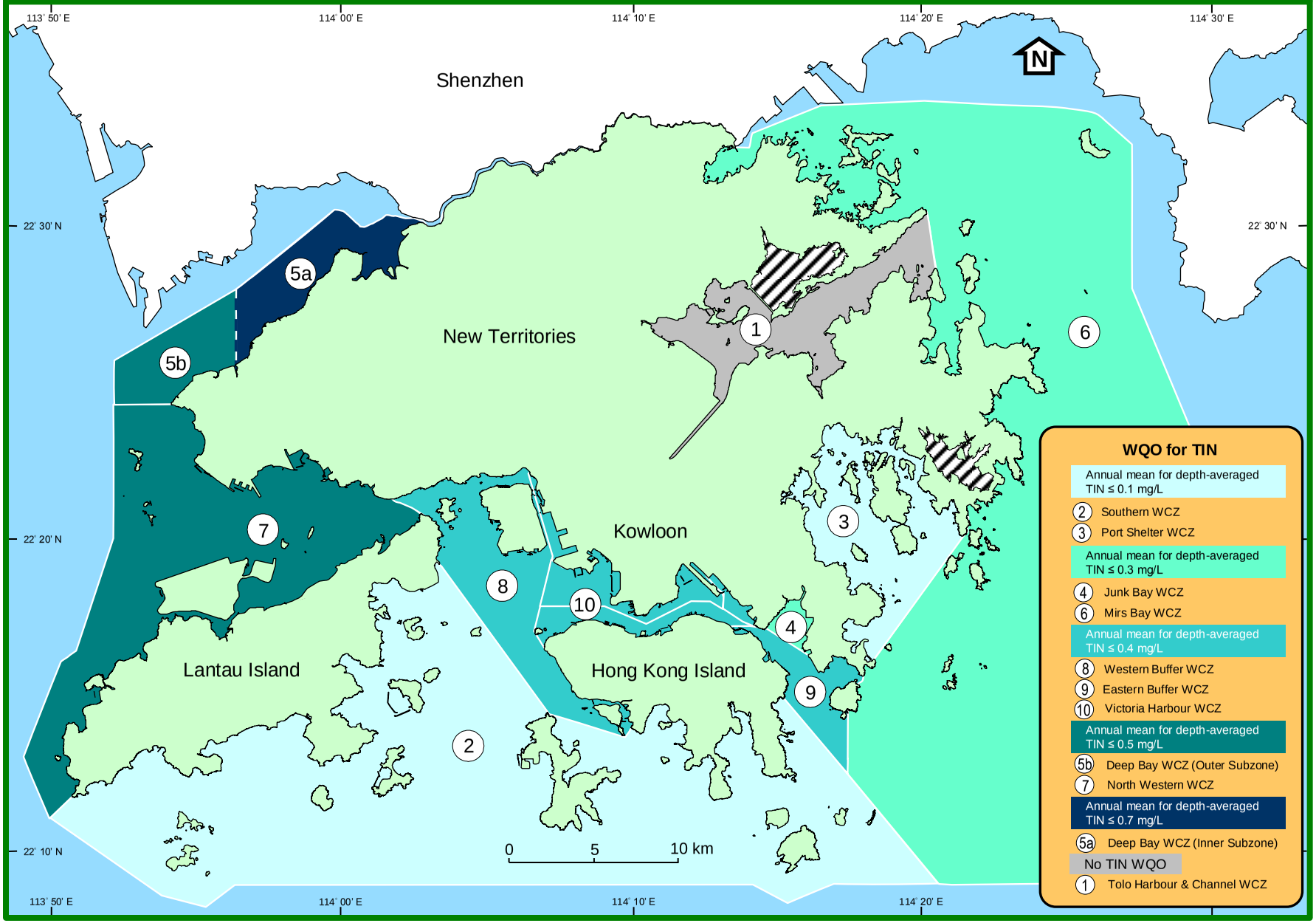

Bathing beaches and secondary contact recreation subzones in Hong Kong in 2018
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N
N
Shenzhen
New Territories
Kowloon
Lantau Island
Hong Kong Island
0
5
10 km
Gazetted beach
Non-gazetted beach
Secondary contact recreation subzone (Area: approx. 260km2)

Fish and shellfish culture zones and marine conservation sites in Hong Kong in 2018

(source: Agriculture, Fisheries and Conservation Department)



Water Quality Objective (WQO) for Total Inorganic Nitrogen (TIN) in the ten Water Control Zones



Summary of Water Quality Objectives (WQOs) for marine waters of Hong Kong

Parameter	Water Quality Objective	Water Control Zone (WCZ) / Part(s) of zone / Subzone to which the WQO applies
Aesthetic Appearance	There should be no objectionable odours or discolouration of the water. Tarry residues, floating wood, articles made of glass, plastic, rubber or of any other substances should be absent. Mineral oil should not be visible on the surface. Surfactants should not give rise to a lasting foam. There should be no recognisable sewage-derived debris. Floating, submerged and semi-submerged objects of a size likely to interfere with the free movement of vessels or cause damage to vessels should be absent. The waters should not contain substances which settle to form objectionable deposits.	All WCZs (whole zone)
Dissolved Oxygen (bottom)	Not less than 2 mg/L for 90% of samples;	Marine waters of all WCZs except Tolo Harbour & Channel WCZ
Dissolved Oxygen (Depth-averaged)	Not less than 4 mg/L for 90% of samples;	Marine waters of all WCZs except Tolo Harbour & Channel WCZ
Dissolved Oxygen (bottom)	Not less than 2 mg/L	Harbour Subzone in Tolo Harbour & Channel WCZ
	Not less than 3 mg/L	Buffer Subzone in Tolo Harbour & Channel WCZ
	Not less than 4 mg/L	Channel Subzone in Tolo Harbour & Channel WCZ
Dissolved Oxygen (surface to 2m above bottom)	Not less than 4 mg/L	Harbour Subzone and Buffer Subzone in Tolo Harbour & Channel WCZ
Dissloved Oxygen (all depths)	Not less than 4 mg/L	Channel Subzone in Tolo Harbour & Channel WCZ
Nutrients	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.1 mg/L	Marine waters of Southern WCZ and Port Shelter WCZ
	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.3 mg/L	Marine waters of Mirs Bay WCZ, Junk Bay WCZ, North Western WCZ (Castle Peak Subzone)
	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.4 mg/L	Marine waters of Eastern Buffer WCZ, Western Buffer WCZ, Victoria Harbour WCZ
	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.5 mg/L	Marine waters of Deep bay WCZ (Outer Subzone) and North Western WCZ (Whole zone except Castle Peak Subzone)
	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.7 mg/L	Marine waters of Deep Bay WCZ (Inner Subzone)
Unionised Ammonia	Annual mean not to exceed 0.021 mg/L	All WCZs (whole zone) except Tolo Harbour & Channel WCZ
E.coli	Annual geometric mean not to exceed 610 cfu/100mL	Secondary contact recreation subzones in Tolo Harbour & Channel WCZ, Southern WCZ, Port Shelter WCZ, Mirs Bay WCZ, Deep Bay WCZ, North Western WCZ, Western Buffer WCZ
	Annual geometric mean not to exceed 610 cfu/100mL	Fish culture subzones in Tolo Harbour & Channel WCZ, Southern WCZ, Port Shelter WCZ, Junk Bay WCZ, Mirs Bay WCZ, Deep Bay WCZ, Eastern Buffer WCZ, Western Buffer WCZ
pH	To be in the range 6.5 - 8.5, change due to waste discharge not to exceed 0.2	Marine waters of all WCZs except Tolo Harbour & Channel WCZ
	Change due to waste discharge not to be greater than ± 0.5	Harbour Subzone in Tolo Harbour & Channel WCZ
	Change due to waste discharge not to be greater than ± 0.3	Buffer Subzone in Tolo Harbour & Channel WCZ
	Change due to waste discharge not to be greater than ± 0.1	Channel Subzone in Tolo Harbour & Channel WCZ
Salinity	Change due to waste discharge not to exceed 10% of natural ambient level	All WCZs (Whole zone) except Tolo Harbour & Channel WCZ
	Change due to waste discharge not to be greater than ± 3ppt	Tolo Harbour & Channel WCZ
Temperature	Change due to waste discharge not to exceed 2°C	All WCZs (Whole zone) except Tolo Harbour & Channel WCZ
	Change due to waste discharge not to exceed 1°C	Tolo Harbour & Channel WCZ
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 of all WCZs except Tolo Harbour & Channel WCZ
Toxicants	Not to be present at levels producing significant toxic effect	All WCZs (Whole zone)
Chlorophyll-*a*	Not to exceed 20mg/m^3 (µg/L) calculated as running arithmetic mean of 5 daily measurements for any location and depth	Harbour Subzone in Tolo Harbour & Channel WCZ
	Not to exceed 10mg/m^3 (µg/L) calculated as running arithmetic mean of 5 daily measurements for any location and depth	Buffer Subzone in Tolo Harbour & Channel WCZ
	Not to exceed 6mg/m^3 (µg/L) calculated as running arithmetic mean of 5 daily measurements for any location and depth	Channel Subzone in Tolo Harbor & Channel WCZ

Sediment Quality Criteria for the Classification of Sediments[1]

Contaminants	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)
Metals (mg/kg dry weight)		
Cadmium (Cd)	1.5	4
Chromium (Cr)	80	160
Copper (Cu)	65	110
Mercury (Hg)	0.5	1
Nickel (Ni)[2]	40	40
Lead (Pb)	75	110
Silver (Ag)	1	2
Zinc (Zn)	200	270
Metalloid (mg/kg dry weight)		
Arsenic (As)	12	42
Organic-PAHs (µg/kg dry weight)		
Low Molecular Weight PAHs[3]	550	3160
High Molecular Weight PAHs[4]	1700	9600
Organic-non-PAHs (µg/kg dry weight)		
Total PCBs	23	180
Organometallics (mg TBT/L in Interstitial water)		
Tributyltin[2]	0.15	0.15

Note:

1. The table is extracted from Appendix A of WBTC (W) No. 34/2002 Management of Dredged / Excavated Sediment (http://www.devb-wb.gov.hk).
2. When the LCEL and UCEL for a contaminant are the same, the contaminant level is considered to have exceeded UCEL if it is greater than the value shown.
3. Low molecular weight PAHs include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene.
4. High molecular weight PAHs include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene.
5. Total PCBs include 18 congeners: PCB 8, 18, 28, 44, 52, 66, 77, 101, 105, 118, 126, 128, 138, 153, 169, 170, 180, 187.

Summary of marine water quality parameters

Parameter		Unit	Reporting Limit	Sampling Depth	Standard Method / Techniques used [20]	Analysed by
Physical and Aggregate Properties	Temperature[1]	°C	0.1	Depth Profiling[10]	Instrumental (thermistor), SEACAT19+ CTD and Water Quality Profiler	MMT/EPD[15]
	Salinity [1,8]	---	0.1	Depth Profiling	Instrumental (electrical conductivity), SEACAT19+ CTD and Water Quality Profiler	MMT/EPD
	Dissolved Oxygen[1]	mg/L % saturation [9]	0.1 1	Depth Profiling	Instrumental (membrane elelectrode), SBE23Y dissolved oxygen sensor linked to SEACAT19+ CTD and Water Quality Profiler	MMT/EPD
	Turbidity[2]	NTU	0.1	Depth Profiling	Instrumental (nephelometric / infrared back scattering), OBS-3 turbidity sensor linked to SEACAT 19+ CTD and Water Quality Profiler	MMT/EPD
	pH[1]	---	0.1	Depth Profiling	Instrumental (electrodemetric), SBE18 pH sensor linked to SEACAT19 + CTD and Water Quality Profiler	MMT/EPD
	Secchi Disc Depth[2]	m	0.1	---	Manual	MMT/EPD
	Suspended Solids[2]	mg/L	0.5	S,M,B[11]	In-house method GL-PH-23 based on APHA 22ed 2540D (weighing)	GL[18]
	Volatile Suspended Solids[3]	mg/L	0.5	S,M,B	In-house method GL-PH-23 based on APHA 22ed 2540E (weighing)	GL
Aggregate Organic Constituents	5-day Biochemical Oxygen Demand (BOD_5)[4]	mg/L	0.1	S,M,B	In-house method based on APHA 20ed 5210B	EML/EPD[16]
Nutrients and Inorganic Constituents	Ammonia Nitrogen[5]	mg/L	0.005	S,M,B	In-house method GL-IN-15 based on ASTM D3590-11 B	GL
	Unionised Ammonia[5]	mg/L	0.001	S,M,B	By calculation[12]	MMT/EPD
	Nitrite Nitrogen[5]	mg/L	0.002	S,M,B	In-house method GL-IN-18 based on APHA 22ed 4500-NO_2-B	GL
	Nitrate Nitrogen[5]	mg/L	0.002	S,M,B	In-house method GL-IN-18 based on APHA 22ed 4500-NO_3-I	GL
	Total Inorganic Nitrogen[5]	mg/L	0.01	S,M,B	By calculation[13]	MMT/EPD
	Total Kjeldahl Nitrogen[5] (soluble; soluble & particulate)	mg/L	0.05	S,M,B	In-house methods GL-IN-14 and GL-IN-15 respectively based on ASTM D3590-11 B	GL
	Total Nitrogen[5]	mg/L	0.05	S,M,B	By calculation[13]	MMT/EPD
	Orthophosphate Phosphorus[5]	mg/L	0.002	S,M,B	In-house method GL-IN-16 based on APHA 22ed 4500-P G	GL
	Total Phosphorus[5] (soluble; soluble & particulate)	mg/L	0.02	S,M,B	In-house methods GL-IN-14 and GL-IN-16 respectively based on ASTM D515-88 B (FIA)	GL
	Silica (as SiO_2) (soluble) [5]	mg/L	0.05	S,M,B	In-house method GL-IN-17 based on APHA 22ed 4500-SiO_2 F	GL
Biological and Microbiological Examination	Chlorophyll-*a*[6]	µg/L	0.2	S,M,B	In-house method GL-OR-34 based on APHA 20ed 10200H 2 (spectrophotometric)	GL
	Escherichia coli (*E. coli*)[7]	cfu/100mL	1	S,M,B	In-house method, membrane filtration with CHROMagar Liquid *E. coli*-coliform culture[14]	EML/EPD
	Faecal Coliforms[7]	cfu/100mL	1	S,M,B	In-house method, membrane filtration with CHROMagar Liquid *E. coli*-coliform culture[14]	EML/EPD
	Phytoplankton	cell/mL	1	S	In-house method, 10 ml settled sub-sample using plankton chamber and inverted microscope[19]	WSL/EPD[17]

Note:

1. Indicate general oceanographic conditions of marine water.
2. Low transparency and light penetration would affect aesthetic value and photosynthesis in marine water.
3. Indicate the amount of particulate organic matters in marine water.
4. Indicate the amount of organic pollutants in marine water.
5. Major nutrients (nitrogen, phosphorus, silica) promoting algal growth in marine water.
6. Indicate the amount of algal biomass in marine water.
7. Sewage bacteria indicate the extent of faecal pollution in marine water.
8. Measuring and reporting of Salinity (S) are based on the Practical Salinity Scale and International Equation of State of Seawater. (UNESCO Technical Papers in Marine Science No. 30 (1981) ; No. 36 (1981) and No. 45 (1985))
9. Percent saturation of dissolved oxygen is calculated from dissolved oxygen in mg/L based on Weiss R.F. (1970); The solubility of nitrogen, oxygen and argon in water and seawater. Deep Sea Res. Vol. 17, pp.721-735.
10. Depth profiling - continuous measurements at downcast are processed and presented at 1m intervals from 1m below the surface to 1m above the seabed.
11. If water depth is 6m or above, sampling is taken at three depths: S - 1m below water surface; M - mid-depth of water column; B - 1m above seabed. If water depth is 4 to 5 m, "M" is skipped; If water depth is 3m or less, "M" and "B" are skipped.
12. i) Bower C.E. and Bidwell J.P. (1978), Ionization of ammonia in seawater: Effect of temperature, pH and salinity. J. Fish. Res. Board Can. Vol.35, pp.1012-1016; ii) K., Russo R.C. & et. al. (1975), Aqueous ammonia equilibrium calculations: effect of pH and temperature. J. Fish. Res. Board Can. Vol.32, pp.2379-2383.
13. Total Inorganic Nitrogen = Ammonia Nitrogen + Nitrite Nitrogen + Nitrate Nitrogen ; Total Nitrogen = Total Kjeldahl Nitrogen (soluble & particulate) + Nitrite Nitrogen + Nitrate Nitrogen
14. i) DoE, DHSS & PHLS (1983); The Bacteriological Examination of Drinking Water Supplies 1982, Sec.7.8 & 7.9; ii) B.S.W. Ho and T.Y. Tam (1997), Enumeration of E. coli in environmental waters and wastewater using a chromogenic medium. Wat. Sci. Tech.Vol.35, No.11-12, pp.409-413; method adopted in 1997.
15. MMT/EPD - Marine Monitoring Team, Water Policy and Science Group, Environmental Protection Department.
16. EML/EPD - Environmental Microbiology Laboratory, Water Policy and Science Group, Environmental Protection Department.
17. WSL/EPD - Water Sciences Laboratory, Water Policy and Science Group, Environmental Protection Department.
18. GL - Government Laboratory.
19. i) Lund, J.H., Kipling, C. and Le Cren, E.D. 1958. The inverted microscope method of estimating algal numbers, and the statistical basis of estimations by counting. Hydrobiologia Vol. 11, pp. 143-170. ii) Utermohl, H. 1958. Zur Vervollkommung der Quantitativen Phytoplankton-Methodik. Mitt. Inter. Verein. Lim. Vol. 9, pp. 1-38.
20. Mention of brand names and commercial products does not constitute or imply endorsement or recommendation by the Environmental Protection Department.

Summary of marine sediment[1] parameters

	Parameter	Unit [2]	Reporting Limit	Standard Method / Techniques used [8]	Analysed by
Physical and Aggregate Properties	Particle Size Fractionation	% w/w	1	In-house method, sieving and weighing ; 8 fractions : >4000 µm, <4000µm, <2000µm, <1000µm, <500µm, <250µm, <125µm and <63µm	MMT/EPD [6]
	Electrochemical Potential [4]	mV	1	Instrumental, Orion Model 250A pH/Redox Meter (electrodemetric)	MMT/EPD
	Total Solids (TS) [3]	% w/w	0.1	In-house method GL-PH-22 based on APHA 20ed 2540G (weighing)	GL [7]
	Total Volatile Solids (TVS) [3]	% TS	0.1	In-house method GL-PH-22 based on APHA 20ed 2540G (weighing)	GL
	Dry Wet Ratio	---	0.01	In-house method GL-PH-22 based on APHA 20ed 2540G (weighing)	GL
Aggregate Organic Constituents [3]	Chemical Oxygen Demand (COD)	mg/kg	2	In-house method GL-OR-47 based on ASTM D1252-00 A (open reflux)	GL
	Total Carbon (TC)	% w/w	0.1	In-house method GL-OR-33 based on APHA 20ed 5310 B (combustion - IR)	GL
Nutrients and Inorganic Constituents [3]	Ammonia Nitrogen (NH_4-N)	mg/kg	0.05	In-house method GL-IN-19 based on ASTM D3590-11 B (FIA)	GL
	Total Kjeldahl Nitrogen (TKN)	mg/kg	0.5	In-house methods GL-IN-14 and GL-IN-15 respectively based on ASTM D3590-11 B (FIA)	GL
	Total Phosphorus	mg/kg	0.2	In-house methods GL-IN-14 and GL-IN-16 respectively based on ASTM D515-88 B (FIA)	GL
	Total Sulphide	mg/kg	0.2	In-house method GL-IN-45 based on APHA 20ed 4500-S^{2-} A&D (spectrophotometric)	GL
	Total Cyanide	mg/kg	0.1	In-house method GL-IN-44 based on APHA 20ed 4500-CN^- A&E (distillation and amperometric)	GL
Metals & Metalloids [5]	Aluminium (Al)	mg/kg	1	In-house method GL-TE-103 (ICP-MS)	GL
	Arsenic (As)	mg/kg	0.1	In-house method GL-TE-103 (ICP-MS)	GL
	Barium (Ba)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Boron (B)	mg/kg	5	In-house method GL-TE-103 (ICP-MS)	GL
	Cadmium (Cd)	mg/kg	0.1	In-house method GL-TE-103 (ICP-MS)	GL
	Chromium (Cr)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Copper (Cu)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Iron (Fe)	mg/kg	5	In-house method GL-TE-103 (ICP-MS)	GL
	Lead (Pb)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Manganese (Mn)	mg/kg	1	In-house method GL-TE-103 (ICP-MS)	GL
	Mercury (Hg)	mg/kg	0.05	In-house method GL-TE-103 (ICP-MS)	GL
	Nickel (Ni)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Silver (Ag)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Vanadium (V)	mg/kg	0.1	In-house method GL-TE-103 (ICP-MS)	GL
	Zinc (Zn)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
Trace Organic Compounds	Polychlorinated Biphenyls (PCBs)				
	18 PCB congeners : PCB 8, 18, 28, 44, 52, 66, 77, 101, 105, 118, 126, 128, 138, 153, 169, 170, 180, 187	µg/kg	2	In-house method GL-OR-25 based on Reference Method for the Analysis of Polychlorinated Biphenyls, Environmental Protection Series: Report EPS 1/RM/31, March 1997, Environment Canada (GC-MS)	GL
	Polyaromatic Hydrocarbons (PAHs)				
	- Acenaphthene	µg/kg	50	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Acenaphthylene	µg/kg	50	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Naphthalene	µg/kg	60	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Fluorene	µg/kg	10	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Phenanthrene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Anthracene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Fluoranthene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Pyrene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*a*)anthracene	µg/kg	3	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Chrysene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*b*)fluoranthene	µg/kg	1	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*k*)fluoranthene	µg/kg	1	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*a*)pyrene	µg/kg	1	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Dibenzo(*a,h*)anthracene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*ghi*)perylene	µg/kg	1	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Indeno(*1,2,3-cd*)pyrene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL

Note:
1. Birge-Ekman (0.023sq.m) grab / Van Veen (0.1sq.m) grab / Smith-McIntyre (0.1sq.m) grab is employed to collect sediment samples from the top 10cm of seabed.
2. All parameters are reported on a dry weight basis unless otherwise stated.
3. Determinants are reported on a wet weight basis.
4. Electrochemical potential (Eh) is measured "on-site" at 3cm below the surface of freshly collected sediment samples (Reference : Handbook of Techniques for Aquatic Sediment Sampling. By A. Mudrock & S.D. MacKnight, 1994, CRC Press).
5. Digestion procedure for metals and metalloids in sediment follows Government Laboratory's in-house method GL-TE-51.
6. MMT/EPD - Marine Monitoring Team, Water Policy and Science Group, Environmental Protection Department.
7. GL - Government Laboratory.
8. Mention of brand names and commercial products does not constitute or imply endorsement or recommendation by the Environmental Protection Department.

Summary of water quality statistics for the Mirs Bay WCZ in 2018

Parameter		Starling Inlet	Crooked Island		Port Island		Mirs Bay (North)	
		MM1	MM2	MM7	MM17	MM3	MM4	MM5
Number of samples		12	12	12	12	12	12	12
Temperature (°C)		24.1 (14.5 - 30.4)	24.0 (14.7 - 30.3)	23.8 (14.4 - 30.1)	23.4 (14.1 - 29.0)	23.6 (14.3 - 29.2)	23.3 (14.4 - 29.0)	23.2 (14.2 - 28.8)
Salinity		31.8 (29.8 - 32.9)	32.0 (30.3 - 33.2)	32.1 (30.5 - 33.2)	32.3 (30.8 - 33.4)	32.2 (30.9 - 33.4)	32.4 (31.0 - 33.5)	32.4 (31.0 - 33.5)
Dissolved Oxygen (mg/L)		6.7 (5.7 - 9.7)	6.6 (5.3 - 9.4)	6.5 (5.0 - 9.2)	6.5 (5.2 - 9.0)	6.6 (5.0 - 9.3)	6.5 (5.1 - 8.9)	6.4 (4.8 - 8.8)
	Bottom	6.8 (5.9 - 9.4)	6.6 (5.0 - 9.2)	6.2 (4.0 - 8.6)	6.2 (3.8 - 8.6)	6.2 (3.5 - 9.1)	6.0 (2.5 - 8.8)	5.7 (1.6 - 8.2)
Dissolved Oxygen (% saturation)		95 (81 - 125)	93 (78 - 123)	92 (72 - 118)	91 (75 - 115)	92 (77 - 121)	91 (79 - 114)	89 (73 - 113)
	Bottom	96 (82 - 119)	92 (74 - 119)	87 (60 - 111)	86 (56 - 109)	87 (53 - 117)	83 (37 - 113)	79 (22 - 103)
pH		7.9 (7.7 - 8.1)	7.9 (7.7 - 8.1)	7.9 (7.7 - 8.1)	7.8 (7.7 - 8.0)	7.9 (7.7 - 8.1)	7.8 (7.7 - 8.0)	7.8 (7.7 - 8.0)
Secchi Disc Depth (m)		2.8 (2.0 - 4.0)	3.4 (2.5 - 4.0)	3.7 (2.5 - 6.0)	3.8 (2.5 - 5.0)	3.6 (2.5 - 5.0)	3.8 (2.5 - 8.0)	4.3 (3.0 - 7.0)
Turbidity (NTU)		1.7 (0.4 - 3.4)	1.2 (0.5 - 2.6)	1.6 (0.3 - 3.9)	0.9 (0.1 - 2.5)	2.0 (0.7 - 4.1)	2.0 (0.5 - 4.8)	2.7 (0.7 - 4.3)
Suspended Solids (mg/L)		6.4 (1.3 - 11.8)	5.9 (1.5 - 11.3)	5.3 (1.1 - 11.3)	4.5 (0.9 - 9.0)	6.1 (1.1 - 18.0)	6.2 (1.1 - 13.1)	6.1 (1.8 - 19.3)
5-day Biochemical Oxygen Demand (mg/L)		1.1 (0.5 - 1.9)	0.8 (0.4 - 1.7)	0.7 (0.1 - 1.1)	0.7 (0.2 - 1.3)	0.7 (0.4 - 1.4)	0.6 (0.3 - 1.2)	0.6 (0.1 - 1.1)
Ammonia Nitrogen (mg/L)		0.031 (0.013 - 0.065)	0.027 (0.010 - 0.046)	0.030 (0.015 - 0.048)	0.023 (0.008 - 0.030)	0.022 (0.010 - 0.030)	0.020 (0.008 - 0.031)	0.019 (<0.005 - 0.027)
Unionised Ammonia (mg/L)		<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.001)	<0.001 (<0.001 - 0.001)	<0.001 (<0.001 - 0.001)	<0.001 (<0.001 - 0.001)	<0.001 (<0.001 - 0.001)	<0.001 (<0.001 - 0.001)
Nitrite Nitrogen (mg/L)		0.007 (<0.002 - 0.041)	0.008 (<0.002 - 0.051)	0.005 (<0.002 - 0.020)	0.006 (<0.002 - 0.024)	0.008 (<0.002 - 0.040)	0.006 (<0.002 - 0.021)	0.007 (<0.002 - 0.019)
Nitrate Nitrogen (mg/L)		0.027 (<0.002 - 0.064)	0.016 (<0.002 - 0.053)	0.011 (<0.002 - 0.035)	0.012 (<0.002 - 0.055)	0.012 (<0.002 - 0.040)	0.013 (<0.002 - 0.057)	0.014 (<0.002 - 0.061)
Total Inorganic Nitrogen (mg/L)		0.06 (0.02 - 0.13)	0.05 (0.01 - 0.13)	0.05 (0.02 - 0.08)	0.04 (0.03 - 0.08)	0.04 (0.02 - 0.10)	0.04 (0.01 - 0.09)	0.04 (0.01 - 0.09)
Total Kjeldahl Nitrogen (mg/L)		0.41 (0.14 - 0.79)	0.39 (0.15 - 0.63)	0.34 (0.12 - 0.76)	0.36 (0.11 - 0.73)	0.37 (0.12 - 0.65)	0.36 (0.09 - 0.81)	0.34 (0.11 - 0.80)
Total Nitrogen (mg/L)		0.45 (0.19 - 0.80)	0.42 (0.18 - 0.68)	0.35 (0.14 - 0.77)	0.38 (0.12 - 0.74)	0.39 (0.15 - 0.66)	0.38 (0.10 - 0.87)	0.36 (0.12 - 0.80)
Orthophosphate Phosphorus (mg/L)		0.005 (<0.002 - 0.010)	0.006 (<0.002 - 0.012)	0.005 (0.002 - 0.009)	0.006 (0.002 - 0.010)	0.005 (<0.002 - 0.011)	0.006 (<0.002 - 0.009)	0.006 (<0.002 - 0.009)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)
Silica (as SiO_2) (mg/L)		0.52 (<0.05 - 1.17)	0.49 (0.05 - 0.96)	0.45 (0.06 - 0.73)	0.49 (0.06 - 1.05)	0.47 (0.05 - 0.82)	0.47 (0.05 - 1.10)	0.50 (0.13 - 1.13)
Chlorophyll-*a* (µg/L)		4.0 (1.2 - 8.0)	2.2 (0.7 - 6.0)	2.3 (0.5 - 9.8)	1.7 (0.4 - 3.3)	2.1 (0.4 - 5.4)	1.8 (0.3 - 4.3)	1.8 (0.4 - 4.5)
E.coli (cfu/100mL)		3 (<1 - 31)	1 (<1 - 2)	1 (<1 - 2)	1 (<1 - 1)	1 (<1 - 2)	1 (<1 - 1)	<1 (<1 - <1)
Faecal Coliforms (cfu/100mL)		6 (<1 - 110)	2 (<1 - 5)	1 (<1 - 3)	1 (<1 - 3)	1 (<1 - 5)	1 (<1 - 3)	1 (<1 - 2)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Mirs Bay WCZ in 2018 (continued)

Parameter		Ninepin Group MM19	Waglan Isalnd MM8	Mirs Bay (South) MM13	MM14	Mirs Bay (Central) MM15	MM16	Long Harbour MM6
Number of samples		12	12	12	12	12	12	12
Temperature (°C)		23.2 (14.6 - 28.8)	23.2 (14.7 - 28.6)	23.2 (14.7 - 28.9)	23.2 (14.6 - 29.0)	23.3 (14.6 - 29.1)	23.6 (15.0 - 29.3)	23.4 (14.0 - 29.4)
Salinity		32.9 (32.2 - 34.0)	33.0 (32.3 - 34.1)	33.0 (32.3 - 34.2)	32.9 (32.2 - 34.0)	32.7 (32.0 - 34.0)	32.6 (31.4 - 33.8)	32.2 (30.8 - 33.3)
Dissolved Oxygen (mg/L)		6.5 (4.9 - 8.1)	6.3 (4.3 - 7.8)	6.5 (4.7 - 7.8)	6.4 (4.9 - 7.9)	6.4 (4.6 - 8.0)	6.5 (4.6 - 8.2)	6.6 (5.2 - 8.5)
	Bottom	6.1 (3.0 - 7.9)	6.1 (3.5 - 7.8)	6.2 (3.6 - 7.9)	6.1 (3.2 - 7.9)	6.1 (2.9 - 7.9)	6.1 (2.0 - 8.0)	6.5 (5.2 - 8.5)
Dissolved Oxygen (% saturation)		92 (70 - 102)	89 (56 - 98)	91 (63 - 98)	90 (69 - 102)	90 (71 - 100)	92 (71 - 103)	92 (75 - 104)
	Bottom	84 (43 - 99)	84 (50 - 99)	86 (52 - 98)	85 (46 - 99)	85 (42 - 98)	86 (30 - 99)	91 (78 - 105)
pH		8.0 (7.6 - 8.4)	8.0 (7.6 - 8.4)	8.0 (7.6 - 8.4)	8.0 (7.6 - 8.4)	8.0 (7.6 - 8.4)	8.0 (7.6 - 8.4)	7.8 (7.6 - 8.0)
Secchi Disc Depth (m)		3.9 (2.0 - 7.0)	3.6 (2.0 - 5.0)	4.4 (3.0 - 7.0)	4.3 (3.0 - 6.0)	4.0 (2.0 - 5.5)	4.0 (2.0 - 6.0)	3.3 (2.5 - 4.6)
Turbidity (NTU)		2.7 (0.5 - 7.7)	3.9 (0.8 - 14.0)	3.0 (0.9 - 7.5)	2.8 (0.8 - 7.8)	2.3 (0.3 - 8.4)	2.4 (0.2 - 8.2)	1.1 (0.2 - 3.0)
Suspended Solids (mg/L)		6.1 (1.8 - 13.0)	7.5 (1.4 - 14.6)	6.0 (1.5 - 11.7)	5.9 (1.9 - 10.5)	6.0 (1.0 - 14.3)	6.3 (0.9 - 14.3)	5.3 (1.6 - 12.7)
5-day Biochemical Oxygen Demand (mg/L)		0.3 (0.1 - 0.6)	0.3 (0.1 - 0.6)	0.3 (0.1 - 0.5)	0.3 (<0.1 - 0.5)	0.3 (0.2 - 0.5)	0.4 (0.2 - 0.7)	0.6 (0.2 - 1.2)
Ammonia Nitrogen (mg/L)		0.015 (<0.005 - 0.028)	0.013 (<0.005 - 0.027)	0.012 (<0.005 - 0.023)	0.013 (<0.005 - 0.030)	0.014 (<0.005 - 0.031)	0.017 (<0.005 - 0.034)	0.023 (0.010 - 0.034)
Unionised Ammonia (mg/L)		<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.001)
Nitrite Nitrogen (mg/L)		0.011 (<0.002 - 0.028)	0.010 (<0.002 - 0.026)	0.009 (<0.002 - 0.025)	0.010 (<0.002 - 0.028)	0.010 (<0.002 - 0.024)	0.008 (<0.002 - 0.022)	0.004 (<0.002 - 0.010)
Nitrate Nitrogen (mg/L)		0.033 (<0.002 - 0.140)	0.034 (<0.002 - 0.130)	0.032 (<0.002 - 0.095)	0.034 (<0.002 - 0.137)	0.035 (<0.002 - 0.163)	0.026 (<0.002 - 0.140)	0.010 (<0.002 - 0.059)
Total Inorganic Nitrogen (mg/L)		0.06 (0.02 - 0.16)	0.06 (0.01 - 0.15)	0.05 (0.01 - 0.12)	0.06 (0.01 - 0.16)	0.06 (0.01 - 0.18)	0.05 (0.01 - 0.16)	0.04 (0.02 - 0.09)
Total Kjeldahl Nitrogen (mg/L)		0.33 (0.07 - 0.70)	0.32 (0.07 - 0.62)	0.38 (0.07 - 0.90)	0.36 (0.08 - 0.66)	0.43 (0.11 - 0.86)	0.39 (0.10 - 0.83)	0.39 (0.12 - 0.78)
Total Nitrogen (mg/L)		0.38 (0.12 - 0.75)	0.36 (0.14 - 0.71)	0.43 (0.10 - 1.01)	0.40 (0.11 - 0.70)	0.47 (0.14 - 1.00)	0.42 (0.12 - 0.83)	0.40 (0.13 - 0.79)
Orthophosphate Phosphorus (mg/L)		0.008 (<0.002 - 0.017)	0.008 (<0.002 - 0.016)	0.008 (<0.002 - 0.013)	0.008 (<0.002 - 0.014)	0.008 (<0.002 - 0.018)	0.007 (<0.002 - 0.017)	0.005 (<0.002 - 0.008)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)
Silica (as SiO_2) (mg/L)		0.55 (0.22 - 1.13)	0.55 (0.19 - 1.02)	0.50 (0.21 - 0.89)	0.54 (0.23 - 1.13)	0.54 (0.26 - 1.17)	0.54 (0.30 - 1.23)	0.49 (0.05 - 1.10)
Chlorophyll-*a* (µg/L)		1.2 (0.5 - 3.7)	1.3 (0.5 - 3.4)	1.1 (0.5 - 3.1)	0.9 (0.4 - 1.4)	0.9 (0.5 - 1.4)	1.2 (0.3 - 2.2)	1.6 (0.4 - 3.3)
E.coli (cfu/100mL)		1 (<1 - 2)	1 (<1 - 1)	<1 (<1 - <1)	1 (<1 - 1)	1 (<1 - 3)	<1 (<1 - <1)	1 (<1 - 1)
Faecal Coliforms (cfu/100mL)		1 (<1 - 2)	1 (<1 - 1)	<1 (<1 - <1)	1 (<1 - 2)	1 (<1 - 3)	1 (<1 - 1)	2 (<1 - 4)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Port Shelter WCZ in 2018

Parameter		Inner Port Shelter PM1	Inner Port Shelter PM2	Inner Port Shelter PM3	Inner Port Shelter PM4	Hebe Haven PM6
Number of samples		12	12	12	12	12
Temperature (°C)		24.2 (13.9 - 29.8)	23.9 (14.1 - 29.4)	23.5 (14.2 - 28.8)	24.1 (14.2 - 29.6)	23.8 (14.4 - 29.0)
Salinity		31.8 (29.0 - 33.8)	31.7 (29.5 - 33.3)	32.3 (30.1 - 33.7)	31.7 (28.0 - 33.9)	32.0 (30.0 - 33.5)
Dissolved Oxygen (mg/L)		6.4 (4.2 - 9.7)	6.2 (3.9 - 9.6)	6.3 (4.2 - 9.2)	6.1 (4.0 - 8.6)	6.2 (3.6 - 9.4)
	Bottom	6.3 (3.8 - 10.8)	6.1 (3.0 - 10.1)	5.7 (2.3 - 8.5)	5.9 (3.7 - 8.8)	5.9 (2.3 - 8.9)
Dissolved Oxygen (% saturation)		90 (57 - 124)	86 (44 - 124)	87 (56 - 119)	85 (53 - 110)	86 (49 - 119)
	Bottom	89 (54 - 138)	84 (39 - 128)	79 (33 - 106)	83 (53 - 113)	83 (34 - 112)
pH		8.1 (7.7 - 8.5)	8.0 (7.7 - 8.4)	8.0 (7.7 - 8.4)	8.0 (7.7 - 8.4)	8.0 (7.6 - 8.4)
Secchi Disc Depth (m)		3.2 (2.0 - 4.5)	2.9 (1.9 - 4.5)	3.1 (1.8 - 5.0)	2.9 (2.0 - 5.0)	3.2 (2.0 - 5.0)
Turbidity (NTU)		1.5 (0.4 - 5.5)	1.5 (0.2 - 7.1)	1.8 (0.2 - 7.8)	1.8 (0.7 - 7.6)	1.4 (0.1 - 6.6)
Suspended Solids (mg/L)		4.1 (1.4 - 13.0)	3.3 (1.4 - 7.1)	4.2 (1.4 - 11.2)	4.9 (1.7 - 12.0)	3.9 (1.2 - 10.5)
5-day Biochemical Oxygen Demand (mg/L)		0.8 (0.2 - 1.8)	0.8 (0.3 - 2.2)	0.7 (0.3 - 1.6)	0.7 (0.3 - 1.5)	0.8 (0.3 - 2.2)
Ammonia Nitrogen (mg/L)		0.029 (0.006 - 0.060)	0.035 (0.008 - 0.083)	0.029 (0.006 - 0.051)	0.033 (0.006 - 0.087)	0.031 (0.009 - 0.062)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.004)	0.002 (<0.001 - 0.005)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.004 (<0.002 - 0.016)	0.007 (<0.002 - 0.036)	0.008 (<0.002 - 0.027)	0.004 (<0.002 - 0.012)	0.006 (<0.002 - 0.025)
Nitrate Nitrogen (mg/L)		0.009 (<0.002 - 0.041)	0.014 (<0.002 - 0.038)	0.017 (<0.002 - 0.061)	0.010 (<0.002 - 0.033)	0.014 (<0.002 - 0.039)
Total Inorganic Nitrogen (mg/L)		0.04 (<0.01 - 0.08)	0.06 (0.01 - 0.15)	0.05 (0.01 - 0.12)	0.05 (0.01 - 0.11)	0.05 (0.02 - 0.10)
Total Kjeldahl Nitrogen (mg/L)		0.38 (0.11 - 0.83)	0.37 (0.13 - 0.62)	0.39 (0.11 - 0.82)	0.36 (0.12 - 0.86)	0.35 (0.10 - 0.86)
Total Nitrogen (mg/L)		0.39 (0.11 - 0.87)	0.39 (0.14 - 0.67)	0.41 (0.14 - 0.87)	0.37 (0.12 - 0.86)	0.37 (0.11 - 0.86)
Orthophosphate Phosphorus (mg/L)		0.006 (<0.002 - 0.011)	0.007 (<0.002 - 0.015)	0.007 (<0.002 - 0.015)	0.006 (<0.002 - 0.012)	0.007 (<0.002 - 0.013)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.50 (0.07 - 0.99)	0.56 (0.10 - 1.20)	0.58 (0.16 - 1.30)	0.67 (0.10 - 1.53)	0.55 (0.15 - 1.11)
Chlorophyll-*a* (µg/L)		2.3 (0.5 - 9.5)	2.8 (0.8 - 12.8)	2.2 (0.5 - 7.4)	2.3 (0.3 - 7.3)	2.7 (0.8 - 10.4)
E.coli (cfu/100mL)		2 (<1 - 11)	7 (1 - 200)	2 (<1 - 27)	2 (<1 - 28)	2 (<1 - 26)
Faecal Coliforms (cfu/100mL)		2 (<1 - 64)	35 (2 - 910)	6 (<1 - 100)	4 (<1 - 220)	6 (<1 - 220)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics of the Port Shelter WCZ in 2018 (continued)

Parameter		Outer Port Shelter PM7	Outer Port Shelter PM8	Rocky Harbour PM9	Bluff Island PM11
Number of samples		12	12	12	12
Temperature (°C)		23.3 (14.8 - 28.8)	23.1 (14.6 - 28.4)	23.2 (13.9 - 28.7)	23.0 (14.6 - 28.5)
Salinity		32.5 (30.9 - 33.8)	32.6 (30.8 - 33.9)	32.4 (30.5 - 33.8)	32.7 (31.0 - 33.8)
Dissolved Oxygen (mg/L)		6.1 (4.0 - 9.1)	6.3 (4.1 - 8.6)	6.4 (4.3 - 9.1)	6.4 (4.3 - 8.8)
	Bottom	5.7 (2.5 - 8.4)	5.8 (3.3 - 7.9)	6.1 (2.2 - 8.8)	5.9 (2.8 - 8.3)
Dissolved Oxygen (% saturation)		86 (57 - 117)	88 (56 - 107)	90 (60 - 114)	89 (62 - 111)
	Bottom	79 (36 - 104)	81 (47 - 97)	84 (31 - 110)	81 (41 - 105)
pH		8.0 (7.7 - 8.4)	8.0 (7.7 - 8.4)	8.0 (7.7 - 8.4)	8.0 (7.7 - 8.4)
Secchi Disc Depth (m)		3.4 (2.0 - 5.0)	3.4 (2.0 - 5.0)	3.4 (2.0 - 5.5)	3.2 (2.0 - 4.1)
Turbidity (NTU)		1.8 (0.1 - 7.5)	2.0 (0.2 - 6.5)	1.7 (0.2 - 6.9)	1.8 (0.1 - 7.7)
Suspended Solids (mg/L)		4.0 (1.1 - 13.7)	4.6 (0.9 - 14.3)	4.2 (1.3 - 10.1)	3.4 (1.1 - 8.1)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.3 - 1.8)	0.5 (0.1 - 1.2)	0.5 (<0.1 - 1.0)	0.4 (<0.1 - 0.9)
Ammonia Nitrogen (mg/L)		0.021 (0.006 - 0.036)	0.020 (0.007 - 0.035)	0.019 (0.006 - 0.033)	0.018 (0.005 - 0.028)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)		0.008 (<0.002 - 0.024)	0.007 (<0.002 - 0.014)	0.008 (<0.002 - 0.023)	0.007 (<0.002 - 0.021)
Nitrate Nitrogen (mg/L)		0.019 (<0.002 - 0.068)	0.022 (<0.002 - 0.071)	0.022 (<0.002 - 0.068)	0.022 (<0.002 - 0.077)
Total Inorganic Nitrogen (mg/L)		0.05 (0.01 - 0.10)	0.05 (0.01 - 0.10)	0.05 (0.01 - 0.10)	0.05 (0.01 - 0.10)
Total Kjeldahl Nitrogen (mg/L)		0.36 (0.09 - 0.64)	0.40 (0.09 - 0.76)	0.39 (0.09 - 0.73)	0.37 (0.08 - 0.73)
Total Nitrogen (mg/L)		0.39 (0.10 - 0.69)	0.43 (0.10 - 0.77)	0.42 (0.09 - 0.76)	0.40 (0.10 - 0.78)
Orthophosphate Phosphorus (mg/L)		0.008 (<0.002 - 0.016)	0.008 (<0.002 - 0.013)	0.008 (<0.002 - 0.016)	0.007 (<0.002 - 0.017)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.57 (0.29 - 1.09)	0.52 (0.21 - 1.03)	0.55 (0.20 - 1.30)	0.52 (0.23 - 1.18)
Chlorophyll-*a* (µg/L)		2.5 (0.4 - 9.8)	2.1 (0.3 - 6.9)	2.5 (0.3 - 7.4)	2.3 (0.4 - 8.3)
E.coli (cfu/100mL)		1 (<1 - 1)	1 (<1 - 3)	1 (<1 - 2)	1 (<1 - 2)
Faecal Coliforms (cfu/100mL)		1 (<1 - 7)	1 (<1 - 15)	2 (<1 - 9)	1 (<1 - 6)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Tolo Harbour and Channel WCZ in 2018

Parameter		Harbour Subzone			Buffer Subzone		Channel Subzone	
		TM2	TM3	TM4	TM5	TM6	TM7	TM8
Number of samples		12	12	12	12	12	12	12
Temperature (°C)		24.6 (16.7 - 30.0)	24.7 (17.2 - 30.0)	24.5 (17.2 - 29.4)	24.8 (17.5 - 30.2)	24.2 (16.5 - 29.3)	24.1 (16.6 - 29.4)	23.7 (16.0 - 29.1)
Salinity		29.0 (23.8 - 32.5)	30.2 (25.2 - 32.6)	30.3 (25.8 - 32.7)	30.5 (26.9 - 32.7)	31.4 (28.6 - 33.1)	31.6 (29.1 - 33.1)	32.2 (29.9 - 33.5)
Dissolved Oxygen (mg/L)		7.2 (4.5 - 8.6)	7.0 (5.6 - 8.6)	6.6 (5.4 - 8.3)	6.9 (5.1 - 9.0)	6.2 (4.3 - 8.3)	6.5 (4.3 - 8.5)	6.0 (3.6 - 8.4)
	Bottom	7.1 (4.5 - 8.8)	6.5 (5.0 - 8.3)	5.9 (4.1 - 8.0)	6.7 (5.0 - 8.8)	5.0 (0.3 - 7.7)	5.5 (1.7 - 8.1)	4.9 (1.7 - 8.1)
Dissolved Oxygen (% saturation)		102 (64 - 121)	100 (71 - 123)	94 (74 - 105)	99 (79 - 140)	88 (65 - 109)	92 (66 - 109)	84 (53 - 104)
	Bottom	102 (65 - 135)	93 (68 - 124)	83 (55 - 103)	96 (71 - 136)	69 (4 - 97)	78 (25 - 103)	68 (24 - 103)
pH		8.1 (7.6 - 8.4)	8.1 (7.7 - 8.4)	8.1 (7.7 - 8.4)	8.1 (7.6 - 8.5)	8.1 (7.7 - 8.4)	8.1 (7.7 - 8.4)	8.1 (7.7 - 8.4)
Secchi Disc Depth (m)		2.6 (2.0 - 3.0)	2.7 (2.0 - 3.5)	2.6 (2.0 - 3.5)	2.8 (2.0 - 3.2)	3.3 (3.0 - 6.0)	3.3 (2.0 - 4.5)	3.9 (2.5 - 6.0)
Turbidity (NTU)		2.3 (0.6 - 7.5)	2.3 (0.2 - 13.1)	2.0 (0.4 - 7.7)	4.2 (0.2 - 20.6)	1.9 (0.4 - 7.2)	1.9 (0.2 - 7.8)	2.4 (0.1 - 8.1)
Suspended Solids (mg/L)		6.4 (1.8 - 11.1)	5.5 (2.6 - 9.6)	6.2 (2.7 - 12.7)	10.1 (1.7 - 64.0)	6.2 (2.1 - 9.2)	5.5 (1.8 - 10.7)	6.7 (1.7 - 14.5)
5-day Biochemical Oxygen Demand (mg/L)		1.8 (0.8 - 4.0)	1.5 (0.6 - 2.4)	1.3 (0.5 - 2.0)	1.4 (0.2 - 2.6)	0.9 (0.5 - 1.6)	0.9 (0.3 - 1.4)	0.6 (0.2 - 1.0)
Ammonia Nitrogen (mg/L)		0.047 (0.014 - 0.092)	0.035 (<0.005 - 0.085)	0.036 (0.006 - 0.063)	0.022 (<0.005 - 0.057)	0.030 (0.011 - 0.060)	0.027 (0.009 - 0.056)	0.029 (0.016 - 0.059)
Unionised Ammonia (mg/L)		0.003 (<0.001 - 0.010)	0.002 (<0.001 - 0.006)	0.002 (<0.001 - 0.006)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.006)	0.001 (<0.001 - 0.006)	0.001 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.004 (<0.002 - 0.007)	0.005 (<0.002 - 0.016)	0.005 (<0.002 - 0.018)	0.003 (<0.002 - 0.009)	0.006 (<0.002 - 0.019)	0.006 (<0.002 - 0.019)	0.008 (<0.002 - 0.036)
Nitrate Nitrogen (mg/L)		0.026 (<0.002 - 0.135)	0.011 (<0.002 - 0.038)	0.008 (<0.002 - 0.027)	0.005 (<0.002 - 0.014)	0.008 (<0.002 - 0.023)	0.006 (<0.002 - 0.020)	0.012 (<0.002 - 0.052)
Total Inorganic Nitrogen (mg/L)		0.08 (0.02 - 0.23)	0.05 (<0.01 - 0.10)	0.05 (<0.01 - 0.09)	0.03 (<0.01 - 0.07)	0.04 (0.02 - 0.07)	0.04 (0.02 - 0.07)	0.05 (0.02 - 0.11)
Total Kjeldahl Nitrogen (mg/L)		0.41 (0.23 - 0.57)	0.34 (0.18 - 0.51)	0.38 (0.16 - 0.73)	0.36 (0.14 - 0.72)	0.35 (0.15 - 0.90)	0.32 (0.13 - 0.58)	0.34 (0.14 - 0.83)
Total Nitrogen (mg/L)		0.44 (0.34 - 0.61)	0.36 (0.22 - 0.52)	0.40 (0.19 - 0.74)	0.36 (0.14 - 0.73)	0.36 (0.15 - 0.91)	0.34 (0.13 - 0.59)	0.36 (0.15 - 0.84)
Orthophosphate Phosphorus (mg/L)		0.006 (<0.002 - 0.013)	0.005 (<0.002 - 0.009)	0.005 (<0.002 - 0.011)	0.004 (<0.002 - 0.008)	0.005 (<0.002 - 0.011)	0.005 (<0.002 - 0.011)	0.008 (<0.002 - 0.014)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.04)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.04)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.81 (0.06 - 1.95)	0.62 (0.05 - 1.77)	0.70 (0.05 - 1.90)	0.52 (0.06 - 1.70)	0.58 (0.15 - 1.53)	0.55 (0.09 - 1.50)	0.59 (0.21 - 1.37)
Chlorophyll-*a* (µg/L)		7.5 (1.7 - 17.0)	6.9 (1.6 - 16.3)	6.8 (1.6 - 13.6)	4.6 (1.1 - 9.8)	4.5 (1.4 - 10.5)	3.5 (1.3 - 6.0)	2.4 (0.8 - 4.3)
E.coli (cfu/100mL)		8 (1 - 43)	6 (<1 - 89)	3 (1 - 24)	2 (<1 - 6)	2 (<1 - 9)	1 (<1 - 4)	1 (<1 - 1)
Faecal Coliforms (cfu/100mL)		44 (7 - 220)	16 (1 - 410)	12 (2 - 110)	3 (<1 - 32)	3 (<1 - 22)	2 (<1 - 5)	1 (<1 - 1)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Southern WCZ in 2018

Parameter		Hong Kong Island (South) SM1	SM2	SM19	East Lamma Channel SM3	SM4
Number of samples		12	12	12	12	12
Temperature (°C)		23.5 (15.9 - 28.7)	23.6 (16.3 - 28.7)	23.4 (15.9 - 28.5)	23.2 (16.5 - 27.4)	23.7 (16.4 - 28.8)
Salinity		32.5 (30.5 - 33.8)	32.2 (29.1 - 33.4)	32.5 (30.6 - 33.8)	32.3 (30.8 - 33.5)	31.8 (28.1 - 33.4)
Dissolved Oxygen (mg/L)		6.2 (4.5 - 7.9)	6.2 (4.3 - 8.2)	6.4 (4.5 - 8.0)	6.3 (3.6 - 8.6)	6.1 (4.0 - 8.2)
	Bottom	6.2 (3.4 - 8.2)	6.2 (4.0 - 8.2)	6.1 (3.8 - 8.2)	5.9 (2.5 - 8.6)	6.1 (3.7 - 8.4)
Dissolved Oxygen (% saturation)		87 (62 - 99)	87 (59 - 105)	91 (63 - 103)	88 (53 - 110)	85 (54 - 106)
	Bottom	87 (49 - 102)	87 (59 - 104)	85 (54 - 104)	81 (36 - 111)	85 (52 - 108)
pH		8.0 (7.6 - 8.3)	8.0 (7.7 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.1)	8.0 (7.6 - 8.2)
Secchi Disc Depth (m)		3.3 (2.5 - 4.0)	2.9 (2.0 - 4.0)	3.3 (2.0 - 5.0)	3.1 (2.3 - 5.0)	2.6 (2.0 - 3.5)
Turbidity (NTU)		1.9 (<0.1 - 7.1)	2.2 (<0.1 - 8.4)	3.2 (1.0 - 8.2)	2.9 (1.2 - 8.9)	2.5 (0.3 - 8.0)
Suspended Solids (mg/L)		5.3 (1.4 - 11.0)	5.7 (1.5 - 12.3)	6.5 (1.6 - 13.5)	7.7 (2.6 - 12.7)	6.4 (2.0 - 14.0)
5-day Biochemical Oxygen Demand (mg/L)		0.5 (0.1 - 1.0)	0.5 (0.2 - 1.0)	0.4 (0.1 - 1.0)	0.7 (0.3 - 1.7)	0.6 (0.2 - 1.1)
Ammonia Nitrogen (mg/L)		0.023 (0.008 - 0.067)	0.028 (0.008 - 0.053)	0.018 (<0.005 - 0.039)	0.040 (0.013 - 0.095)	0.044 (0.006 - 0.068)
Unionised Ammonia (mg/L)		<0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.003)	<0.001 (<0.001 - 0.002)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.013 (<0.002 - 0.037)	0.019 (<0.002 - 0.060)	0.016 (<0.002 - 0.039)	0.023 (<0.002 - 0.057)	0.024 (<0.002 - 0.080)
Nitrate Nitrogen (mg/L)		0.054 (<0.002 - 0.133)	0.072 (<0.002 - 0.181)	0.050 (<0.002 - 0.179)	0.087 (<0.002 - 0.212)	0.100 (<0.002 - 0.232)
Total Inorganic Nitrogen (mg/L)		0.09 (0.02 - 0.19)	0.12 (0.02 - 0.28)	0.08 (0.02 - 0.22)	0.15 (0.02 - 0.28)	0.17 (0.01 - 0.36)
Total Kjeldahl Nitrogen (mg/L)		0.29 (0.10 - 0.56)	0.31 (0.10 - 0.58)	0.27 (0.07 - 0.59)	0.43 (0.18 - 1.15)	0.32 (0.12 - 0.72)
Total Nitrogen (mg/L)		0.36 (0.12 - 0.69)	0.40 (0.13 - 0.68)	0.33 (0.12 - 0.69)	0.54 (0.18 - 1.16)	0.45 (0.13 - 0.83)
Orthophosphate Phosphorus (mg/L)		0.008 (0.003 - 0.014)	0.009 (0.004 - 0.015)	0.009 (<0.002 - 0.015)	0.012 (0.002 - 0.026)	0.010 (0.005 - 0.017)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.04)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.49 (0.21 - 1.13)	0.56 (0.27 - 1.03)	0.53 (0.25 - 1.04)	0.74 (0.07 - 1.73)	0.63 (0.26 - 1.30)
Chlorophyll-*a* (µg/L)		2.4 (0.3 - 9.5)	2.3 (0.5 - 6.9)	1.4 (0.3 - 3.0)	3.3 (0.4 - 10.4)	3.4 (0.8 - 11.4)
E.coli (cfu/100mL)		1 (<1 - 17)	2 (<1 - 4)	1 (<1 - 1)	6 (<1 - 620)	6 (1 - 450)
Faecal Coliforms (cfu/100mL)		2 (<1 - 54)	3 (1 - 17)	1 (<1 - 2)	11 (<1 - 1100)	12 (1 - 670)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Southern WCZ in 2018 (continued)

Parameter		West Lamma Channel				
		SM5	SM6	SM7	SM9	SM18
Number of samples		12	12	12	12	12
Temperature (°C)		24.1 (16.7 - 29.6)	23.8 (16.7 - 28.8)	24.0 (16.8 - 29.2)	23.9 (16.1 - 28.3)	23.6 (16.3 - 28.5)
Salinity		31.5 (25.6 - 33.8)	31.9 (28.7 - 33.8)	31.2 (25.8 - 33.5)	30.3 (25.2 - 32.6)	32.2 (29.7 - 33.9)
Dissolved Oxygen (mg/L)		6.4 (4.1 - 8.7)	6.5 (4.6 - 9.0)	6.4 (4.6 - 9.6)	5.8 (4.0 - 7.5)	6.5 (4.7 - 8.7)
	Bottom	6.3 (4.0 - 8.7)	6.2 (2.7 - 8.6)	6.4 (4.2 - 9.6)	5.8 (2.9 - 7.8)	6.1 (2.9 - 8.1)
Dissolved Oxygen (% saturation)		90 (56 - 118)	92 (63 - 116)	90 (63 - 125)	81 (58 - 97)	91 (64 - 112)
	Bottom	89 (56 - 126)	86 (41 - 109)	89 (62 - 124)	81 (43 - 101)	85 (42 - 102)
pH		8.0 (7.7 - 8.2)	8.0 (7.7 - 8.2)	8.0 (7.7 - 8.2)	8.0 (7.7 - 8.2)	8.0 (7.7 - 8.3)
Secchi Disc Depth (m)		2.7 (2.0 - 4.0)	2.9 (2.0 - 4.0)	2.7 (2.0 - 4.0)	2.7 (2.0 - 3.5)	3.1 (2.0 - 5.0)
Turbidity (NTU)		3.3 (0.4 - 8.3)	3.0 (0.2 - 8.4)	3.8 (0.3 - 7.6)	3.8 (1.5 - 9.0)	3.2 (0.2 - 7.5)
Suspended Solids (mg/L)		8.1 (2.3 - 23.7)	7.4 (1.5 - 19.3)	9.6 (2.8 - 22.3)	9.1 (3.2 - 15.4)	7.6 (1.3 - 19.3)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.2 - 1.4)	0.6 (0.2 - 1.2)	0.8 (0.4 - 1.7)	0.8 (0.1 - 2.7)	0.5 (0.1 - 1.4)
Ammonia Nitrogen (mg/L)		0.020 (0.006 - 0.036)	0.020 (<0.005 - 0.040)	0.049 (0.013 - 0.095)	0.084 (0.035 - 0.147)	0.016 (<0.005 - 0.032)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.004)	0.003 (0.001 - 0.006)	<0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)		0.023 (<0.002 - 0.094)	0.022 (<0.002 - 0.081)	0.033 (<0.002 - 0.133)	0.050 (0.006 - 0.163)	0.018 (<0.002 - 0.034)
Nitrate Nitrogen (mg/L)		0.098 (<0.002 - 0.400)	0.083 (<0.002 - 0.242)	0.137 (0.012 - 0.397)	0.236 (0.061 - 0.617)	0.072 (<0.002 - 0.216)
Total Inorganic Nitrogen (mg/L)		0.14 (0.01 - 0.46)	0.13 (0.01 - 0.36)	0.22 (0.04 - 0.57)	0.37 (0.19 - 0.82)	0.10 (0.02 - 0.26)
Total Kjeldahl Nitrogen (mg/L)		0.30 (0.10 - 0.70)	0.33 (0.12 - 0.68)	0.36 (0.20 - 0.68)	0.45 (0.15 - 1.10)	0.26 (0.10 - 0.51)
Total Nitrogen (mg/L)		0.42 (0.10 - 0.75)	0.44 (0.13 - 0.77)	0.53 (0.24 - 0.82)	0.73 (0.37 - 1.32)	0.35 (0.11 - 0.55)
Orthophosphate Phosphorus (mg/L)		0.008 (<0.002 - 0.016)	0.008 (<0.002 - 0.016)	0.011 (<0.002 - 0.023)	0.021 (<0.002 - 0.034)	0.008 (<0.002 - 0.012)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.03 (<0.02 - 0.04)	0.03 (0.02 - 0.06)	0.02 (<0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.61 (0.11 - 1.65)	0.58 (0.14 - 1.28)	0.76 (0.15 - 1.97)	1.28 (0.35 - 3.77)	0.55 (0.17 - 1.20)
Chlorophyll-*a* (µg/L)		3.8 (0.6 - 9.0)	4.7 (0.8 - 15.4)	5.6 (0.7 - 15.7)	4.3 (0.5 - 15.0)	2.8 (0.4 - 9.7)
E.coli (cfu/100mL)		1 (<1 - 4)	1 (<1 - 4)	4 (<1 - 44)	64 (2 - 4700)	1 (<1 - 1)
Faecal Coliforms (cfu/100mL)		2 (<1 - 10)	2 (<1 - 7)	6 (<1 - 85)	130 (4 - 8000)	1 (<1 - 2)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Southern WCZ in 2018 (continued)

Parameter		Lantau Island (East) SM10	Lantau Island (East) SM11	Lantau Island (South) SM12	Lantau Island (South) SM13	Soko Islands SM17	Soko Islands SM20
Number of samples		12	12	12	12	12	12
Temperature (°C)		23.8 (16.7 - 29.8)	23.9 (16.4 - 29.9)	23.9 (16.9 - 29.7)	24.0 (16.7 - 29.9)	23.9 (16.9 - 29.3)	23.9 (16.6 - 29.3)
Salinity		30.1 (24.9 - 32.3)	30.5 (26.2 - 32.4)	31.1 (25.9 - 32.8)	30.9 (24.1 - 32.9)	31.7 (25.5 - 33.8)	30.9 (22.0 - 33.1)
Dissolved Oxygen (mg/L)		6.1 (4.1 - 8.7)	6.5 (4.3 - 9.1)	6.2 (5.0 - 7.4)	6.4 (4.8 - 8.1)	6.7 (5.7 - 8.1)	6.4 (5.2 - 8.1)
	Bottom	6.1 (4.2 - 8.4)	6.5 (4.2 - 9.0)	6.2 (4.4 - 7.5)	6.4 (4.5 - 8.4)	6.5 (4.8 - 8.1)	6.2 (4.7 - 8.0)
Dissolved Oxygen (% saturation)		86 (62 - 133)	92 (65 - 138)	88 (74 - 108)	90 (74 - 123)	95 (83 - 118)	89 (78 - 102)
	Bottom	85 (61 - 128)	92 (64 - 138)	88 (66 - 110)	90 (66 - 128)	92 (73 - 106)	88 (71 - 108)
pH		8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.7 - 8.3)	8.0 (7.7 - 8.3)
Secchi Disc Depth (m)		2.1 (1.0 - 2.5)	2.2 (1.0 - 3.0)	2.5 (1.9 - 4.0)	2.4 (1.8 - 4.0)	2.9 (2.0 - 5.0)	2.5 (2.0 - 3.5)
Turbidity (NTU)		4.6 (1.0 - 8.6)	4.5 (2.0 - 9.7)	4.7 (1.3 - 10.6)	4.8 (0.6 - 15.0)	3.5 (0.4 - 11.1)	4.4 (1.7 - 10.7)
Suspended Solids (mg/L)		10.9 (5.0 - 21.5)	11.5 (5.9 - 23.3)	11.0 (3.7 - 18.3)	11.3 (2.6 - 30.3)	8.2 (2.7 - 15.3)	10.8 (2.8 - 22.0)
5-day Biochemical Oxygen Demand (mg/L)		0.8 (0.3 - 1.8)	0.9 (0.4 - 1.8)	0.8 (0.4 - 1.5)	0.7 (0.3 - 1.3)	0.6 (0.1 - 1.2)	0.6 (0.2 - 1.3)
Ammonia Nitrogen (mg/L)		0.081 (0.012 - 0.145)	0.071 (0.020 - 0.120)	0.056 (0.008 - 0.123)	0.040 (<0.005 - 0.082)	0.026 (<0.005 - 0.076)	0.032 (<0.005 - 0.059)
Unionised Ammonia (mg/L)		0.003 (<0.001 - 0.005)	0.003 (<0.001 - 0.005)	0.002 (<0.001 - 0.004)	0.002 (<0.001 - 0.004)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.005)
Nitrite Nitrogen (mg/L)		0.042 (0.006 - 0.104)	0.038 (0.002 - 0.088)	0.027 (<0.002 - 0.081)	0.029 (<0.002 - 0.085)	0.019 (<0.002 - 0.054)	0.027 (<0.002 - 0.116)
Nitrate Nitrogen (mg/L)		0.221 (0.115 - 0.395)	0.191 (0.110 - 0.310)	0.126 (0.045 - 0.263)	0.127 (0.049 - 0.337)	0.076 (<0.002 - 0.205)	0.148 (0.018 - 0.830)
Total Inorganic Nitrogen (mg/L)		0.34 (0.21 - 0.58)	0.30 (0.22 - 0.46)	0.21 (0.07 - 0.36)	0.20 (0.09 - 0.43)	0.12 (0.01 - 0.28)	0.21 (0.05 - 0.97)
Total Kjeldahl Nitrogen (mg/L)		0.39 (0.21 - 0.60)	0.38 (0.21 - 1.08)	0.38 (0.18 - 0.95)	0.41 (0.19 - 1.30)	0.37 (0.15 - 0.96)	0.39 (0.15 - 1.37)
Total Nitrogen (mg/L)		0.65 (0.39 - 0.93)	0.61 (0.38 - 1.30)	0.54 (0.38 - 1.00)	0.57 (0.34 - 1.36)	0.47 (0.21 - 0.97)	0.56 (0.20 - 1.43)
Orthophosphate Phosphorus (mg/L)		0.018 (0.007 - 0.029)	0.017 (0.006 - 0.025)	0.013 (0.005 - 0.026)	0.011 (0.005 - 0.017)	0.008 (0.003 - 0.016)	0.010 (0.003 - 0.019)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.06)	0.03 (0.02 - 0.05)	0.03 (<0.02 - 0.04)	0.02 (<0.02 - 0.04)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		1.16 (0.20 - 2.95)	1.09 (0.11 - 2.93)	0.75 (<0.05 - 1.23)	0.82 (0.07 - 1.63)	0.53 (<0.05 - 1.31)	0.89 (<0.05 - 4.27)
Chlorophyll-*a* (µg/L)		5.7 (0.5 - 18.0)	7.2 (0.5 - 22.3)	4.8 (1.1 - 19.0)	4.4 (0.4 - 15.7)	2.8 (0.8 - 9.3)	3.5 (0.6 - 14.0)
E.coli (cfu/100mL)		7 (1 - 65)	3 (<1 - 12)	16 (2 - 420)	3 (<1 - 18)	1 (<1 - 1)	1 (<1 - 2)
Faecal Coliforms (cfu/100mL)		14 (2 - 94)	5 (1 - 25)	28 (3 - 650)	5 (1 - 35)	1 (<1 - 2)	1 (<1 - 3)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics of the Victoria Harbour WCZ in 2018

Parameter		Victoria Harbour (East) VM1	Victoria Harbour (East) VM2	Victoria Harbour (Central) VM4	Victoria Harbour (Central) VM5	Victoria Harbour (Central) VM6
Number of samples		12	12	12	12	12
Temperature (°C)		22.8 (16.1 - 26.6)	23.2 (16.1 - 28.1)	23.4 (16.1 - 27.5)	23.5 (16.0 - 28.0)	23.4 (16.1 - 27.9)
Salinity		32.5 (31.2 - 33.5)	31.9 (28.6 - 33.3)	31.7 (29.5 - 33.0)	31.3 (28.5 - 33.0)	31.4 (28.9 - 33.1)
Dissolved Oxygen (mg/L)		5.9 (4.4 - 7.5)	5.9 (4.4 - 7.4)	5.7 (4.2 - 7.5)	5.7 (4.6 - 7.4)	5.5 (4.2 - 7.3)
	Bottom	6.0 (3.2 - 7.8)	5.8 (3.8 - 7.5)	5.6 (2.9 - 7.5)	5.6 (3.0 - 7.4)	5.3 (2.4 - 7.4)
Dissolved Oxygen (% saturation)		83 (63 - 96)	82 (63 - 92)	80 (60 - 92)	80 (67 - 92)	77 (61 - 90)
	Bottom	82 (47 - 102)	81 (53 - 98)	78 (43 - 97)	77 (45 - 94)	74 (35 - 94)
pH		7.9 (7.6 - 8.1)	7.9 (7.6 - 8.2)	7.9 (7.6 - 8.2)	7.9 (7.6 - 8.2)	7.9 (7.6 - 8.2)
Secchi Disc Depth (m)		2.9 (2.0 - 3.8)	2.9 (2.0 - 3.5)	2.8 (2.0 - 3.5)	2.7 (2.0 - 4.0)	2.7 (2.0 - 3.5)
Turbidity (NTU)		3.2 (1.3 - 7.9)	2.9 (1.3 - 7.0)	2.9 (1.5 - 7.0)	2.7 (1.6 - 6.0)	3.0 (1.5 - 7.1)
Suspended Solids (mg/L)		8.0 (2.4 - 17.0)	7.2 (3.3 - 12.0)	6.9 (3.2 - 14.3)	6.5 (3.1 - 11.0)	6.7 (2.4 - 13.0)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.3 - 1.1)	0.6 (0.3 - 1.7)	0.6 (0.3 - 1.5)	0.8 (0.3 - 2.0)	0.8 (0.1 - 2.0)
Ammonia Nitrogen (mg/L)		0.060 (0.036 - 0.085)	0.081 (0.043 - 0.123)	0.108 (0.044 - 0.180)	0.136 (0.058 - 0.227)	0.143 (0.069 - 0.227)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.004)	0.003 (<0.001 - 0.007)	0.004 (<0.001 - 0.008)	0.005 (<0.001 - 0.010)	0.005 (<0.001 - 0.010)
Nitrite Nitrogen (mg/L)		0.020 (<0.002 - 0.050)	0.025 (<0.002 - 0.065)	0.028 (0.003 - 0.080)	0.030 (0.007 - 0.089)	0.029 (0.007 - 0.080)
Nitrate Nitrogen (mg/L)		0.094 (0.016 - 0.200)	0.122 (0.037 - 0.231)	0.139 (0.049 - 0.253)	0.164 (0.060 - 0.320)	0.159 (0.061 - 0.287)
Total Inorganic Nitrogen (mg/L)		0.17 (0.06 - 0.27)	0.23 (0.09 - 0.36)	0.27 (0.11 - 0.45)	0.33 (0.14 - 0.53)	0.33 (0.15 - 0.47)
Total Kjeldahl Nitrogen (mg/L)		0.34 (0.18 - 0.68)	0.37 (0.20 - 0.77)	0.45 (0.25 - 0.74)	0.48 (0.23 - 0.87)	0.46 (0.23 - 0.87)
Total Nitrogen (mg/L)		0.45 (0.20 - 0.87)	0.52 (0.24 - 0.93)	0.61 (0.32 - 0.90)	0.68 (0.31 - 1.08)	0.65 (0.31 - 1.12)
Orthophosphate Phosphorus (mg/L)		0.017 (0.004 - 0.031)	0.021 (0.009 - 0.036)	0.024 (0.008 - 0.046)	0.025 (0.009 - 0.040)	0.025 (0.010 - 0.038)
Total Phosphorus (mg/L)		0.03 (0.02 - 0.04)	0.03 (0.02 - 0.05)	0.04 (0.02 - 0.06)	0.04 (0.03 - 0.05)	0.04 (0.03 - 0.05)
Silica (as SiO_2) (mg/L)		0.69 (0.13 - 1.53)	0.71 (0.21 - 1.87)	0.82 (0.25 - 2.00)	0.88 (0.32 - 2.30)	0.89 (0.32 - 2.10)
Chlorophyll-*a* (µg/L)		3.0 (0.3 - 10.8)	3.9 (0.3 - 22.3)	3.1 (<0.2 - 13.2)	3.6 (0.4 - 16.6)	3.3 (0.7 - 14.2)
E.coli (cfu/100mL)		100 (5 - 350)	220 (23 - 1300)	350 (21 - 2400)	410 (14 - 5300)	700 (14 - 5000)
Faecal Coliforms (cfu/100mL)		210 (7 - 740)	480 (35 - 2800)	720 (39 - 4900)	1200 (26 - 14000)	1800 (51 - 14000)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics of the Victoria Harbour WCZ in 2018 (continued)

Parameter		Victoria Harbour (West) VM7	Victoria Harbour (West) VM8	Stonecutters Island VM15	Rambler Channel VM12	Rambler Channel VM14
Number of samples		12	12	12	12	12
Temperature (°C)		23.6 (16.1 - 28.0)	23.5 (16.3 - 27.8)	23.5 (16.1 - 27.7)	23.5 (16.2 - 27.4)	24.1 (16.4 - 28.9)
Salinity		31.0 (27.6 - 33.0)	31.2 (28.1 - 33.0)	31.0 (27.6 - 33.0)	30.9 (28.0 - 32.8)	29.0 (21.3 - 32.1)
Dissolved Oxygen (mg/L)		5.6 (4.6 - 7.1)	5.9 (4.4 - 7.3)	5.6 (4.4 - 7.1)	5.3 (3.6 - 7.0)	5.5 (3.9 - 7.2)
	Bottom	5.3 (3.3 - 7.1)	5.7 (2.9 - 7.5)	5.1 (2.7 - 7.1)	5.1 (2.7 - 7.0)	5.3 (2.2 - 7.4)
Dissolved Oxygen (% saturation)		78 (69 - 93)	83 (64 - 96)	79 (65 - 89)	74 (54 - 86)	77 (57 - 93)
	Bottom	74 (49 - 96)	80 (43 - 101)	71 (41 - 92)	71 (39 - 89)	74 (33 - 96)
pH		7.9 (7.6 - 8.2)	8.0 (7.6 - 8.2)	7.9 (7.6 - 8.2)	7.9 (7.6 - 8.2)	7.9 (7.7 - 8.2)
Secchi Disc Depth (m)		2.6 (2.0 - 3.5)	2.5 (2.0 - 3.0)	2.6 (2.0 - 3.0)	2.6 (2.0 - 3.0)	2.4 (2.0 - 3.5)
Turbidity (NTU)		3.4 (1.8 - 7.5)	3.5 (1.9 - 6.4)	3.7 (2.3 - 8.1)	4.9 (2.2 - 15.2)	3.2 (1.4 - 9.1)
Suspended Solids (mg/L)		6.9 (2.7 - 11.7)	11.0 (2.9 - 38.1)	9.0 (3.6 - 18.7)	10.7 (3.4 - 34.9)	6.6 (2.7 - 11.7)
5-day Biochemical Oxygen Demand (mg/L)		0.9 (0.2 - 2.0)	0.9 (0.3 - 2.0)	0.9 (0.2 - 2.0)	0.8 (0.2 - 2.0)	0.7 (0.2 - 1.2)
Ammonia Nitrogen (mg/L)		0.170 (0.060 - 0.237)	0.132 (0.071 - 0.247)	0.168 (0.070 - 0.257)	0.149 (0.087 - 0.233)	0.098 (0.022 - 0.193)
Unionised Ammonia (mg/L)		0.007 (0.001 - 0.014)	0.005 (<0.001 - 0.008)	0.007 (<0.001 - 0.015)	0.005 (0.001 - 0.012)	0.003 (<0.001 - 0.008)
Nitrite Nitrogen (mg/L)		0.034 (0.010 - 0.105)	0.032 (0.007 - 0.090)	0.033 (0.008 - 0.095)	0.036 (0.010 - 0.103)	0.077 (0.010 - 0.330)
Nitrate Nitrogen (mg/L)		0.185 (0.059 - 0.383)	0.163 (0.028 - 0.347)	0.184 (0.045 - 0.410)	0.196 (0.056 - 0.317)	0.356 (0.071 - 1.100)
Total Inorganic Nitrogen (mg/L)		0.39 (0.14 - 0.58)	0.33 (0.14 - 0.52)	0.39 (0.13 - 0.58)	0.38 (0.16 - 0.54)	0.53 (0.20 - 1.45)
Total Kjeldahl Nitrogen (mg/L)		0.47 (0.22 - 0.70)	0.46 (0.27 - 0.72)	0.45 (0.22 - 0.71)	0.46 (0.20 - 0.72)	0.33 (0.13 - 0.91)
Total Nitrogen (mg/L)		0.69 (0.30 - 0.87)	0.66 (0.34 - 0.94)	0.67 (0.31 - 0.93)	0.69 (0.30 - 0.95)	0.77 (0.38 - 1.58)
Orthophosphate Phosphorus (mg/L)		0.028 (0.013 - 0.040)	0.022 (0.011 - 0.035)	0.028 (0.012 - 0.039)	0.026 (0.007 - 0.041)	0.025 (0.012 - 0.037)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.05)	0.04 (0.02 - 0.05)	0.04 (0.03 - 0.05)	0.04 (0.03 - 0.06)	0.04 (0.03 - 0.05)
Silica (as SiO_2) (mg/L)		0.98 (0.32 - 2.60)	0.97 (0.26 - 2.13)	1.01 (0.37 - 2.50)	1.18 (0.55 - 2.57)	1.80 (0.32 - 5.67)
Chlorophyll-*a* (µg/L)		3.8 (0.5 - 14.8)	3.5 (0.4 - 14.5)	3.7 (0.6 - 17.3)	2.2 (0.7 - 4.9)	2.5 (0.5 - 5.7)
E.coli (cfu/100mL)		1200 (83 - 11000)	770 (24 - 11000)	780 (32 - 4000)	850 (130 - 8000)	310 (78 - 5400)
Faecal Coliforms (cfu/100mL)		3200 (170 - 27000)	2100 (70 - 24000)	1900 (64 - 10000)	2000 (190 - 20000)	670 (190 - 12000)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Eastern Buffer WCZ in 2018

Parameter		Chai Wan EM1	Tathong Channel EM2	Tathong Channel EM3
Number of samples		12	12	12
Temperature (°C)		22.7 (15.0 - 27.3)	22.6 (14.9 - 27.3)	22.8 (15.0 - 27.7)
Salinity		32.5 (31.2 - 33.8)	32.7 (31.8 - 33.9)	32.7 (31.2 - 33.9)
Dissolved Oxygen (mg/L)		6.0 (4.6 - 7.8)	6.1 (4.7 - 8.1)	6.4 (5.1 - 8.1)
	Bottom	5.9 (3.4 - 8.1)	5.7 (3.3 - 8.0)	6.0 (3.5 - 7.9)
Dissolved Oxygen (% saturation)		83 (67 - 102)	84 (69 - 103)	89 (75 - 104)
	Bottom	81 (48 - 104)	79 (47 - 103)	83 (50 - 101)
pH		8.0 (7.7 - 8.3)	8.0 (7.7 - 8.3)	8.0 (7.7 - 8.3)
Secchi Disc Depth (m)		3.0 (2.0 - 4.0)	3.0 (2.0 - 4.0)	3.3 (2.4 - 4.0)
Turbidity (NTU)		2.9 (1.1 - 6.4)	2.8 (0.9 - 6.0)	2.8 (1.1 - 10.1)
Suspended Solids (mg/L)		6.2 (2.4 - 14.0)	6.9 (3.3 - 14.7)	5.4 (1.9 - 10.8)
5-day Biochemical Oxygen Demand (mg/L)		0.5 (<0.1 - 1.0)	0.5 (0.1 - 1.1)	0.5 (<0.1 - 1.2)
Ammonia Nitrogen (mg/L)		0.046 (0.012 - 0.117)	0.039 (0.011 - 0.098)	0.023 (<0.005 - 0.059)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.006)	0.002 (<0.001 - 0.005)	0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.022 (<0.002 - 0.041)	0.021 (<0.002 - 0.041)	0.016 (<0.002 - 0.030)
Nitrate Nitrogen (mg/L)		0.078 (0.006 - 0.167)	0.070 (<0.002 - 0.170)	0.044 (<0.002 - 0.122)
Total Inorganic Nitrogen (mg/L)		0.15 (0.03 - 0.24)	0.13 (0.02 - 0.26)	0.08 (0.01 - 0.15)
Total Kjeldahl Nitrogen (mg/L)		0.26 (<0.05 - 0.57)	0.27 (0.12 - 0.54)	0.26 (0.09 - 0.84)
Total Nitrogen (mg/L)		0.36 (0.23 - 0.58)	0.36 (0.16 - 0.60)	0.32 (0.16 - 0.84)
Orthophosphate Phosphorus (mg/L)		0.013 (0.004 - 0.021)	0.012 (0.002 - 0.020)	0.009 (<0.002 - 0.014)
Total Phosphorus (mg/L)		0.02 (0.02 - 0.03)	0.02 (<0.02 - 0.04)	0.02 (<0.02 - 0.02)
Silica (as SiO_2) (mg/L)		0.68 (0.07 - 1.33)	0.65 (0.10 - 1.27)	0.55 (0.09 - 1.10)
Chlorophyll-*a* (µg/L)		3.3 (0.5 - 10.5)	3.1 (0.4 - 9.7)	3.3 (0.3 - 11.6)
E.coli (cfu/100mL)		46 (4 - 340)	25 (1 - 170)	6 (<1 - 45)
Faecal Coliforms (cfu/100mL)		100 (7 - 920)	65 (1 - 640)	10 (1 - 130)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Western Buffer WCZ in 2018

Parameter		Hong Kong Island (West) WM1	WM2	Tsing Yi (South) WM3	Tsing Yi (West) WM4
Number of samples		12	12	12	12
Temperature (°C)		23.1 (16.5 - 27.4)	23.7 (16.3 - 27.9)	23.5 (16.4 - 27.5)	23.5 (16.3 - 27.4)
Salinity		32.3 (30.9 - 33.5)	30.7 (27.2 - 32.7)	31.4 (29.5 - 32.7)	30.8 (27.8 - 32.5)
Dissolved Oxygen (mg/L)		6.0 (3.9 - 8.1)	5.8 (3.7 - 7.8)	5.7 (3.5 - 7.5)	5.5 (3.7 - 7.4)
	Bottom	5.8 (2.6 - 8.7)	5.7 (2.5 - 7.9)	5.5 (2.4 - 7.8)	5.3 (2.3 - 7.5)
Dissolved Oxygen (% saturation)		83 (56 - 105)	81 (54 - 101)	79 (51 - 95)	76 (54 - 95)
	Bottom	80 (37 - 111)	79 (36 - 105)	77 (34 - 104)	74 (33 - 97)
pH		8.0 (7.7 - 8.2)	7.9 (7.7 - 8.2)	7.9 (7.7 - 8.2)	7.9 (7.7 - 8.2)
Secchi Disc Depth (m)		3.0 (2.2 - 4.5)	2.8 (2.0 - 3.2)	2.8 (2.0 - 3.5)	2.9 (2.3 - 3.5)
Turbidity (NTU)		3.7 (1.7 - 10.0)	3.1 (1.4 - 8.9)	3.2 (1.8 - 7.3)	3.7 (2.0 - 7.7)
Suspended Solids (mg/L)		10.2 (4.6 - 18.8)	8.1 (3.0 - 12.5)	8.3 (3.6 - 12.3)	9.6 (4.0 - 18.0)
5-day Biochemical Oxygen Demand (mg/L)		0.8 (0.4 - 1.5)	0.7 (0.2 - 1.1)	0.7 (0.3 - 1.0)	0.6 (0.3 - 1.2)
Ammonia Nitrogen (mg/L)		0.046 (0.018 - 0.096)	0.080 (0.016 - 0.150)	0.094 (0.040 - 0.152)	0.080 (0.019 - 0.147)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.005)	0.003 (<0.001 - 0.006)	0.004 (<0.001 - 0.007)	0.003 (<0.001 - 0.007)
Nitrite Nitrogen (mg/L)		0.028 (<0.002 - 0.073)	0.046 (0.005 - 0.110)	0.038 (0.004 - 0.098)	0.046 (0.003 - 0.113)
Nitrate Nitrogen (mg/L)		0.097 (<0.002 - 0.225)	0.196 (0.045 - 0.326)	0.166 (0.033 - 0.309)	0.207 (0.063 - 0.347)
Total Inorganic Nitrogen (mg/L)		0.17 (0.02 - 0.32)	0.32 (0.11 - 0.46)	0.30 (0.12 - 0.45)	0.33 (0.16 - 0.47)
Total Kjeldahl Nitrogen (mg/L)		0.28 (0.13 - 0.52)	0.34 (0.12 - 0.70)	0.34 (0.13 - 0.83)	0.37 (0.14 - 0.85)
Total Nitrogen (mg/L)		0.41 (0.14 - 0.64)	0.58 (0.31 - 0.76)	0.54 (0.27 - 1.05)	0.62 (0.30 - 0.95)
Orthophosphate Phosphorus (mg/L)		0.013 (0.004 - 0.028)	0.018 (0.004 - 0.032)	0.018 (0.004 - 0.031)	0.019 (0.008 - 0.031)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.04)	0.03 (0.02 - 0.04)	0.03 (0.02 - 0.05)	0.03 (0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.83 (0.07 - 2.10)	1.16 (0.31 - 2.27)	1.04 (0.33 - 2.40)	1.27 (0.43 - 2.17)
Chlorophyll-*a* (µg/L)		3.3 (0.3 - 10.0)	2.7 (0.6 - 5.0)	2.8 (0.2 - 6.2)	2.0 (0.3 - 3.8)
E.coli (cfu/100mL)		23 (1 - 2600)	120 (9 - 3900)	320 (21 - 1300)	180 (38 - 2200)
Faecal Coliforms (cfu/100mL)		44 (2 - 4800)	240 (21 - 6600)	630 (43 - 2300)	320 (57 - 4400)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Junk Bay WCZ in 2018

Parameter		Junk Bay JM3	Junk Bay JM4
Number of samples		12	12
Temperature (°C)		22.9 (14.9 - 27.5)	22.7 (15.0 - 27.3)
Salinity		32.3 (30.7 - 33.8)	32.5 (31.2 - 33.8)
Dissolved Oxygen (mg/L)		6.5 (4.8 - 8.1)	6.2 (4.9 - 7.8)
	Bottom	6.3 (4.1 - 8.1)	5.9 (3.4 - 8.1)
Dissolved Oxygen (% saturation)		91 (72 - 115)	86 (73 - 99)
	Bottom	87 (58 - 104)	81 (48 - 103)
pH		8.0 (7.7 - 8.3)	8.0 (7.7 - 8.2)
Secchi Disc Depth (m)		3.1 (2.0 - 4.0)	2.9 (2.0 - 4.0)
Turbidity (NTU)		2.5 (1.2 - 6.7)	3.1 (1.8 - 8.2)
Suspended Solids (mg/L)		5.2 (1.8 - 10.5)	6.6 (1.5 - 11.1)
5-day Biochemical Oxygen Demand (mg/L)		0.7 (<0.1 - 2.0)	0.6 (<0.1 - 1.2)
Ammonia Nitrogen (mg/L)		0.044 (0.016 - 0.100)	0.041 (0.013 - 0.102)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.005)
Nitrite Nitrogen (mg/L)		0.020 (<0.002 - 0.051)	0.021 (<0.002 - 0.044)
Nitrate Nitrogen (mg/L)		0.068 (<0.002 - 0.180)	0.063 (0.009 - 0.173)
Total Inorganic Nitrogen (mg/L)		0.13 (0.02 - 0.22)	0.12 (0.03 - 0.21)
Total Kjeldahl Nitrogen (mg/L)		0.54 (0.17 - 0.93)	0.57 (0.16 - 1.37)
Total Nitrogen (mg/L)		0.63 (0.22 - 0.99)	0.66 (0.24 - 1.38)
Orthophosphate Phosphorus (mg/L)		0.011 (0.005 - 0.022)	0.011 (0.005 - 0.021)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.03 (<0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.57 (0.07 - 1.40)	0.66 (0.10 - 1.27)
Chlorophyll-*a* (µg/L)		5.0 (0.3 - 19.0)	3.7 (0.2 - 12.2)
E.coli (cfu/100mL)		22 (2 - 100)	34 (1 - 200)
Faecal Coliforms (cfu/100mL)		80 (6 - 800)	80 (5 - 560)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Deep Bay WCZ in 2018

Parameter		Inner Deep Bay			Outer Deep Bay	
		DM1	DM2	DM3	DM4	DM5
Number of samples		12	12	12	12	12
Temperature (°C)		25.4 (18.8 - 31.6)	25.3 (19.0 - 31.3)	25.5 (18.7 - 31.5)	25.0 (17.8 - 31.1)	24.7 (17.4 - 30.5)
Salinity		14.5 (3.2 - 23.3)	16.7 (4.8 - 25.3)	21.3 (10.0 - 27.9)	22.7 (10.5 - 28.7)	25.9 (19.4 - 30.2)
Dissolved Oxygen (mg/L)		4.5 (1.5 - 8.5)	5.1 (2.9 - 7.5)	5.5 (3.4 - 7.7)	5.8 (4.1 - 10.0)	6.0 (4.4 - 9.0)
	Bottom	NA	NA	NA	5.9 (3.5 - 10.5)	5.9 (3.5 - 8.3)
Dissolved Oxygen (% saturation)		59 (20 - 112)	68 (40 - 99)	75 (49 - 98)	79 (59 - 129)	83 (64 - 115)
	Bottom	NA	NA	NA	81 (49 - 135)	81 (50 - 105)
pH		7.2 (6.9 - 7.5)	7.3 (6.9 - 7.6)	7.4 (7.0 - 7.7)	7.6 (7.2 - 7.8)	7.7 (7.4 - 7.9)
Secchi Disc Depth (m)		1.2 (1.0 - 1.8)	1.2 (0.9 - 1.6)	1.5 (1.0 - 2.0)	1.7 (1.0 - 3.0)	2.0 (1.3 - 3.0)
Turbidity (NTU)		27.1 (12.8 - 54.1)	26.6 (12.2 - 66.2)	10.6 (3.9 - 21.9)	5.8 (3.5 - 8.9)	4.5 (2.4 - 6.2)
Suspended Solids (mg/L)		39.9 (21.0 - 98.0)	38.7 (18.0 - 92.0)	16.5 (8.6 - 31.0)	11.8 (5.7 - 21.0)	8.9 (5.1 - 14.0)
5-day Biochemical Oxygen Demand (mg/L)		2.4 (0.8 - 4.0)	2.2 (0.9 - 4.2)	1.1 (0.6 - 3.4)	1.1 (0.5 - 3.8)	1.1 (0.5 - 3.4)
Ammonia Nitrogen (mg/L)		0.679 (0.016 - 1.900)	0.475 (0.210 - 0.960)	0.121 (<0.005 - 0.220)	0.116 (<0.005 - 0.255)	0.101 (0.028 - 0.197)
Unionised Ammonia (mg/L)		0.007 (<0.001 - 0.026)	0.005 (<0.001 - 0.015)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.004)	0.002 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.400 (0.093 - 1.000)	0.347 (0.065 - 1.000)	0.192 (0.035 - 0.480)	0.142 (0.032 - 0.415)	0.101 (0.028 - 0.283)
Nitrate Nitrogen (mg/L)		1.513 (0.570 - 2.400)	1.378 (0.710 - 1.800)	0.965 (0.750 - 1.300)	0.797 (0.500 - 1.500)	0.562 (0.283 - 0.870)
Total Inorganic Nitrogen (mg/L)		2.59 (1.54 - 4.00)	2.20 (1.78 - 3.06)	1.28 (0.94 - 1.78)	1.05 (0.63 - 1.70)	0.76 (0.39 - 1.09)
Total Kjeldahl Nitrogen (mg/L)		1.48 (0.59 - 4.00)	0.91 (0.57 - 1.80)	0.37 (0.19 - 0.74)	0.31 (0.15 - 0.41)	0.29 (0.15 - 0.47)
Total Nitrogen (mg/L)		3.39 (2.33 - 5.52)	2.64 (2.19 - 3.90)	1.53 (1.11 - 2.10)	1.25 (0.74 - 1.95)	0.96 (0.54 - 1.32)
Orthophosphate Phosphorus (mg/L)		0.174 (0.099 - 0.320)	0.144 (0.077 - 0.250)	0.076 (0.031 - 0.160)	0.044 (0.021 - 0.073)	0.026 (0.008 - 0.043)
Total Phosphorus (mg/L)		0.26 (0.18 - 0.36)	0.23 (0.18 - 0.36)	0.11 (0.08 - 0.16)	0.07 (0.04 - 0.09)	0.04 (0.03 - 0.06)
Silica (as SiO_2) (mg/L)		8.15 (3.80 - 18.00)	7.12 (2.00 - 17.00)	4.26 (1.00 - 9.80)	3.43 (1.40 - 7.50)	2.37 (1.07 - 4.30)
Chlorophyll-*a* (µg/L)		4.5 (1.6 - 9.0)	5.1 (1.6 - 15.0)	2.7 (0.9 - 7.0)	3.0 (0.8 - 15.2)	3.5 (0.6 - 14.0)
E.coli (cfu/100mL)		990 (49 - 200000)	380 (18 - 7900)	11 (1 - 370)	56 (5 - 410)	280 (15 - 880)
Faecal Coliforms (cfu/100mL)		1900 (110 - 600000)	820 (67 - 31000)	30 (2 - 900)	120 (15 - 990)	630 (35 - 1900)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

4. NA (Not Applicable) indicates the measurement was not made due to shallow water.

Summary of water quality statistics for the North Western WCZ in 2018

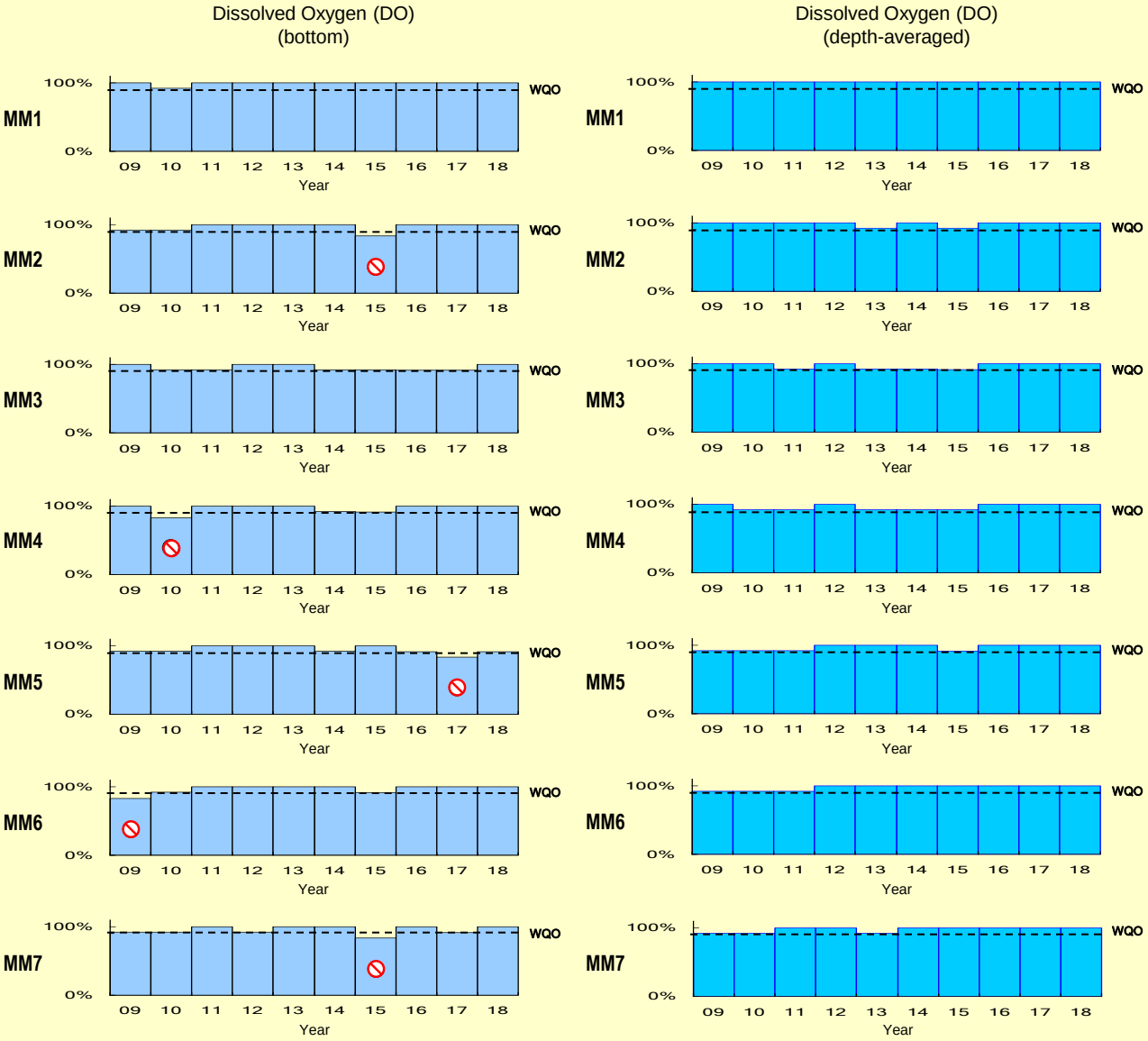
Parameter		Lantau Island (North) NM1	Pearl Island NM2	Pillar Point NM3	Urmston Road NM5	Chek Lap Kok (North) NM6	Chek Lap Kok (West) NM8
Number of samples		12	12	12	12	12	12
Temperature (°C)		23.6 (16.6 - 27.9)	23.8 (16.7 - 28.2)	23.9 (16.9 - 28.6)	24.1 (16.9 - 28.6)	24.3 (16.6 - 28.9)	24.1 (16.4 - 28.9)
Salinity		30.3 (25.9 - 32.3)	29.2 (24.3 - 32.3)	29.1 (24.9 - 32.0)	27.6 (21.0 - 31.6)	26.3 (17.3 - 30.6)	28.1 (20.8 - 31.9)
Dissolved Oxygen (mg/L)		5.8 (4.2 - 7.3)	5.9 (4.3 - 7.4)	5.9 (4.0 - 7.4)	5.9 (4.1 - 7.7)	6.3 (4.8 - 8.3)	6.5 (4.5 - 8.2)
	Bottom	5.5 (3.0 - 7.5)	5.7 (3.1 - 7.5)	5.6 (2.9 - 7.7)	5.5 (2.6 - 7.5)	6.4 (4.0 - 8.8)	6.2 (3.4 - 8.2)
Dissolved Oxygen (% saturation)		80 (62 - 92)	82 (64 - 92)	82 (58 - 98)	81 (58 - 97)	87 (67 - 121)	90 (64 - 114)
	Bottom	77 (43 - 95)	79 (45 - 93)	78 (42 - 100)	76 (38 - 100)	88 (56 - 127)	87 (49 - 102)
pH		8.0 (7.7 - 8.1)	8.0 (7.7 - 8.2)	8.0 (7.7 - 8.2)	8.0 (7.7 - 8.2)	8.0 (7.7 - 8.3)	8.1 (7.8 - 8.2)
Secchi Disc Depth (m)		2.8 (2.0 - 4.0)	2.7 (2.0 - 3.6)	2.4 (1.9 - 3.5)	2.5 (1.7 - 4.0)	2.2 (1.6 - 3.0)	2.3 (1.9 - 3.0)
Turbidity (NTU)		5.3 (1.9 - 8.7)	4.9 (1.7 - 8.0)	5.7 (1.9 - 9.2)	8.6 (3.2 - 17.5)	8.9 (1.6 - 28.8)	6.9 (2.2 - 10.6)
Suspended Solids (mg/L)		9.3 (2.8 - 20.0)	9.0 (3.0 - 18.7)	11.1 (5.3 - 22.0)	13.8 (7.3 - 35.0)	13.3 (5.4 - 28.7)	14.6 (5.8 - 42.0)
5-day Biochemical Oxygen Demand (mg/L)		0.7 (0.3 - 1.5)	0.7 (0.2 - 1.5)	0.7 (0.2 - 1.4)	0.7 (0.2 - 1.2)	0.8 (0.4 - 1.5)	0.7 (0.2 - 1.5)
Ammonia Nitrogen (mg/L)		0.084 (0.014 - 0.137)	0.080 (0.006 - 0.133)	0.078 (0.016 - 0.137)	0.086 (0.029 - 0.147)	0.085 (0.009 - 0.287)	0.040 (0.007 - 0.098)
Unionised Ammonia (mg/L)		0.003 (<0.001 - 0.005)	0.003 (<0.001 - 0.005)	0.003 (<0.001 - 0.005)	0.003 (0.001 - 0.006)	0.004 (<0.001 - 0.011)	0.002 (<0.001 - 0.005)
Nitrite Nitrogen (mg/L)		0.053 (0.012 - 0.164)	0.061 (0.013 - 0.130)	0.066 (0.013 - 0.157)	0.088 (0.014 - 0.230)	0.098 (0.024 - 0.297)	0.059 (0.018 - 0.150)
Nitrate Nitrogen (mg/L)		0.221 (0.070 - 0.510)	0.282 (0.076 - 0.480)	0.314 (0.137 - 0.560)	0.428 (0.230 - 0.817)	0.504 (0.253 - 1.100)	0.329 (0.160 - 0.857)
Total Inorganic Nitrogen (mg/L)		0.36 (0.15 - 0.69)	0.42 (0.16 - 0.60)	0.46 (0.19 - 0.77)	0.60 (0.34 - 1.08)	0.69 (0.34 - 1.41)	0.43 (0.20 - 1.02)
Total Kjeldahl Nitrogen (mg/L)		0.40 (0.19 - 1.05)	0.36 (0.18 - 0.81)	0.32 (0.18 - 0.69)	0.33 (0.20 - 0.71)	0.35 (0.17 - 0.74)	0.31 (0.14 - 0.93)
Total Nitrogen (mg/L)		0.68 (0.33 - 1.23)	0.70 (0.37 - 1.04)	0.70 (0.43 - 0.94)	0.85 (0.54 - 1.30)	0.95 (0.52 - 1.62)	0.70 (0.41 - 1.25)
Orthophosphate Phosphorus (mg/L)		0.017 (<0.002 - 0.029)	0.018 (0.002 - 0.035)	0.019 (0.004 - 0.039)	0.021 (0.004 - 0.037)	0.020 (0.002 - 0.041)	0.012 (<0.002 - 0.028)
Total Phosphorus (mg/L)		0.03 (0.03 - 0.04)	0.03 (0.03 - 0.04)	0.04 (0.03 - 0.05)	0.04 (0.03 - 0.06)	0.04 (0.03 - 0.07)	0.03 (0.02 - 0.04)
Silica (as SiO_2) (mg/L)		1.21 (0.22 - 3.23)	1.31 (0.34 - 2.47)	1.44 (0.43 - 3.10)	1.96 (0.67 - 4.57)	2.20 (0.63 - 5.57)	1.47 (0.11 - 4.00)
Chlorophyll-*a* (µg/L)		3.1 (0.5 - 15.4)	3.5 (0.5 - 19.7)	3.1 (0.4 - 11.8)	2.8 (0.3 - 10.6)	4.1 (0.9 - 20.3)	4.6 (0.6 - 19.2)
E.coli (cfu/100mL)		140 (14 - 780)	54 (3 - 660)	98 (4 - 3600)	210 (8 - 1100)	42 (2 - 350)	4 (<1 - 270)
Faecal Coliforms (cfu/100mL)		290 (30 - 1800)	120 (12 - 1100)	230 (7 - 10000)	470 (24 - 2200)	77 (2 - 860)	9 (2 - 500)

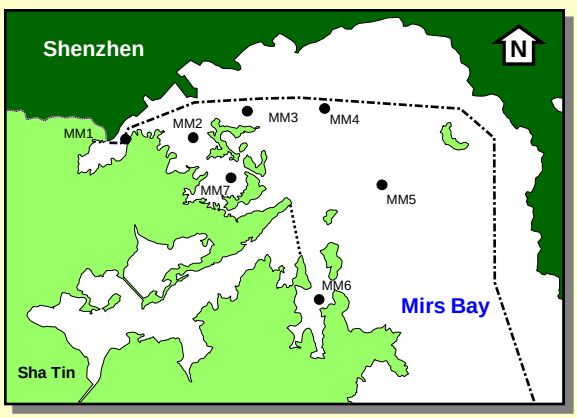
Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ



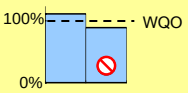


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

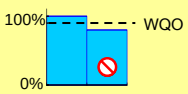
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

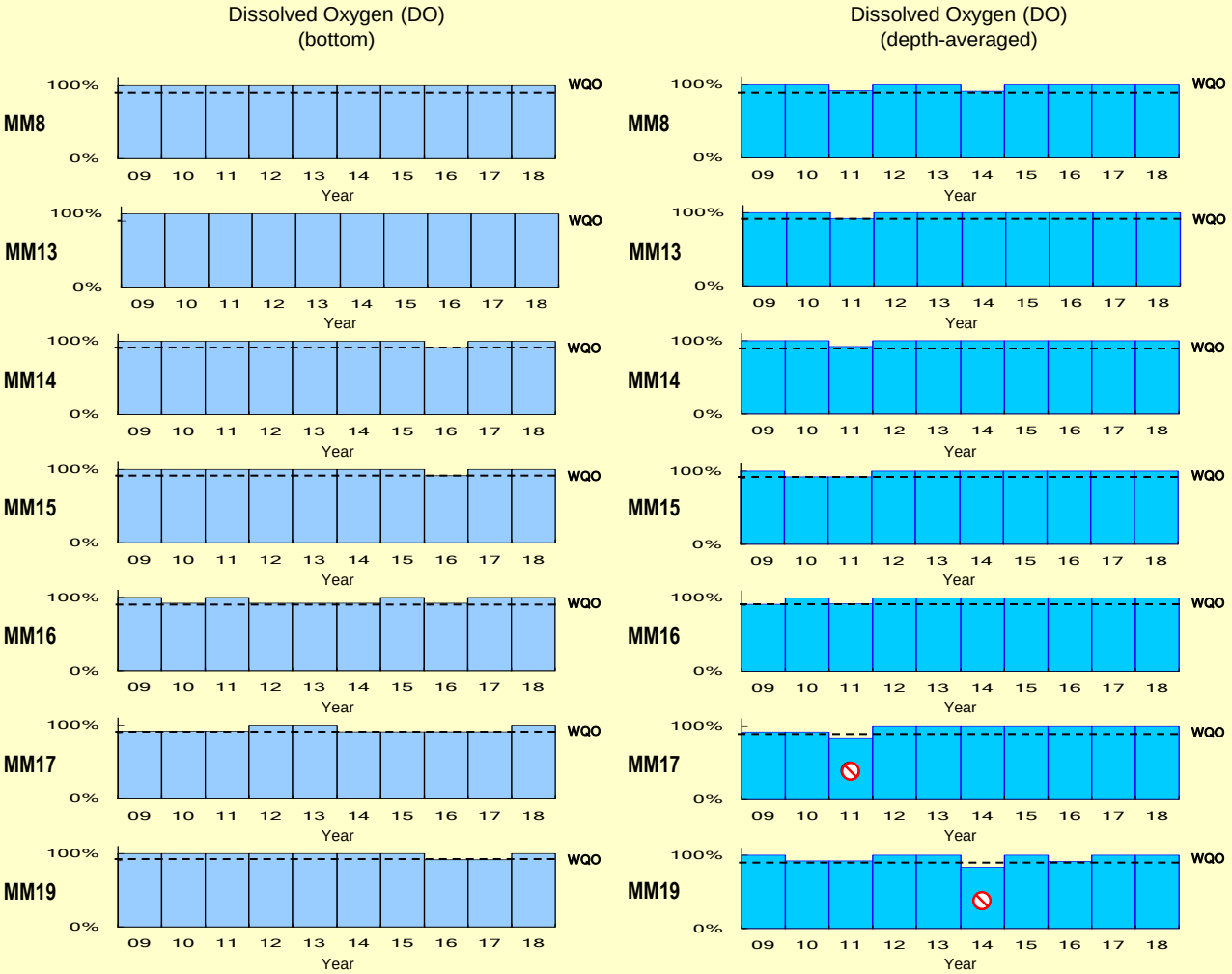
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

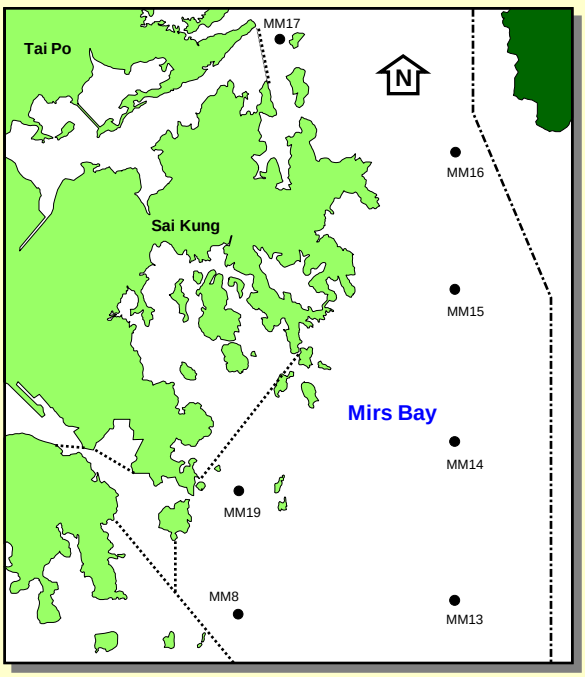
% sample with depth-averaged DO ≥ 4 mg/L



Non-compliance

Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ (continued)





Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

2. Depth-averaged

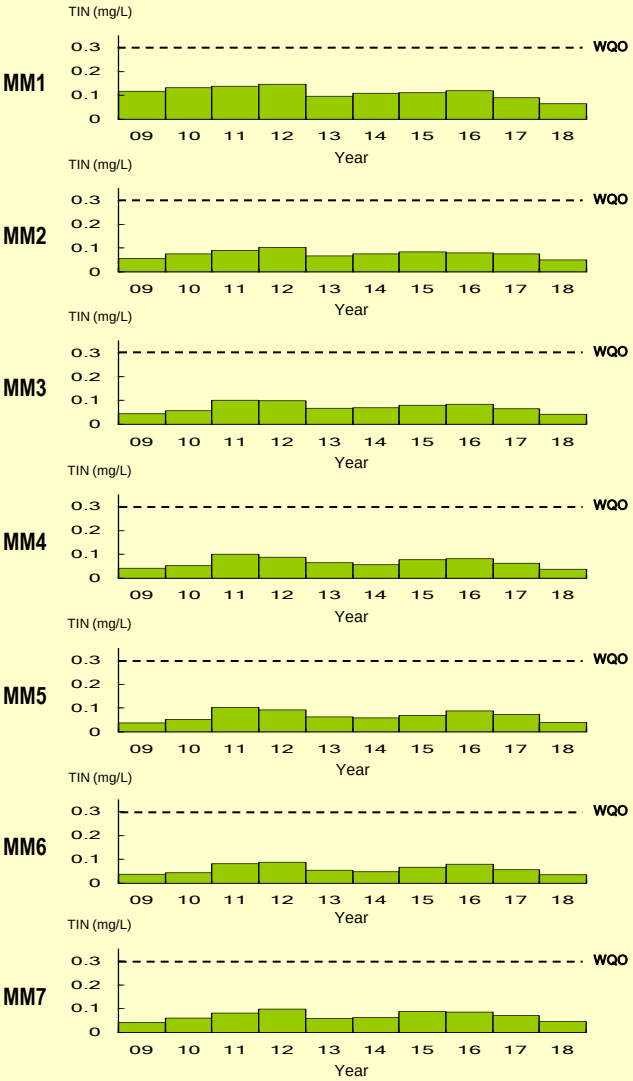
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L

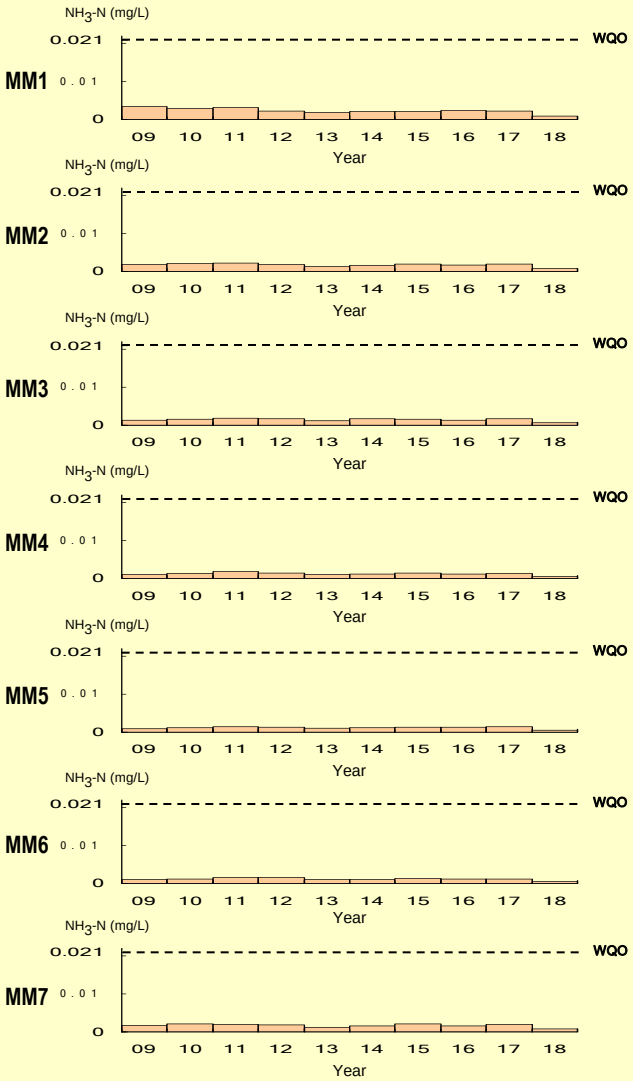
Non-compliance

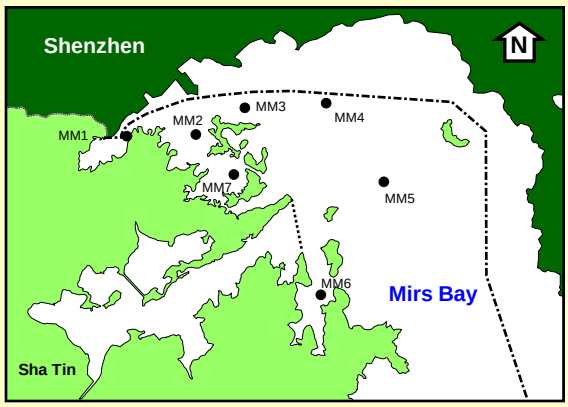
Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)



Unionised Ammonia (NH_3-N) (depth-averaged)





Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.3 mg/L

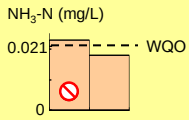
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

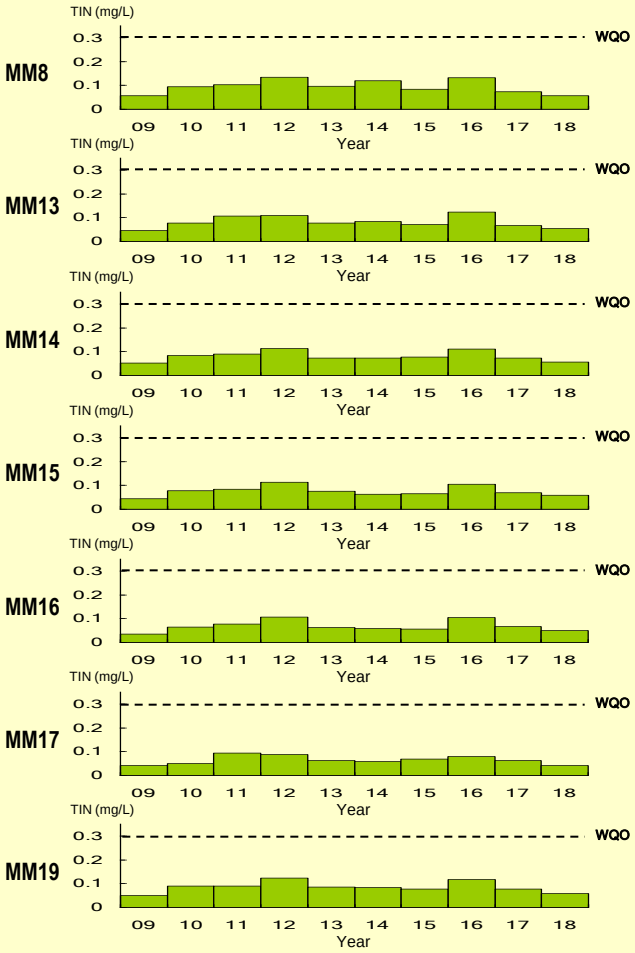
annual mean for depth-averaged NH_3-N

Non-compliance

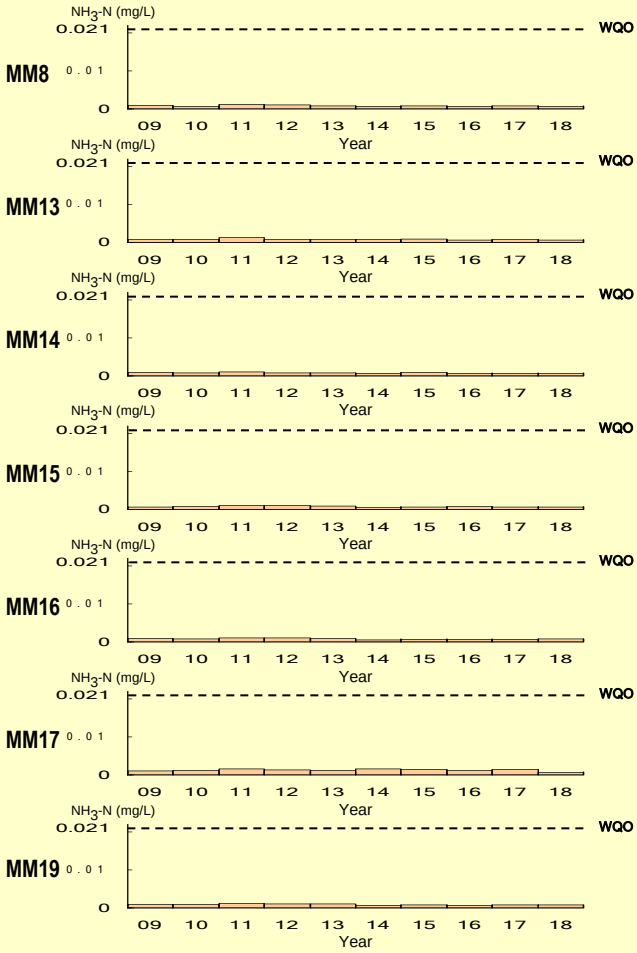


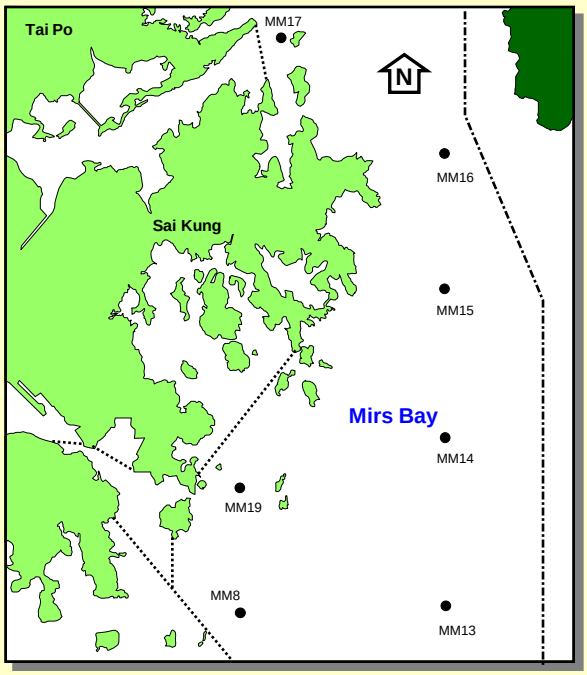
Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)





Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.3 mg/L

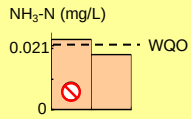
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

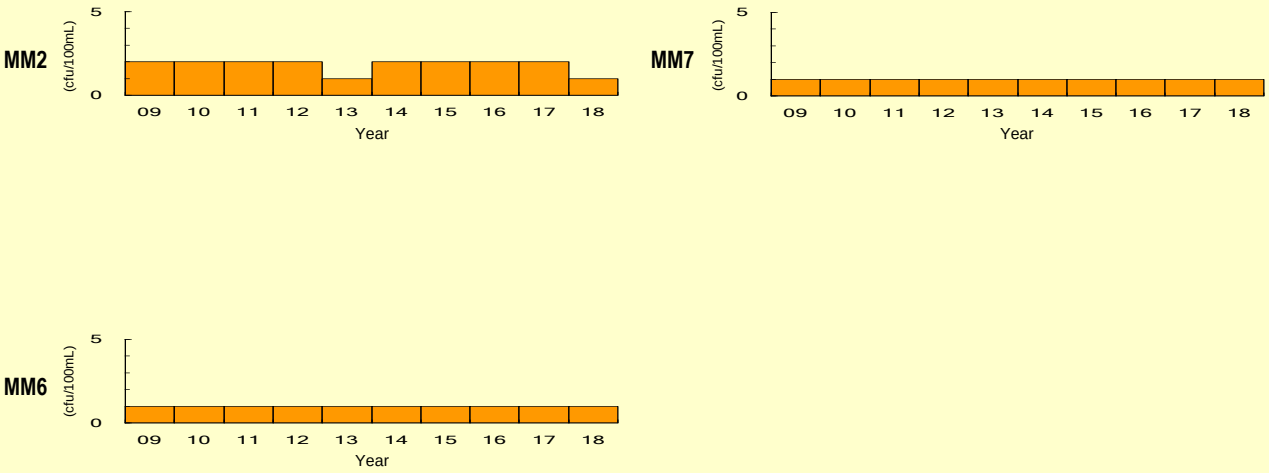
annual mean for depth-averaged NH_3-N

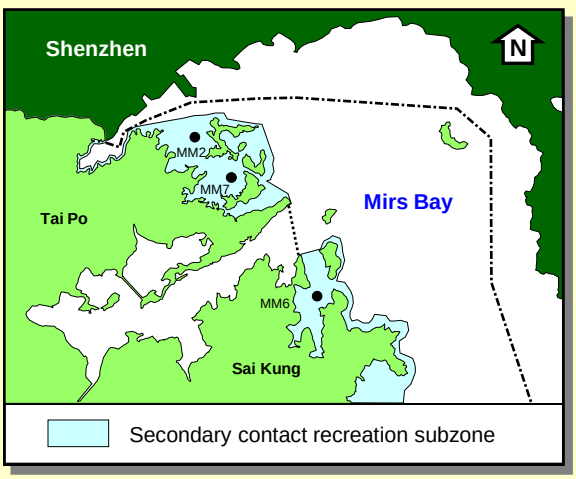
Non-compliance



Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ (continued)

E. coli
(annual geometric mean)





E. coli

WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli ≤ 610 cfu/100mL

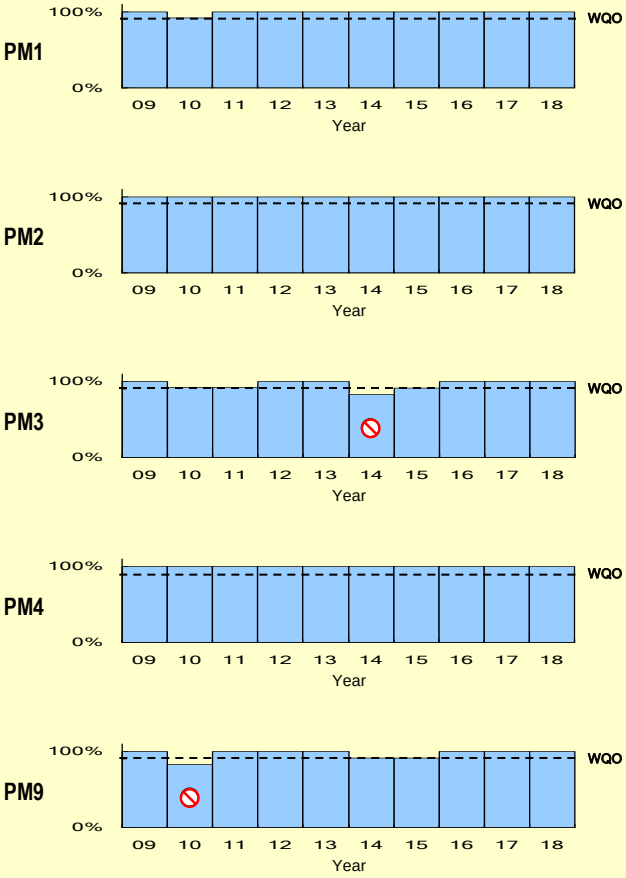
annual geometric mean for depth averaged *E. coli* (cfu/100mL)

610
WQO
0

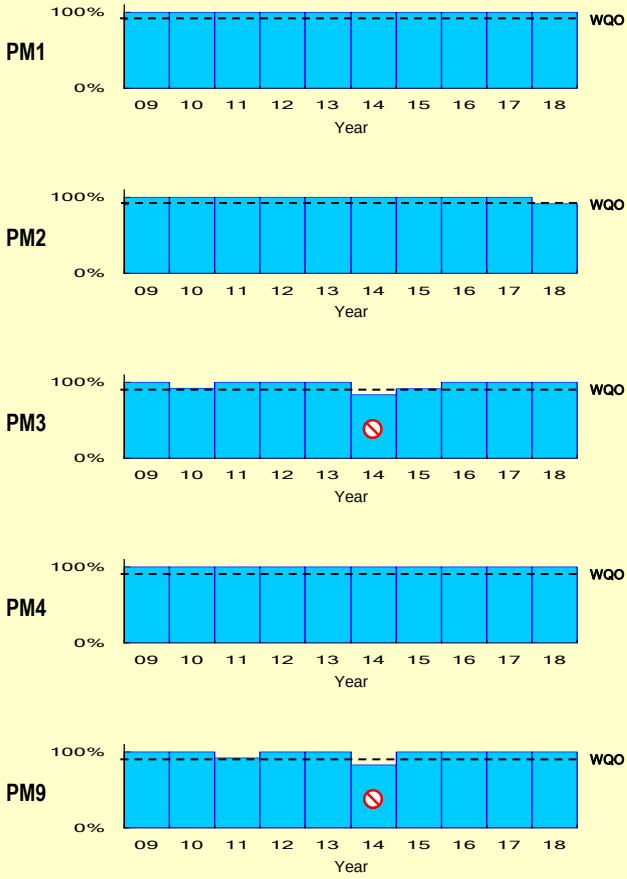
Non-compliance

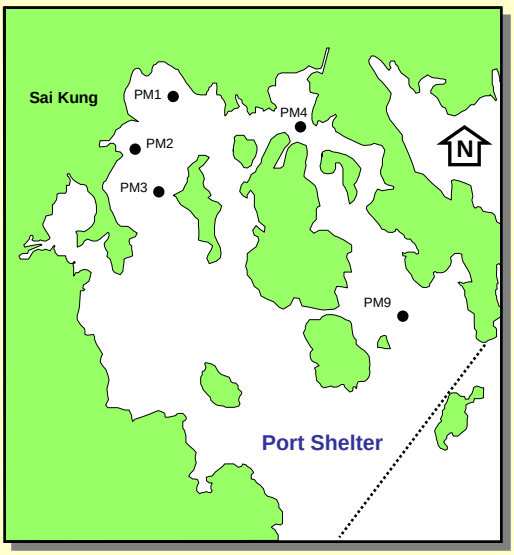
Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



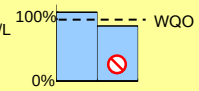


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

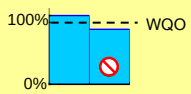


2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

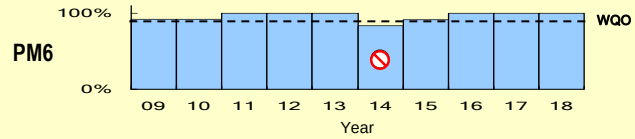
% sample with depth-averaged DO ≥ 4 mg/L

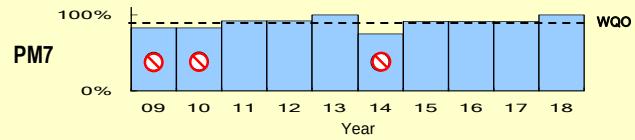
Non-compliance

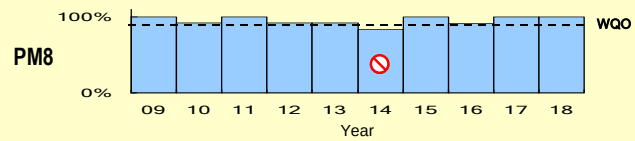


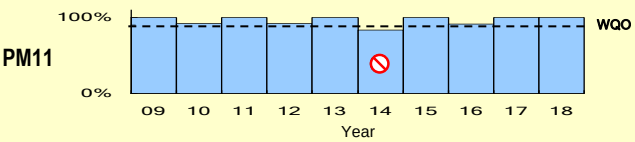
Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ (continued)

Dissolved Oxygen (DO)
(bottom)

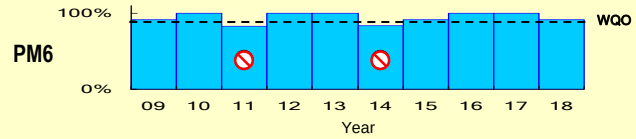


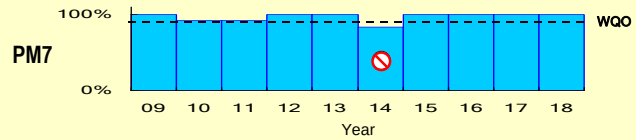


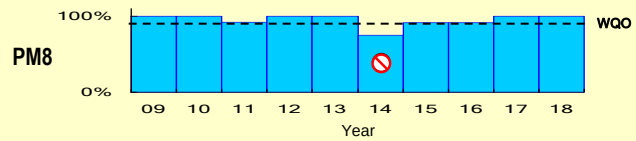


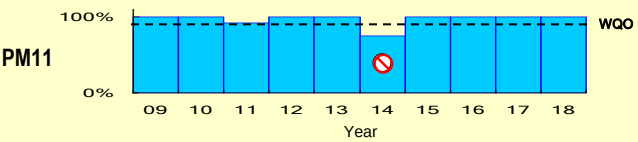


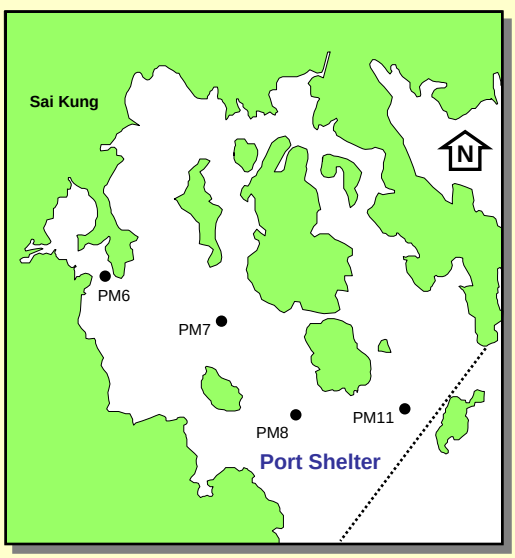
Dissolved Oxygen (DO)
(depth-averaged)









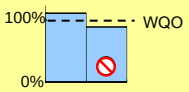


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

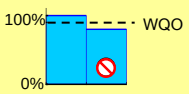
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

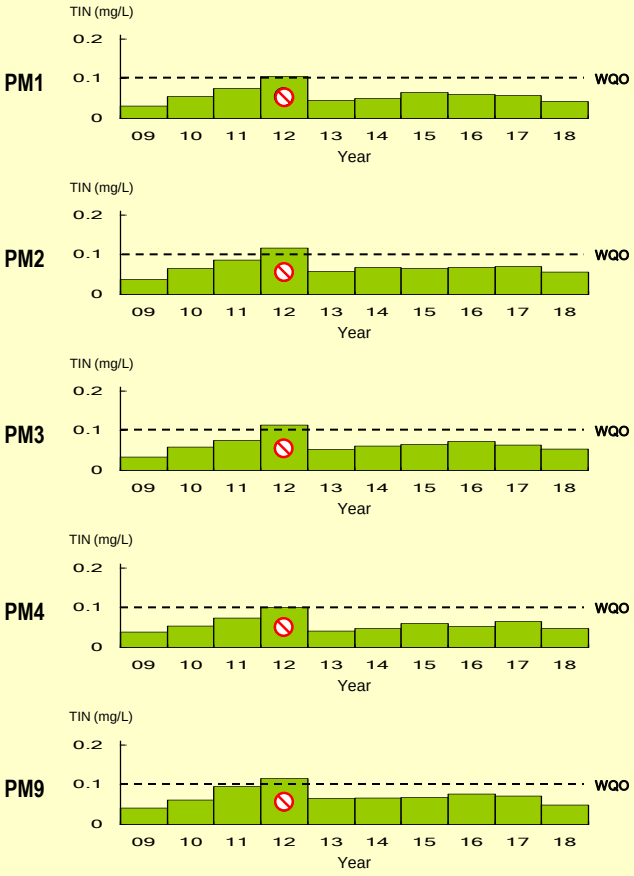
% sample with depth-averaged DO ≥ 4 mg/L



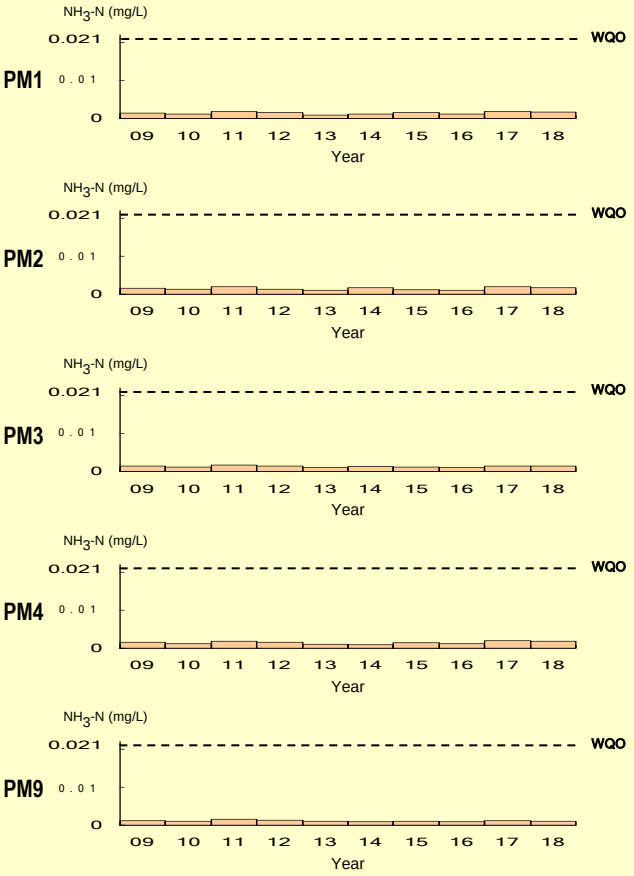
Non-compliance

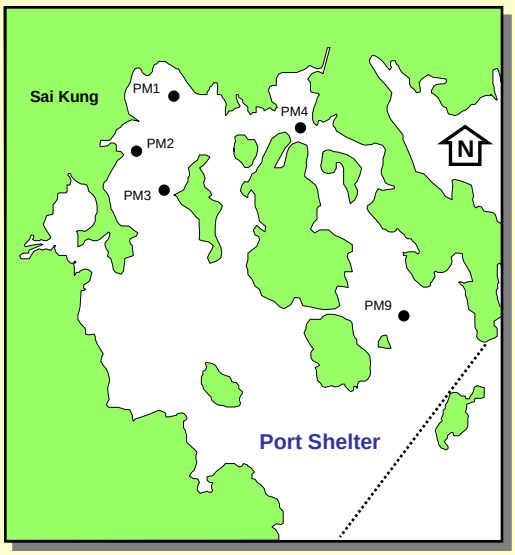
Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)

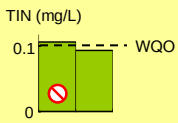




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.1 mg/L

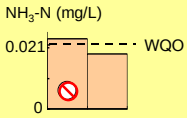
annual mean for depth-averaged TIN



Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

annual mean for depth-averaged NH_3-N

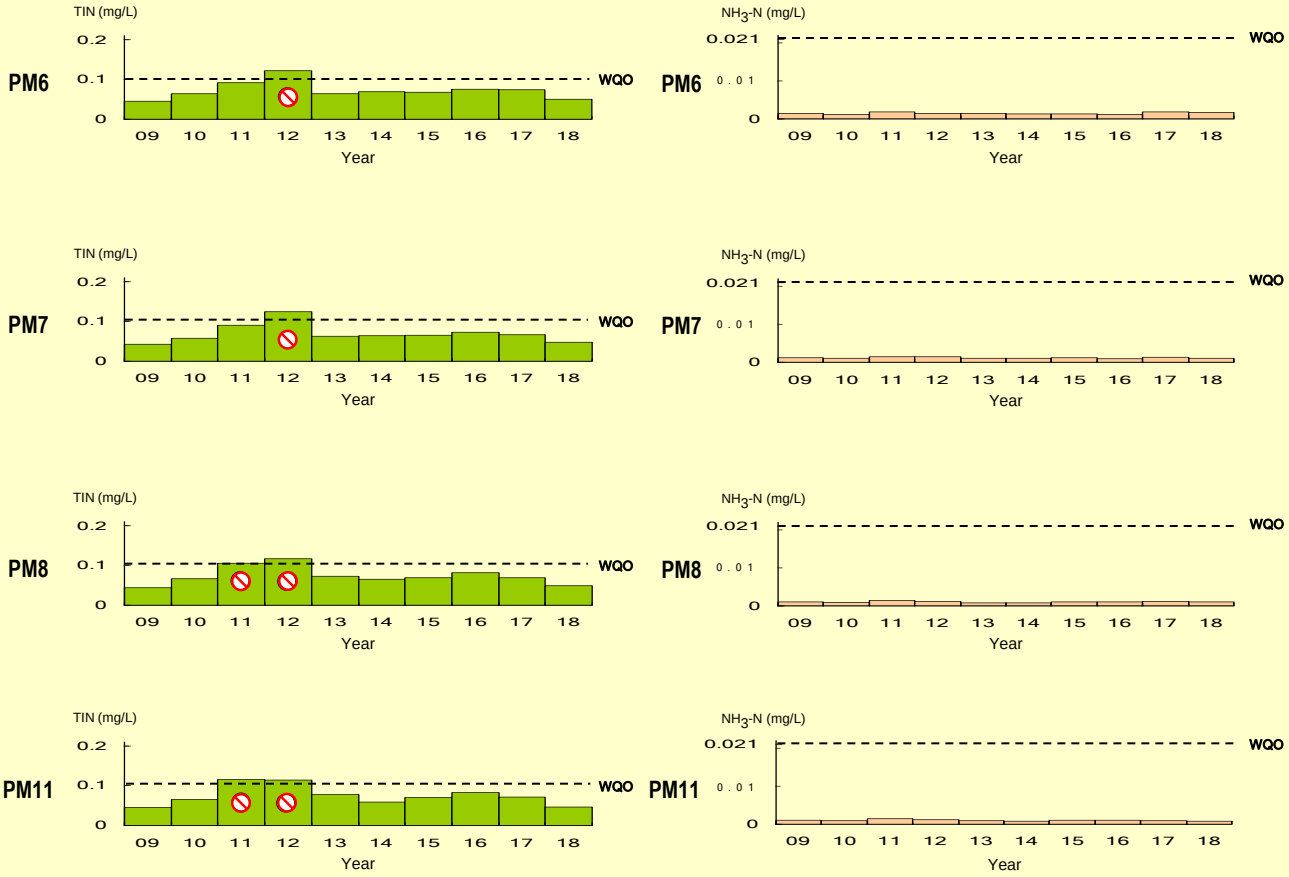


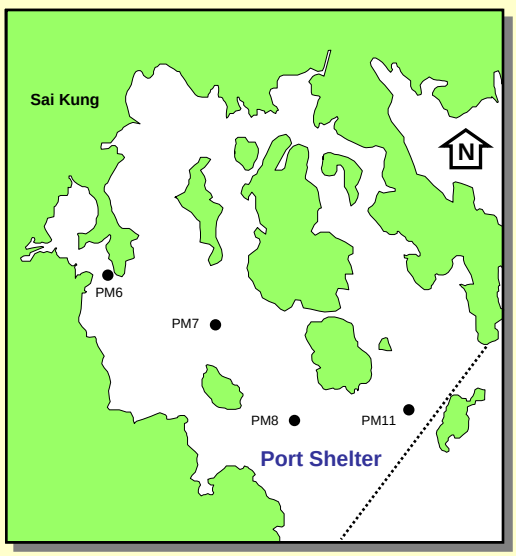
Non-compliance

Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)

Unionised Ammonia (NH_3-N) (depth-averaged)

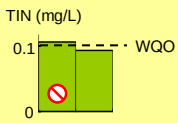




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.1 mg/L

annual mean for depth-averaged TIN

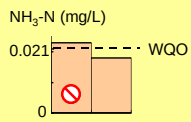


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

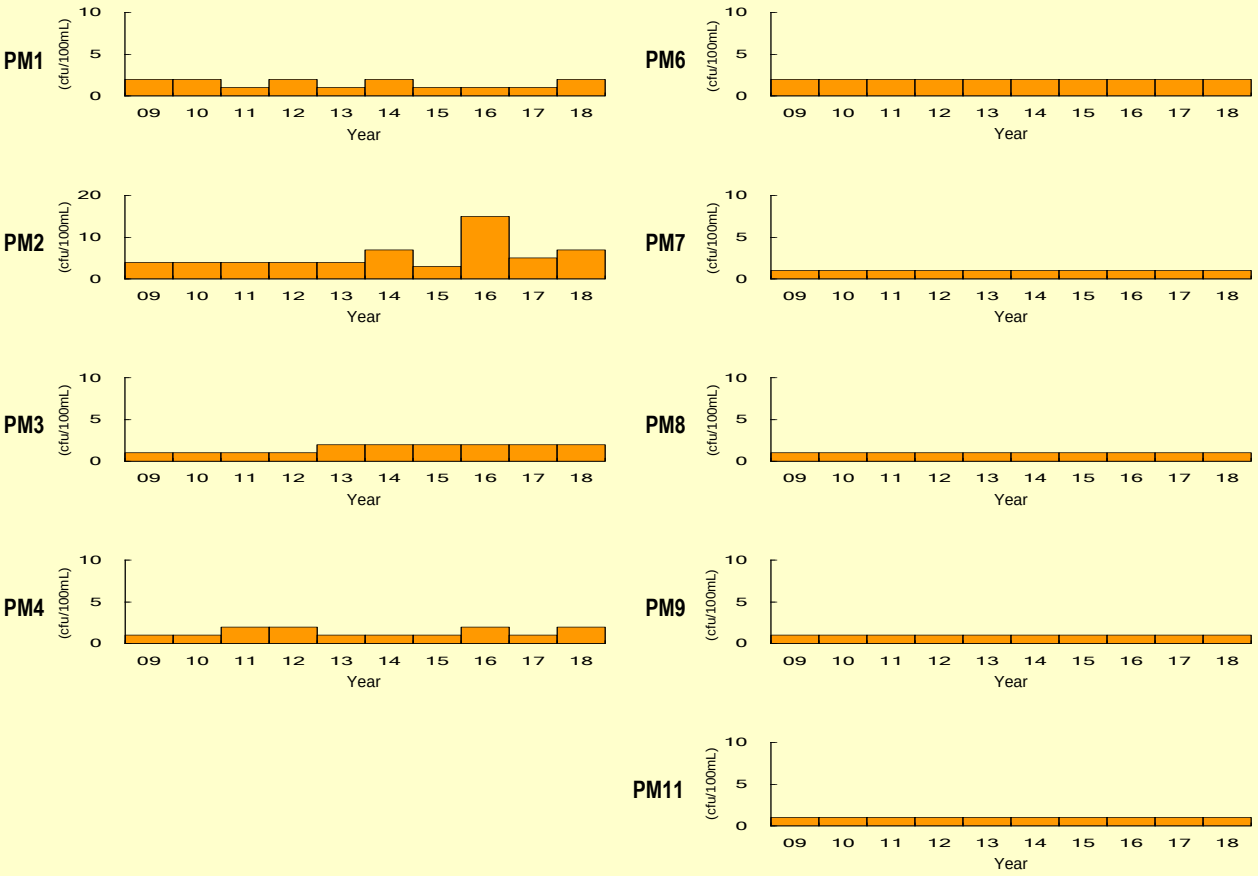
annual mean for depth-averaged NH_3-N

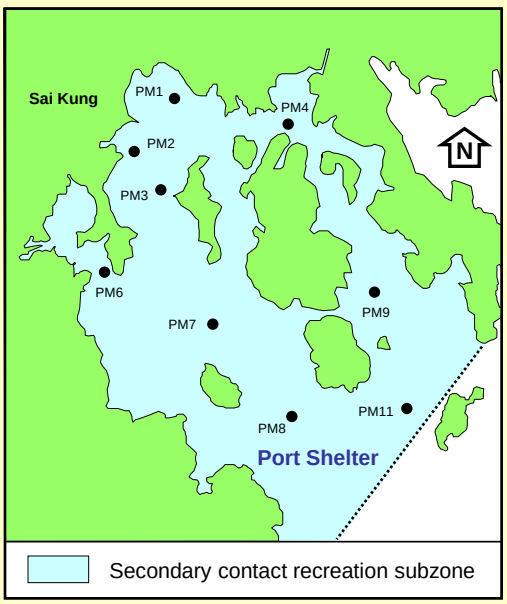
Non-compliance



Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ (continued)

E. coli
(annual geometric mean)





E. coli

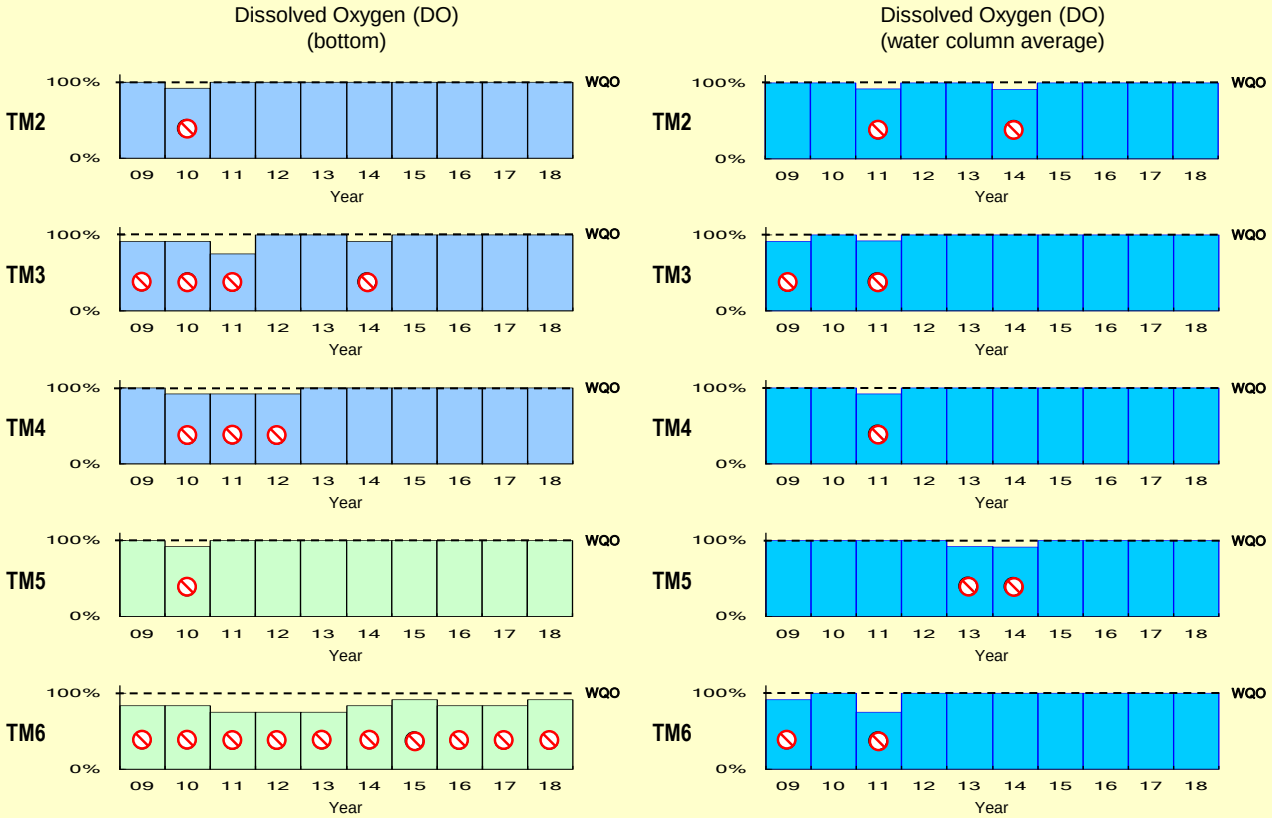
WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli ≤ 610 cfu/100mL

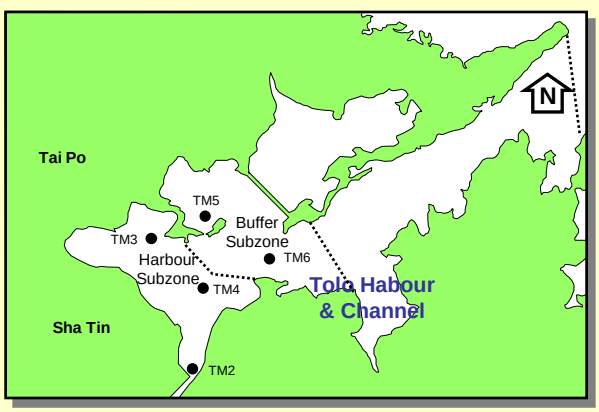
annual geometric mean for depth averaged *E. coli* (cfu/100mL)

610 WQO
0

Non-compliance

Levels of compliance with key Water Quality Objectives in the Tolo Harbour and Channel WCZ





Dissolved Oxygen (DO)

Harbour Subzone (TM2 - TM4)

1. Bottom

WQO : 100% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

2. Water column average (surface to 2m above bottom)

WQO : 100% sample with water column average DO ≥ 4 mg/L

% sample with water column average DO ≥ 4 mg/L

Buffer Subzone (TM5 - TM6)

1. Bottom

WQO : 100% sample with bottom DO ≥ 3 mg/L

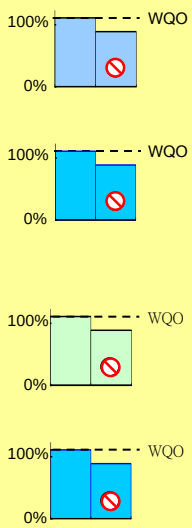
% sample with bottom DO ≥ 3 mg/L

2. Water column average (surface to 2m above bottom)

WQO : 100% sample with water column average DO ≥ 4 mg/L

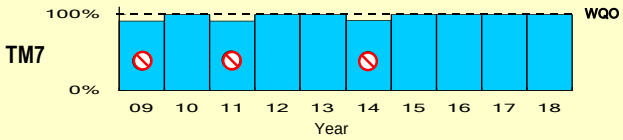
% sample with water column average DO ≥ 4 mg/L

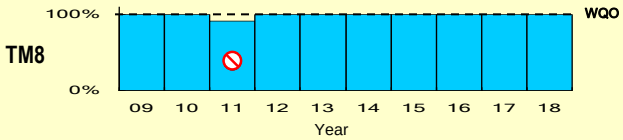
Non-compliance



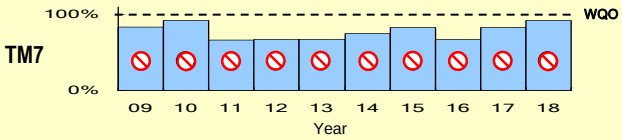
Levels of compliance with key Water Quality Objectives in the Tolo Harbour and Channel WCZ (continued)

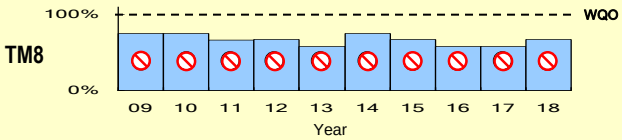
Dissolved Oxygen (DO)
(surface)



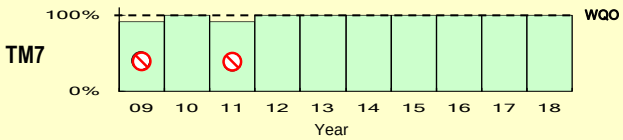


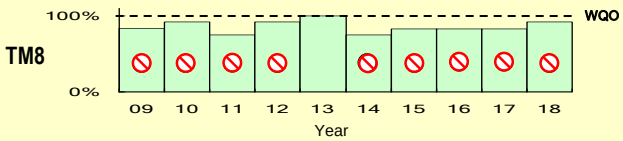
Dissolved Oxygen (DO)
(bottom)

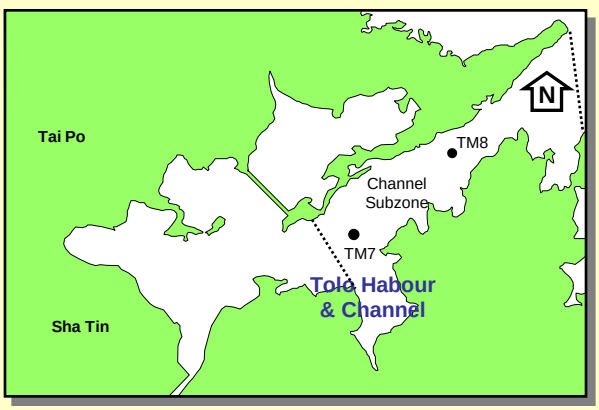




Dissolved Oxygen (DO)
(middle)







Dissolved Oxygen (DO)

Channel Subzone (TM7 - TM8)

1. Surface

WQO : 100% sample with surface DO ≥ 4 mg/L

% sample with surface DO ≥ 4 mg/L

2. Middle

WQO : 100% sample with middle DO ≥ 4 mg/L

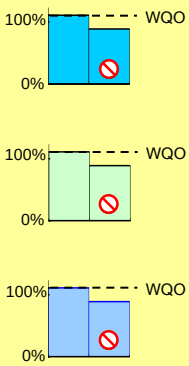
% sample with middle DO ≥ 4 mg/L

3. Bottom

WQO : 100% sample with bottom DO ≥ 4 mg/L

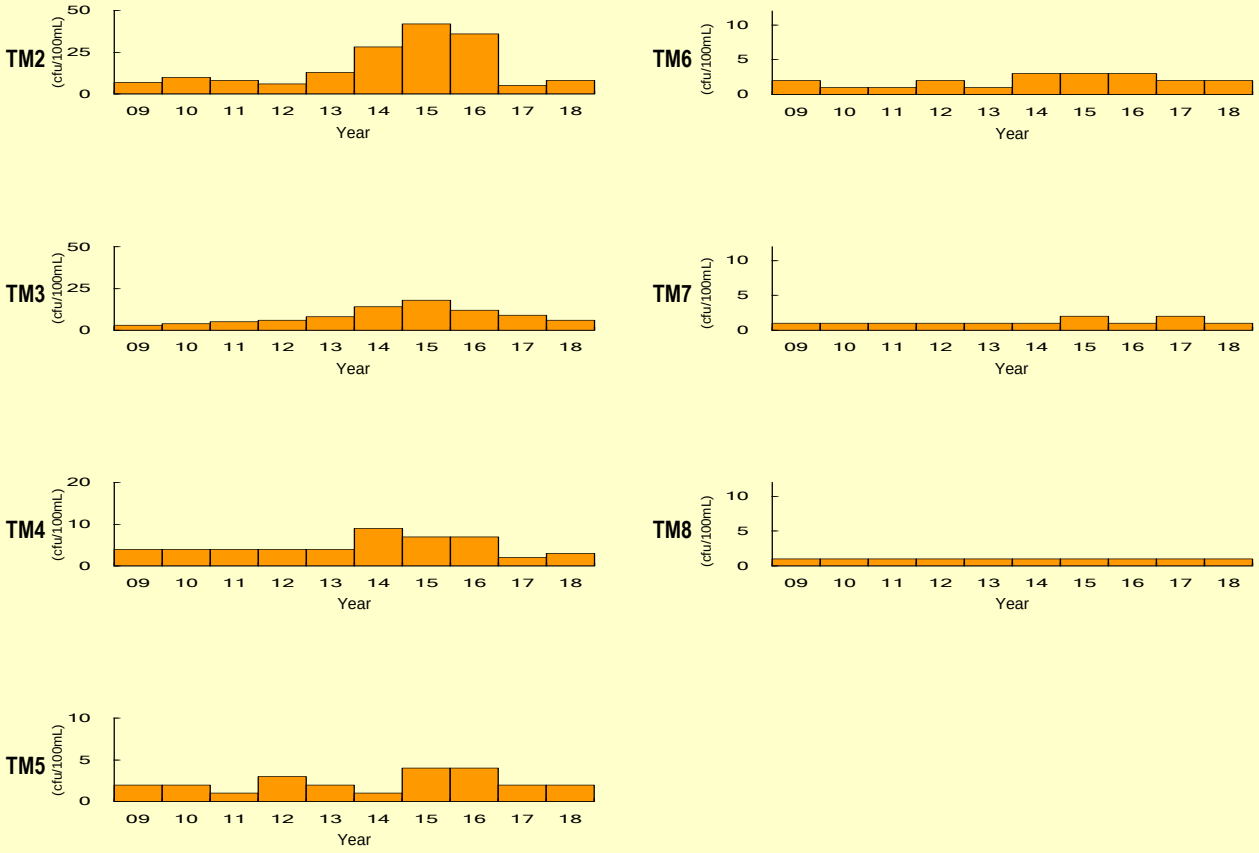
% sample with bottom DO ≥ 4 mg/L

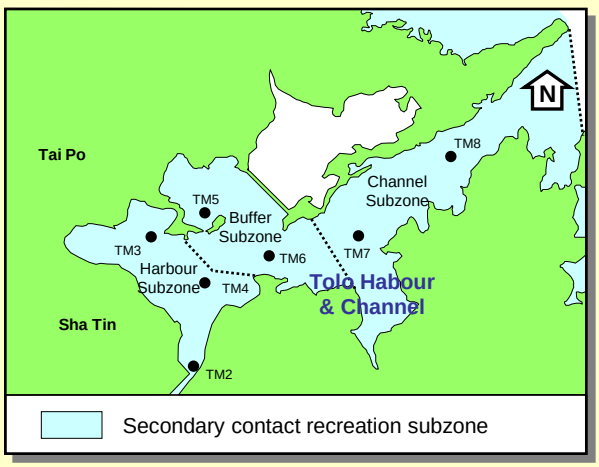
Non-compliance



Levels of compliance with key Water Quality Objectives in the Tolo Harbour and Channel WCZ (continued)

E. coli
(annual geometric mean)



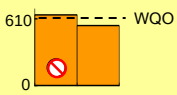


E. coli

WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli ≤ 610 cfu/100mL

annual geometric mean for depth averaged *E. coli* (cfu/100mL)

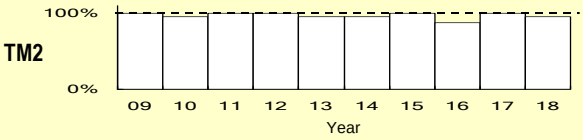
Non-compliance

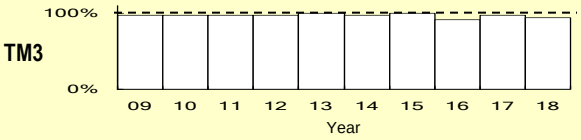


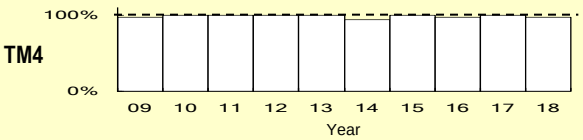
Levels of chlorophyll-*a* in the Tolo Harbour and Channel WCZ

Chlorophyll-*a*

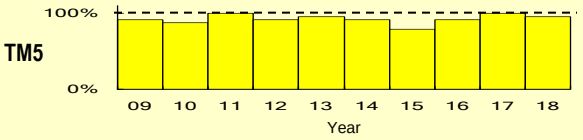
1. Harbour Subzone

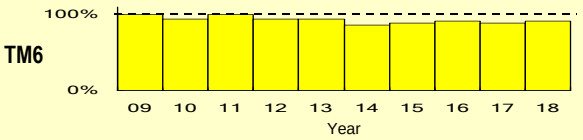




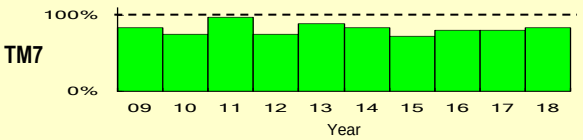


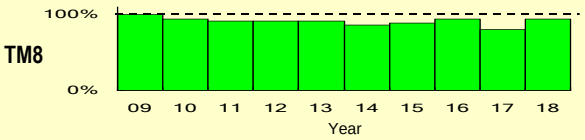
2. Buffer Subzone

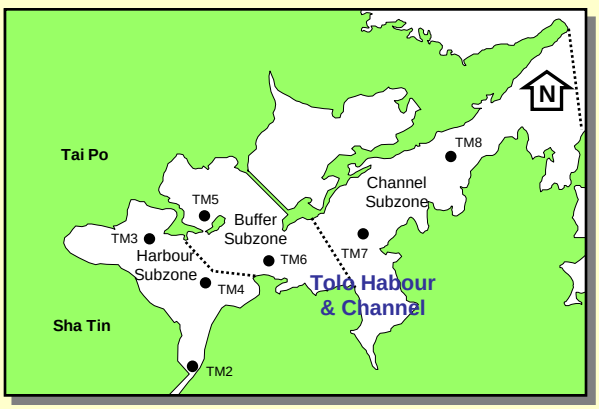




3. Channel Subzone







Chlorophyll-*a*

1. Harbour Subzone

% sample (S, M, B) with Chlorophyll-*a* ≤ 20 μg/L

WQO : Chlorophyll-*a* ≤ 20 μg/L

2. Buffer Subzone

% sample (S, M, B) with Chlorophyll-*a* ≤ 10 μg/L

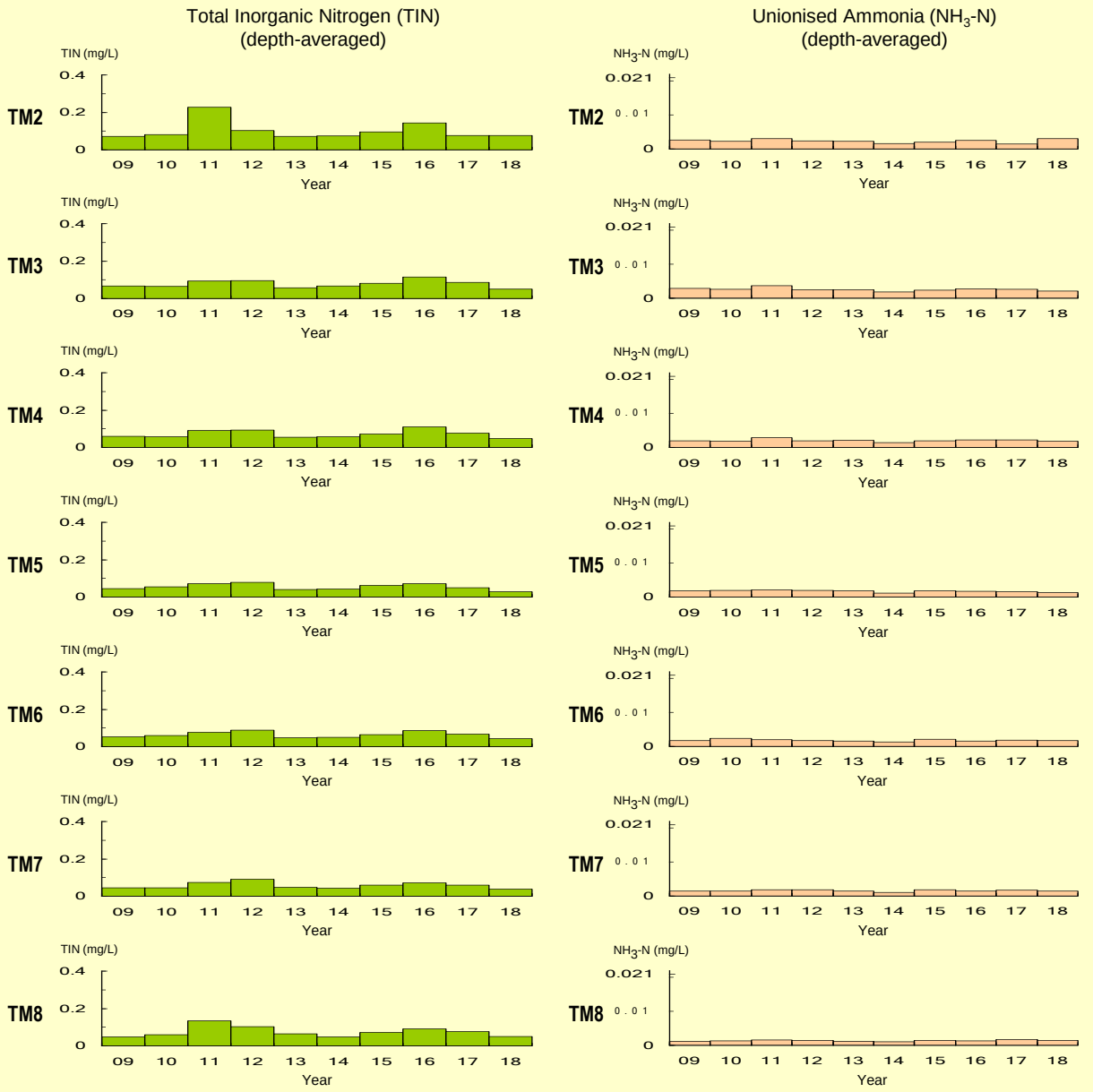
WQO : Chlorophyll-*a* ≤ 10 μg/L

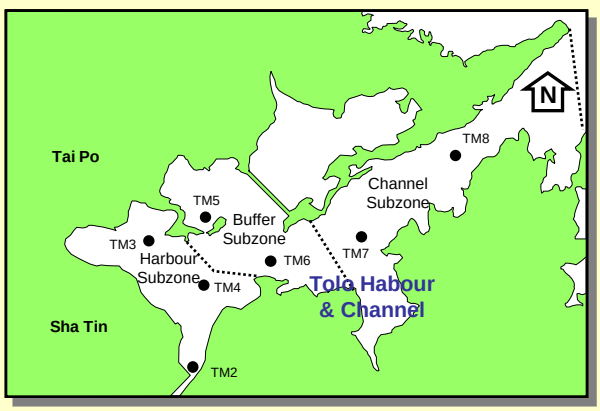
3. Channel Subzone

% sample (S, M, B) with Chlorophyll-*a* ≤ 6 μg/L

WQO : Chlorophyll-*a* ≤ 6 μg/L

Levels of total inorganic nitrogen and unionised ammonia in the Tolo Harbour and Channel WCZ





Total Inorganic Nitrogen (TIN)

annual mean for depth-averaged TIN (mg/L)

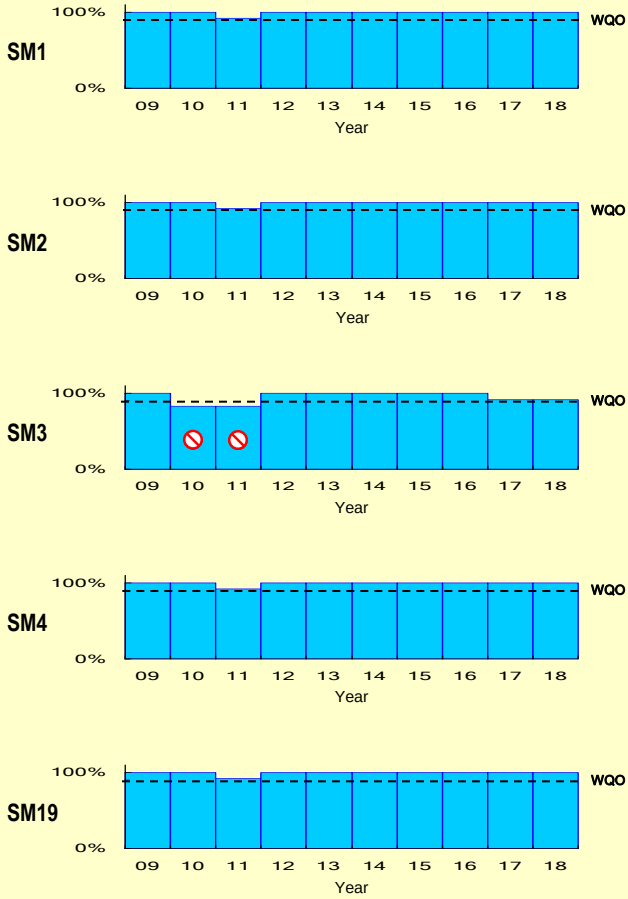
Unionised Ammonia (NH_3-N)

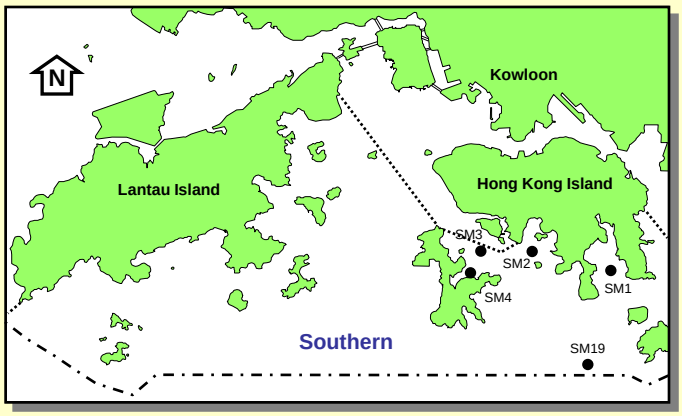
annual mean for depth-averaged NH_3-N (mg/L)

Levels of compliance with key Water Quality Objectives in the Southern WCZ

Dissolved Oxygen (DO)
(bottom)

Dissolved Oxygen (DO)
(depth-averaged)



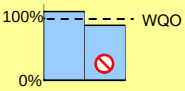


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

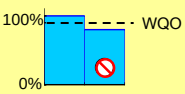


2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

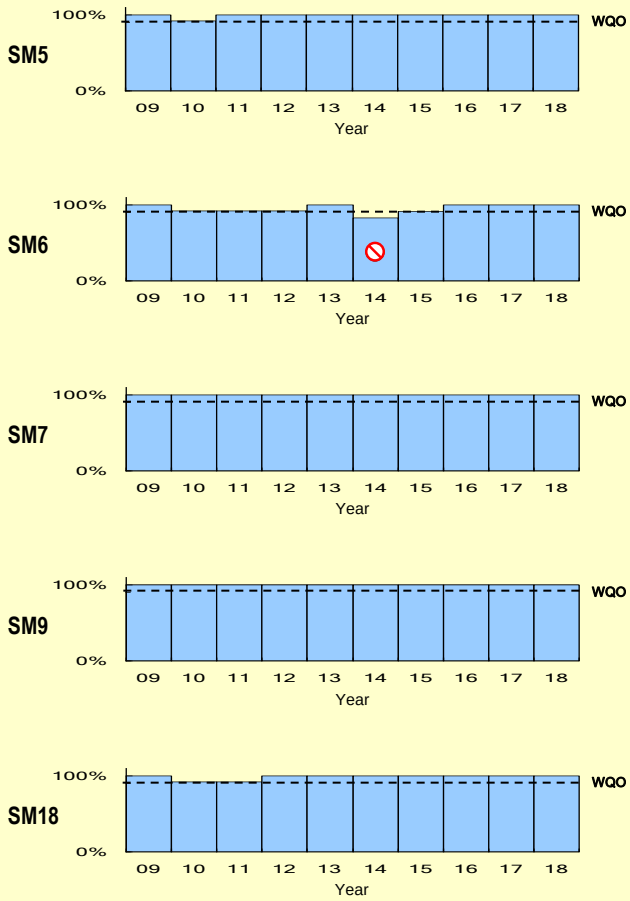
% sample with depth-averaged DO ≥ 4 mg/L

Non-compliance

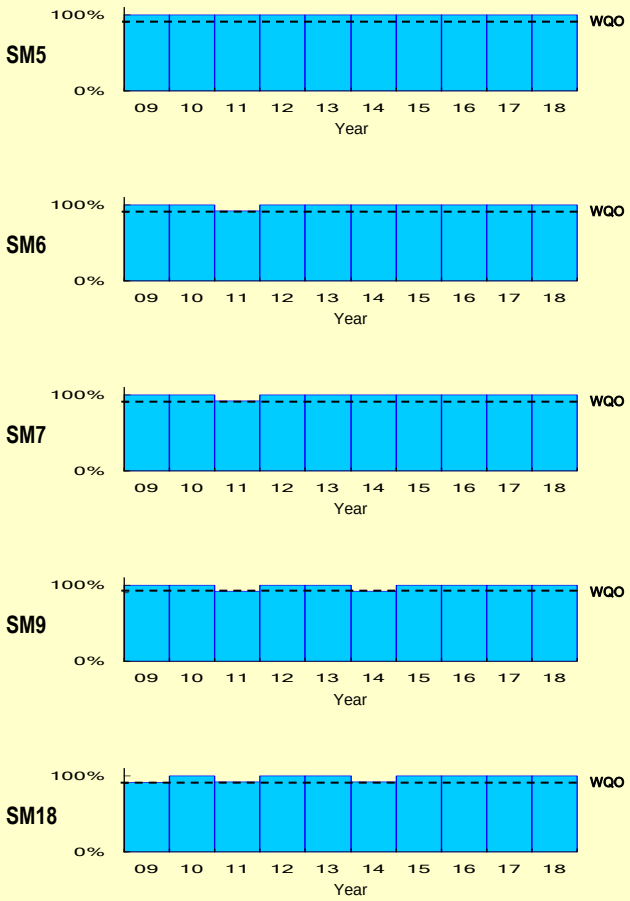


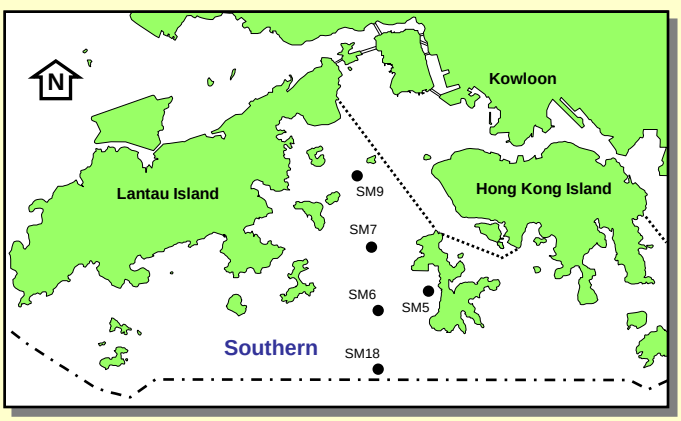
Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

Dissolved Oxygen (DO) (bottom)



Dissolved Oxygen (DO) (depth-averaged)





Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

2. Depth-averaged

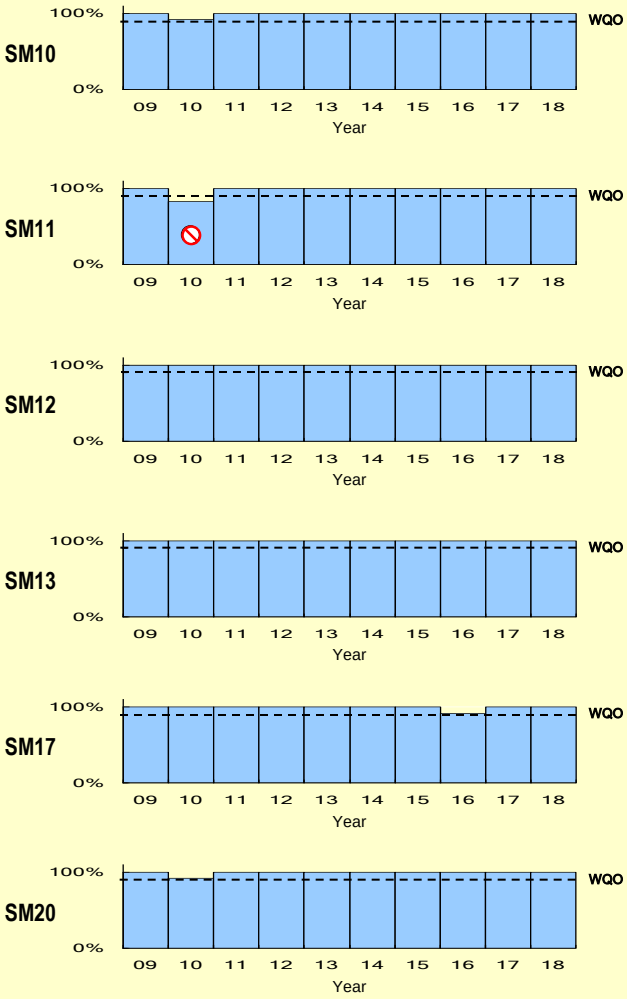
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L

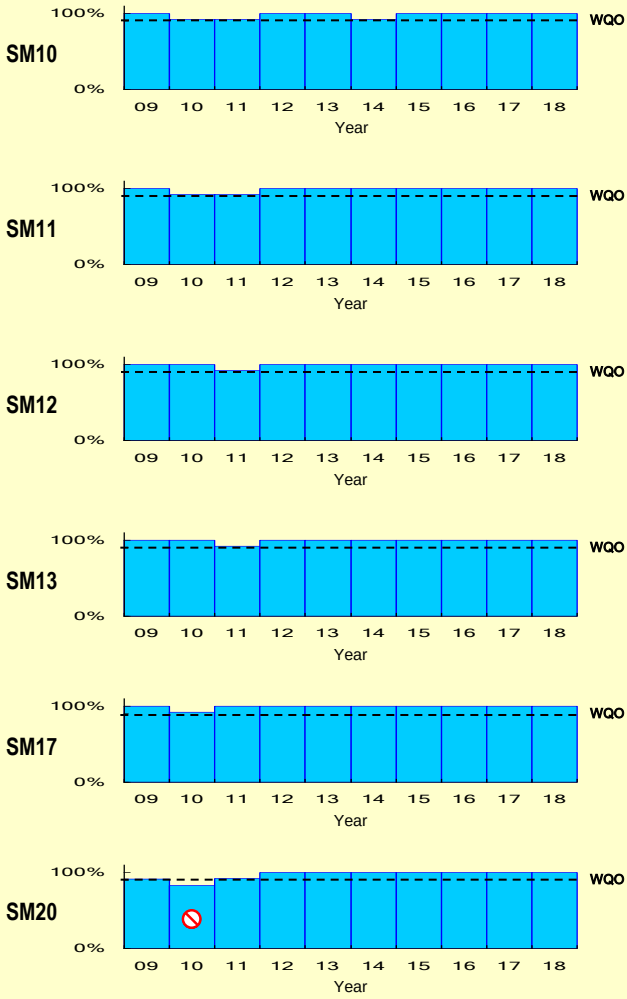
Non-compliance

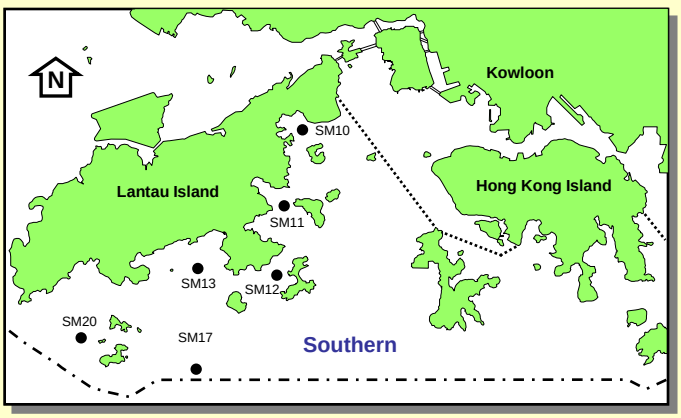
Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

Dissolved Oxygen (DO) (bottom)



Dissolved Oxygen (DO) (depth-averaged)



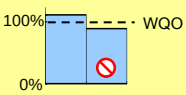


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

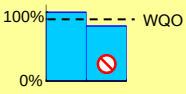
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L

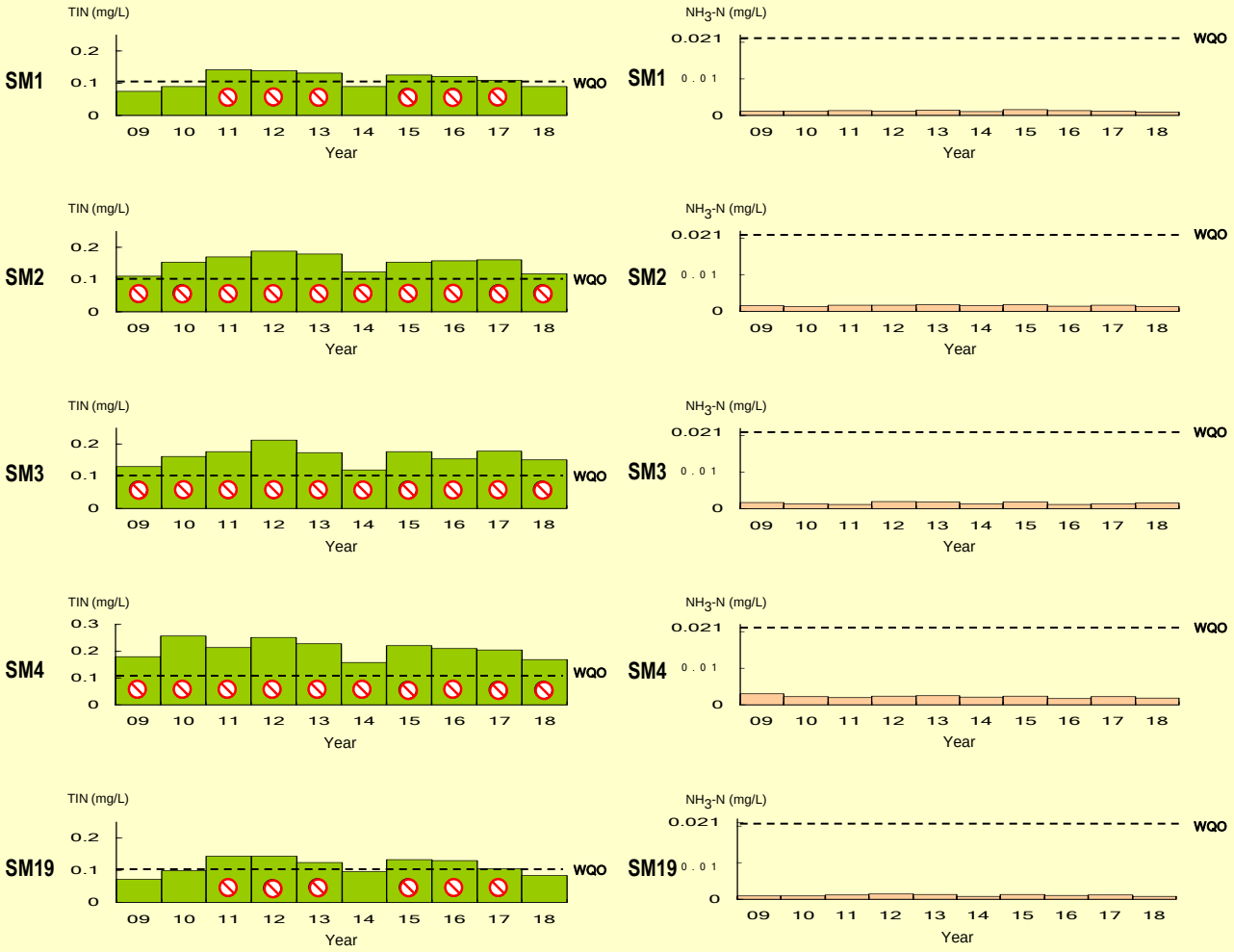


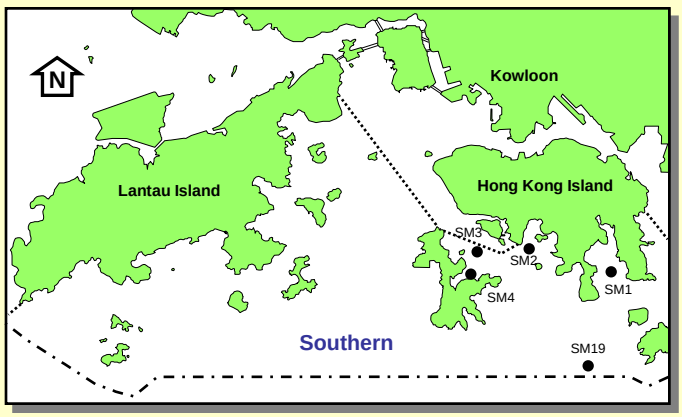
Non-compliance

Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)

Unionised Ammonia (NH_3-N) (depth-averaged)

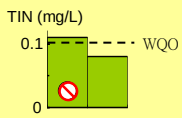




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN $\leq$ 0.1 mg/L

annual mean for depth-averaged TIN

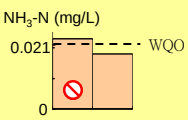


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N $\leq$ 0.021 mg/L

annual mean for depth-averaged NH_3-N

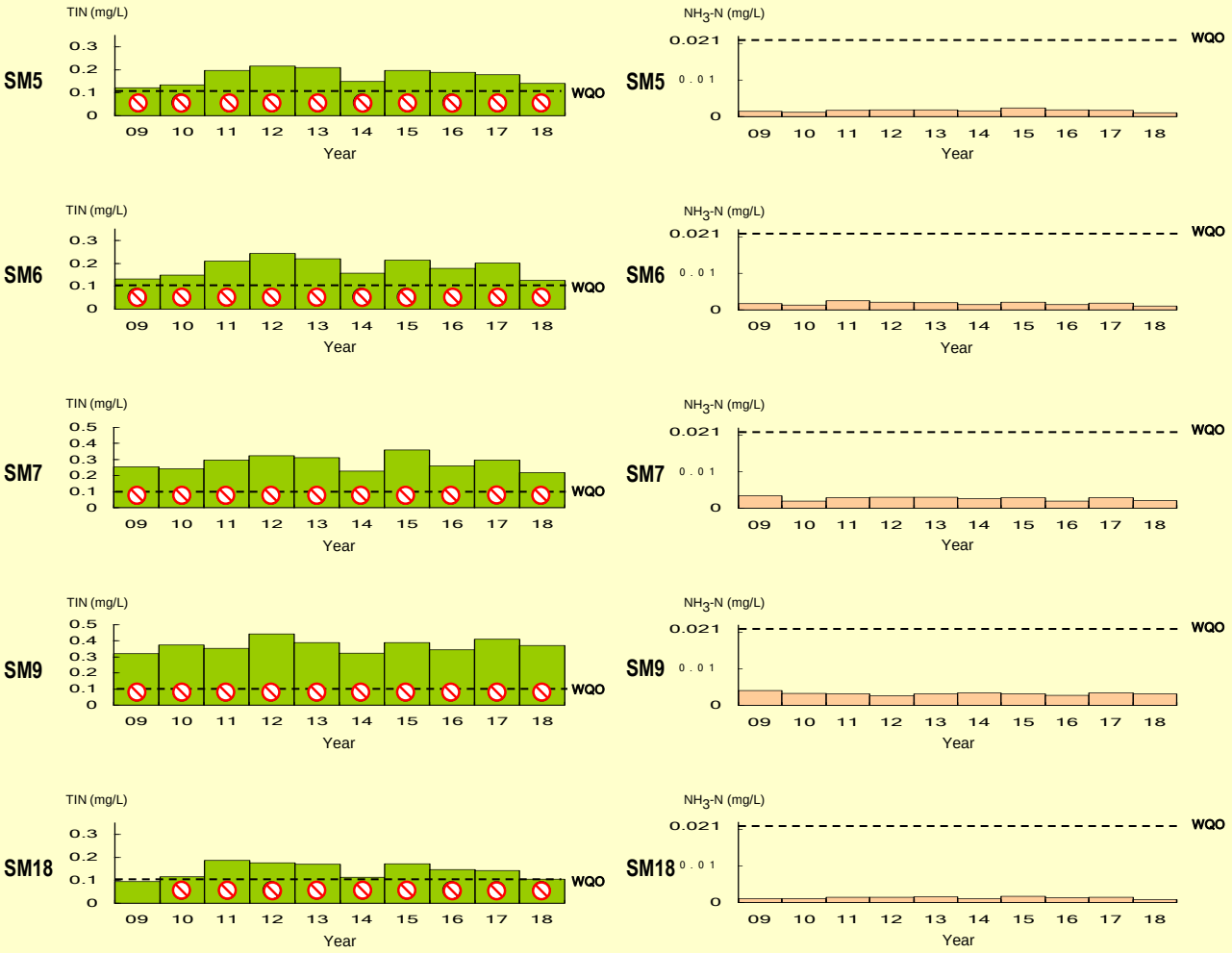
Non-compliance

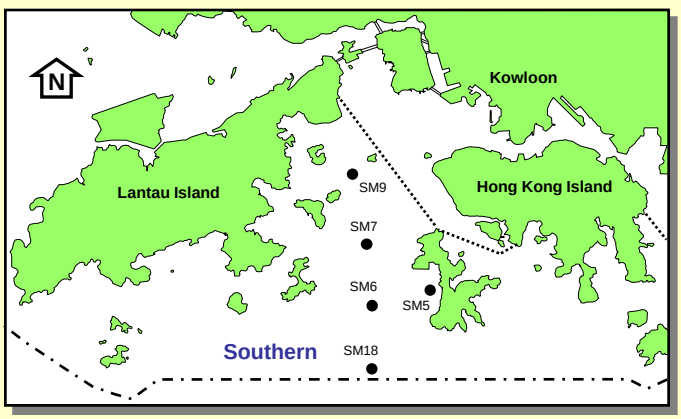


Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)

Unionised Ammonia (NH_3-N) (depth-averaged)





Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.1 mg/L

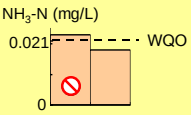
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

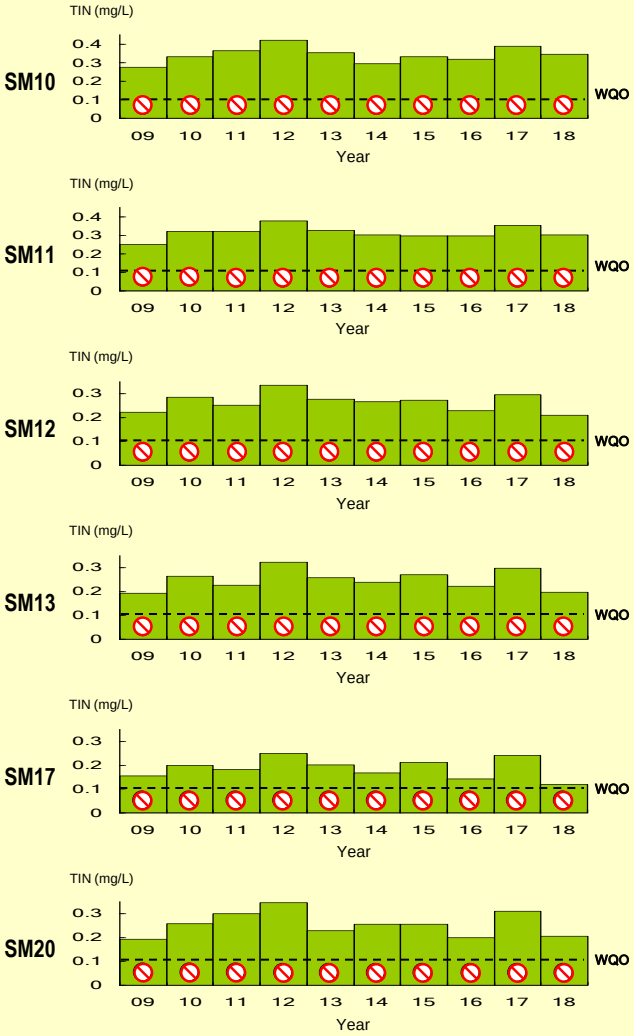
annual mean for depth-averaged NH_3-N

Non-compliance

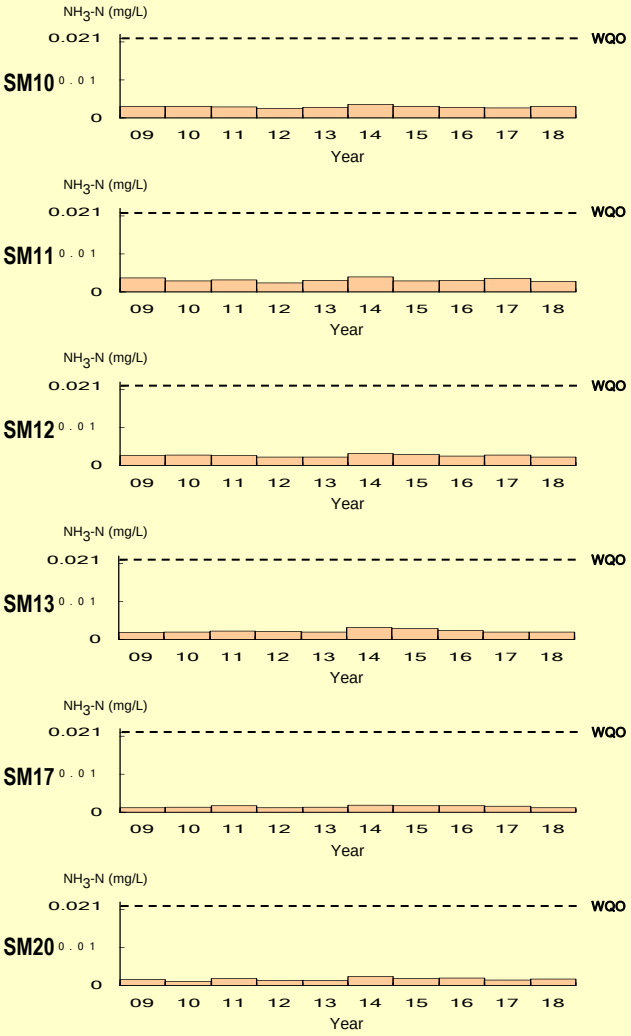


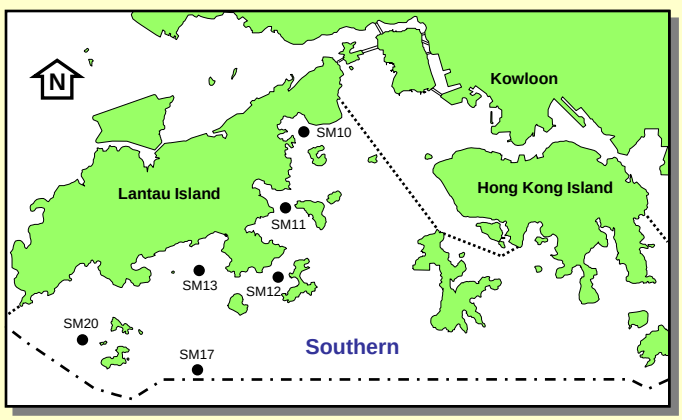
Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)

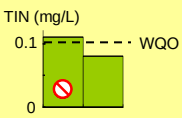




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN $\leq$ 0.1 mg/L

annual mean for depth-averaged TIN

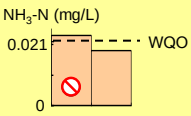


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N $\leq$ 0.021 mg/L

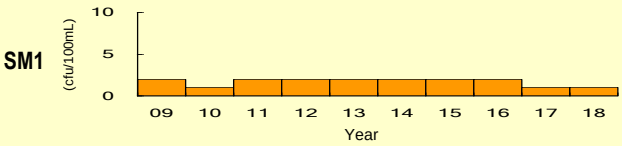
annual mean for depth-averaged NH_3-N

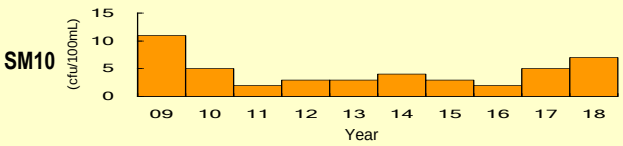
Non-compliance

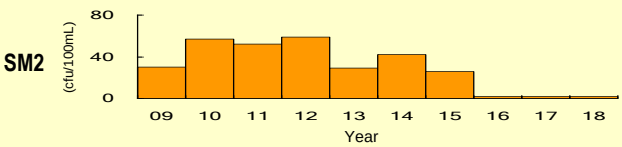


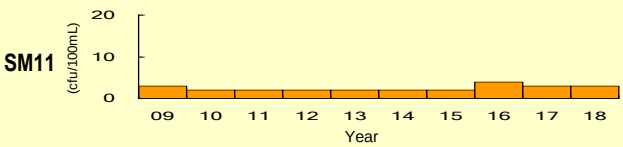
Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

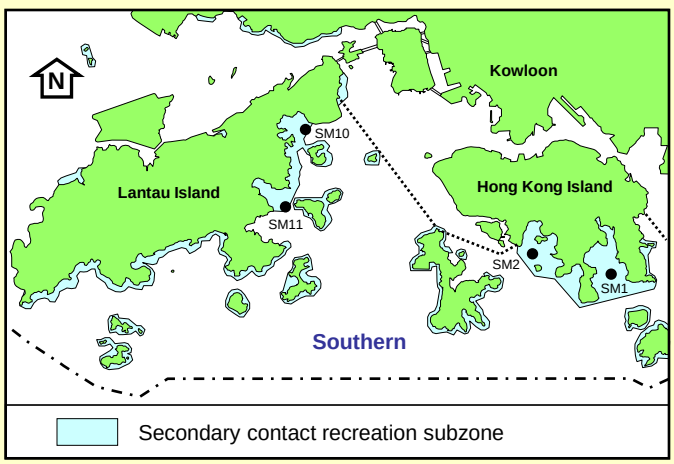
E. coli
(annual geometric mean)

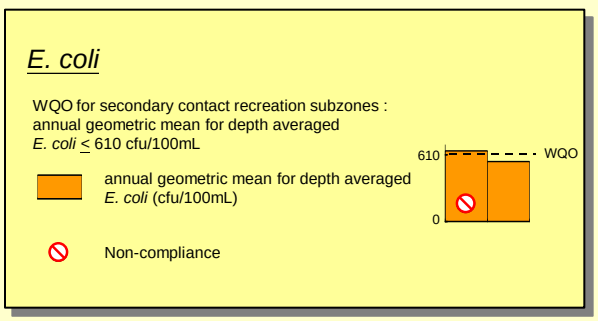




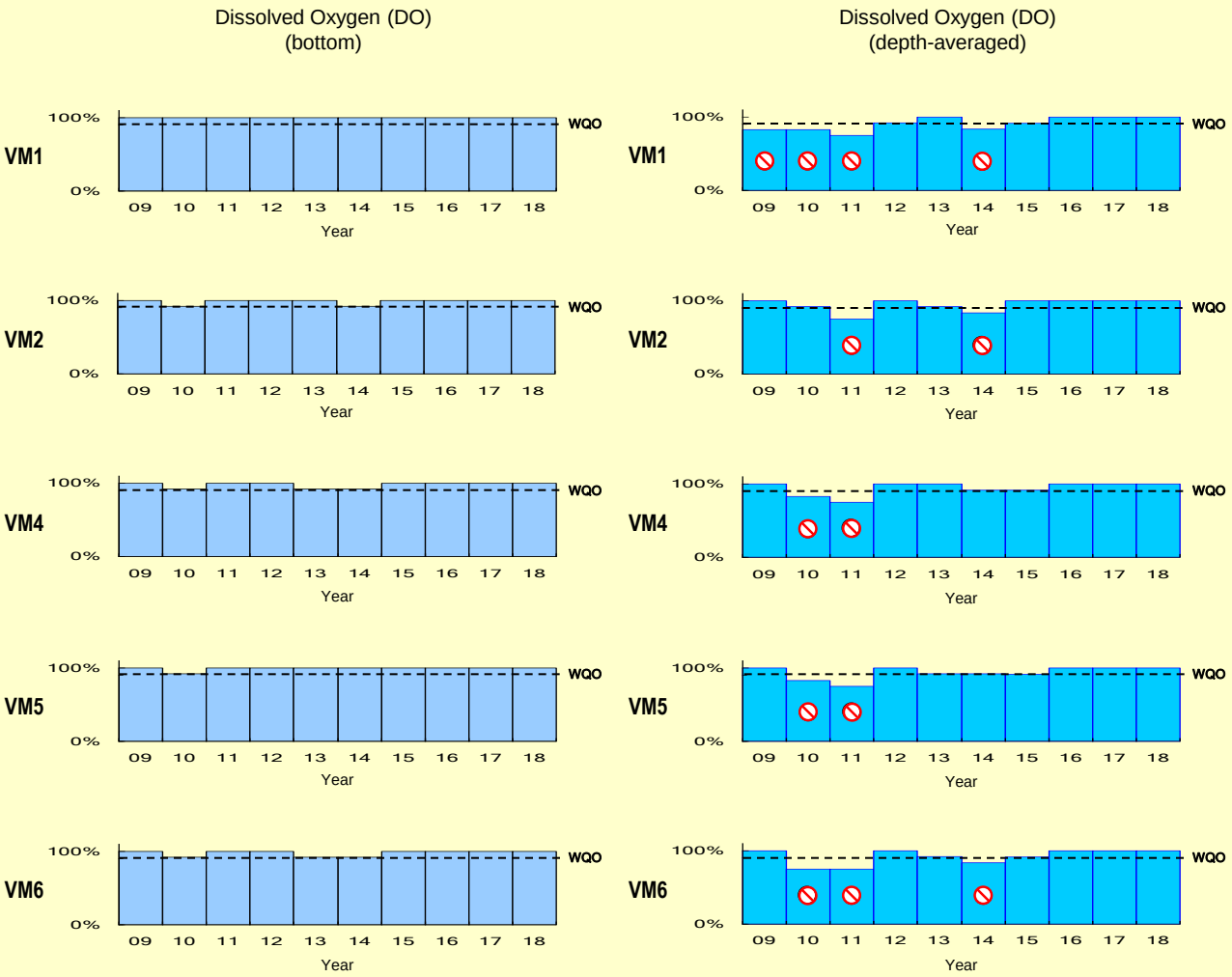


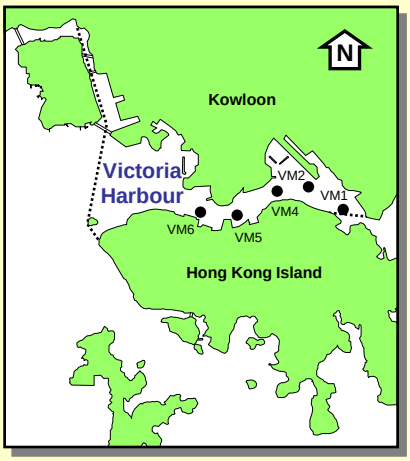






Levels of compliance with key Water Quality Objectives in the Victoria Harbour WCZ





Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

2. Depth-averaged

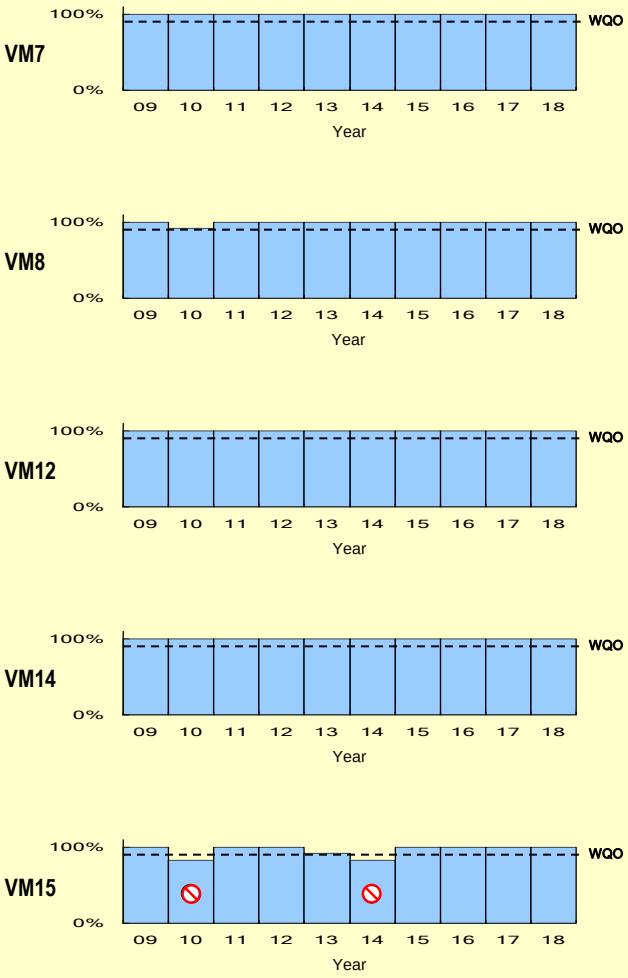
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L

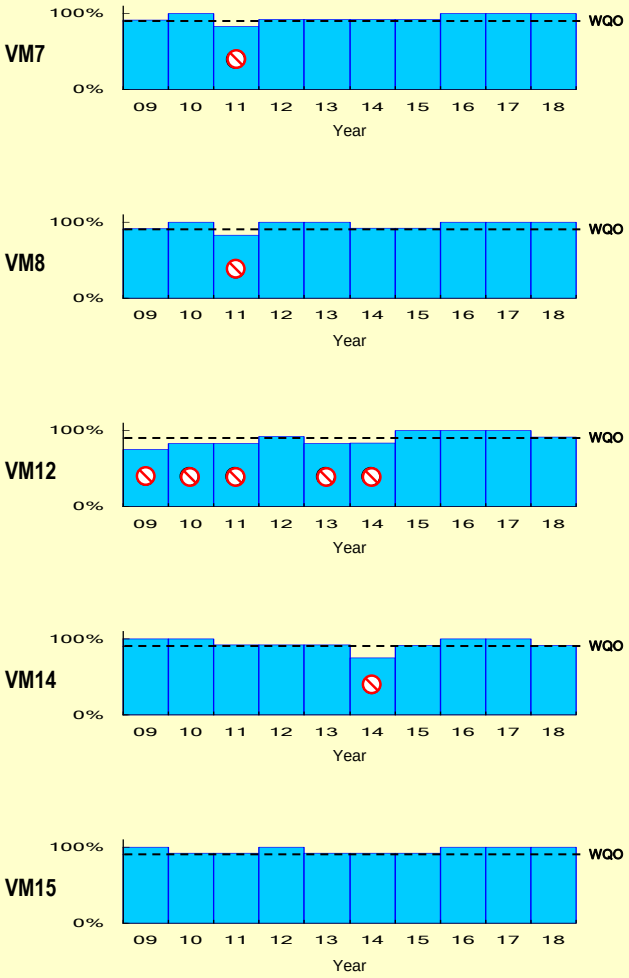
Non-compliance

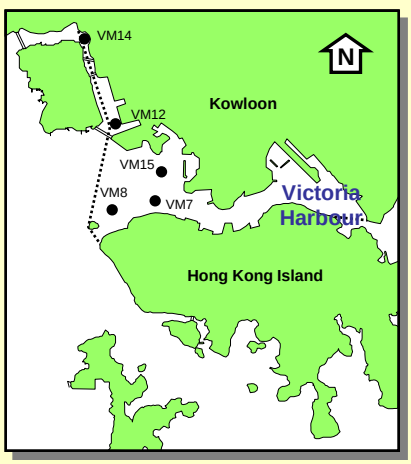
Levels of compliance with key Water Quality Objectives in the Victoria Harbour WCZ (continued)

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



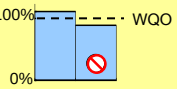


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

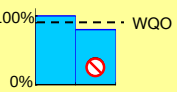
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

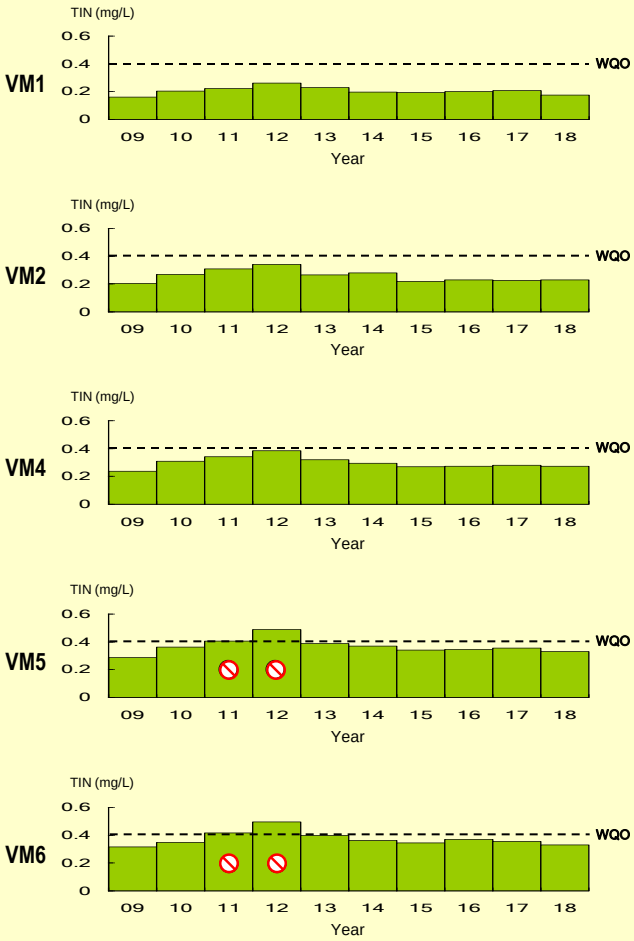
% sample with depth-averaged DO ≥ 4 mg/L



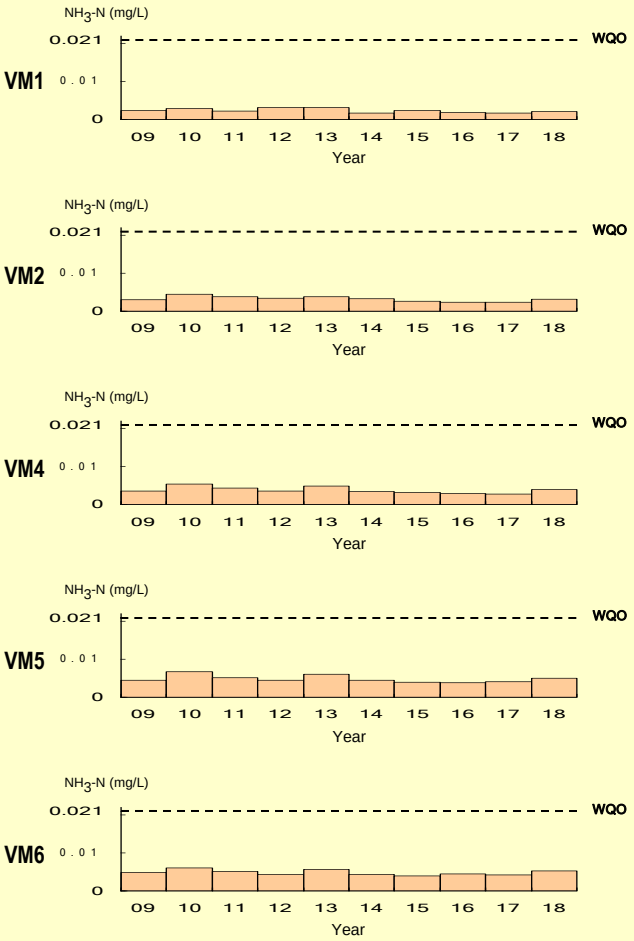
Non-compliance

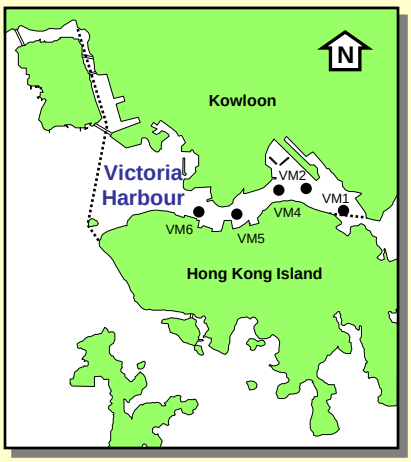
Levels of compliance with key Water Quality Objectives in the Victoria Harbour WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)

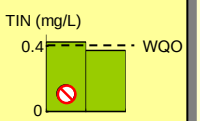




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.4 mg/L

annual mean for depth-averaged TIN

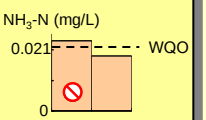


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

annual mean for depth-averaged NH_3-N

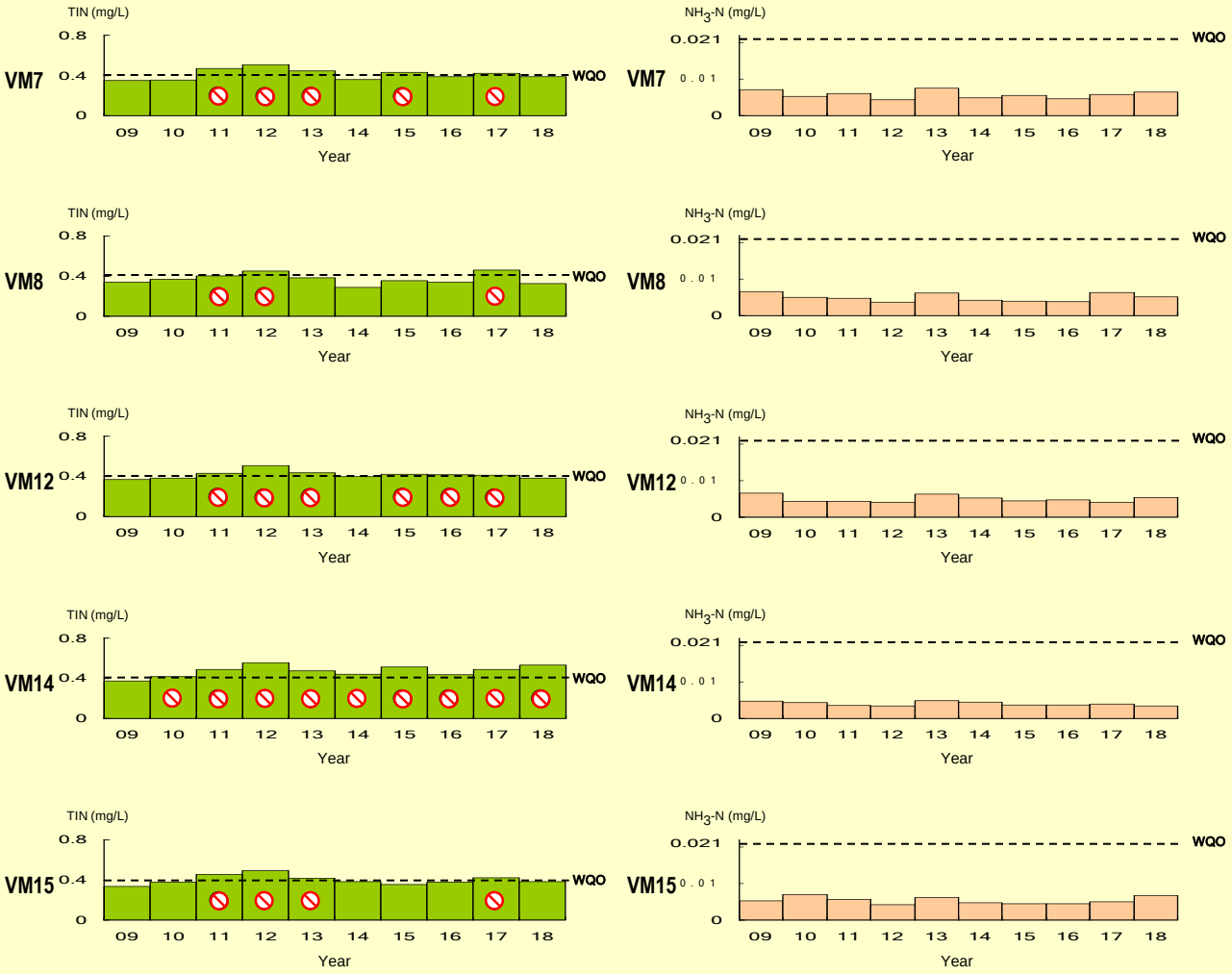
Non-compliance

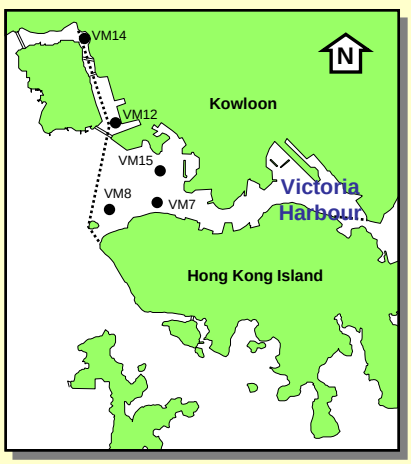


Levels of compliance with key Water Quality Objectives in the Victoria Harbour WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)

Unionised Ammonia (NH_3-N)
(depth-averaged)

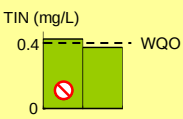




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.4 mg/L

annual mean for depth-averaged TIN

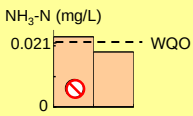


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

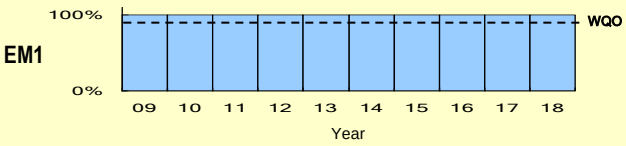
annual mean for depth-averaged NH_3-N

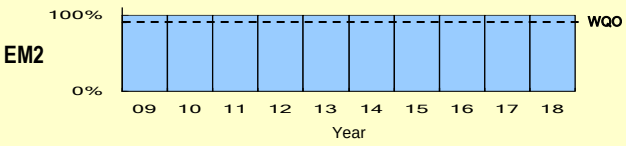
Non-compliance

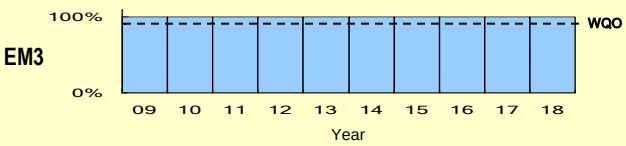


Levels of compliance with key Water Quality Objectives in the Eastern Buffer WCZ

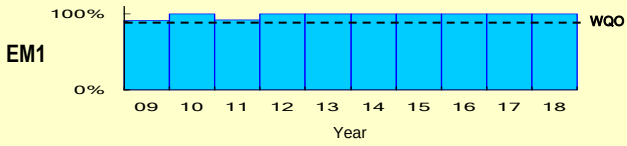
Dissolved Oxygen (DO)
(bottom)

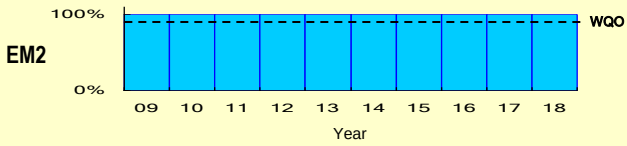


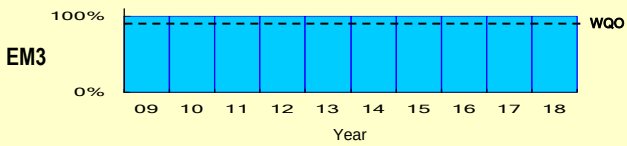


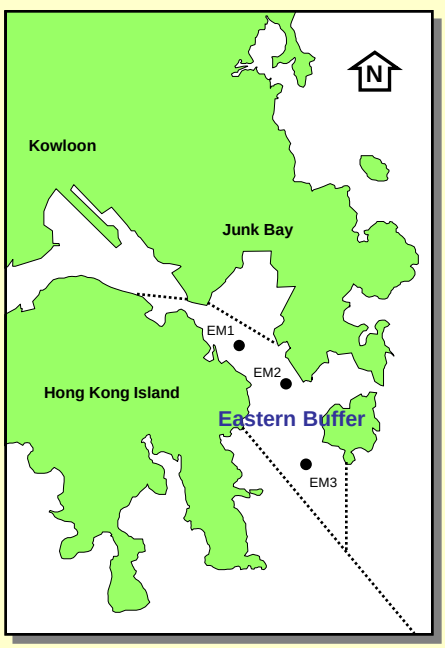


Dissolved Oxygen (DO)
(depth-averaged)







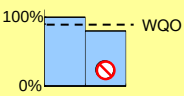


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

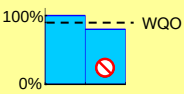
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

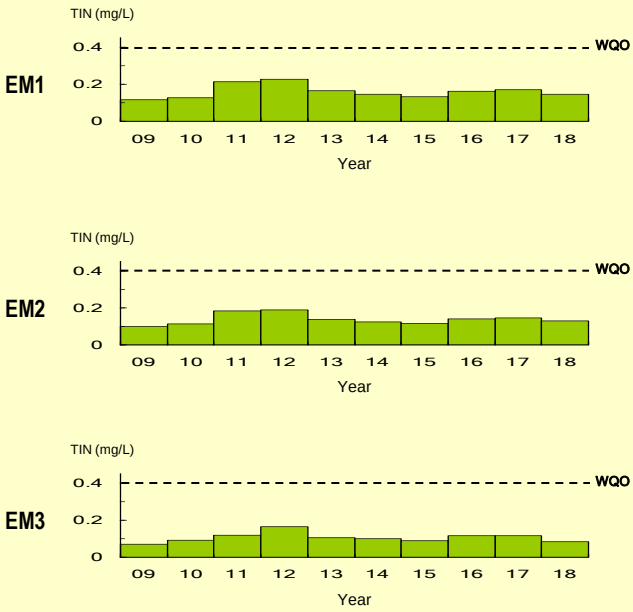
% sample with depth-averaged DO ≥ 4 mg/L



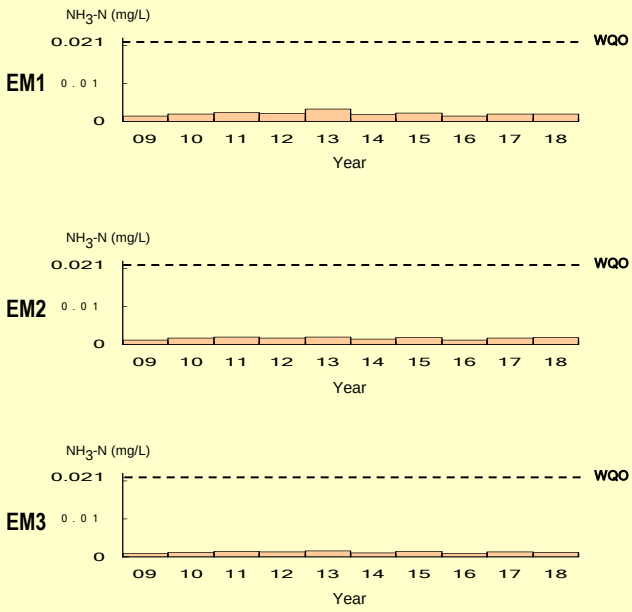
Non-compliance

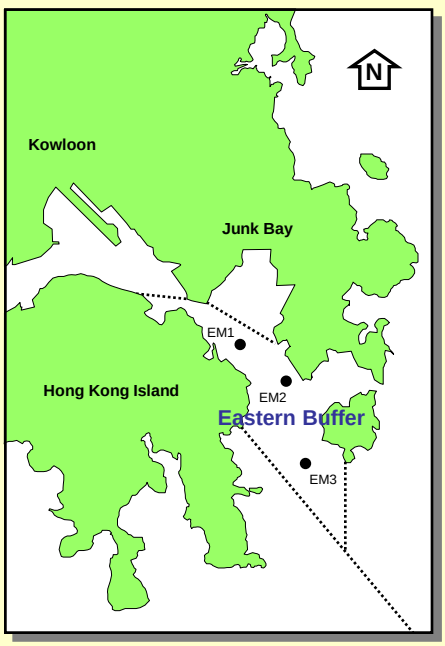
Levels of compliance with key Water Quality Objectives in the Eastern Buffer WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)

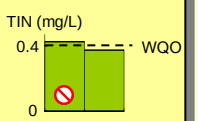




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.4 mg/L

annual mean for depth-averaged TIN

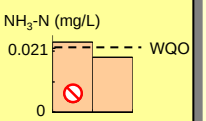


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

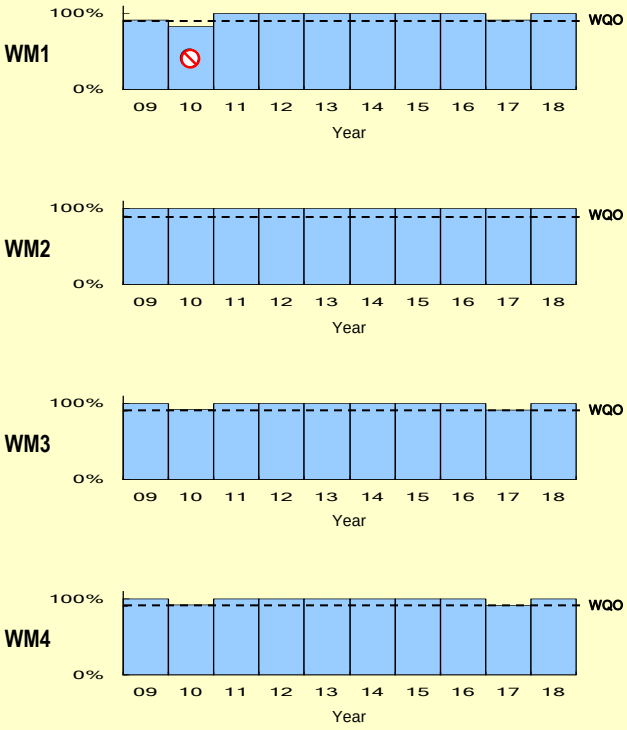
annual mean for depth-averaged NH_3-N

Non-compliance

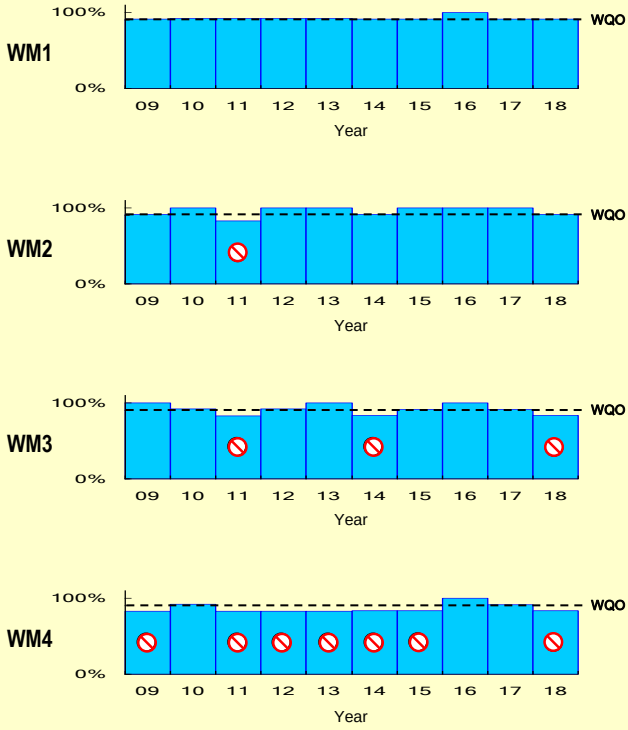


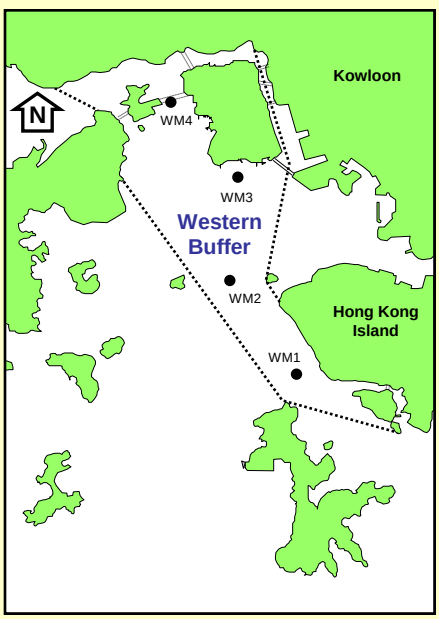
Levels of compliance with key Water Quality Objectives in the Western Buffer WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



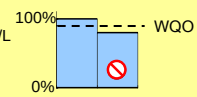


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

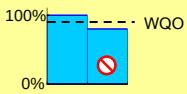
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

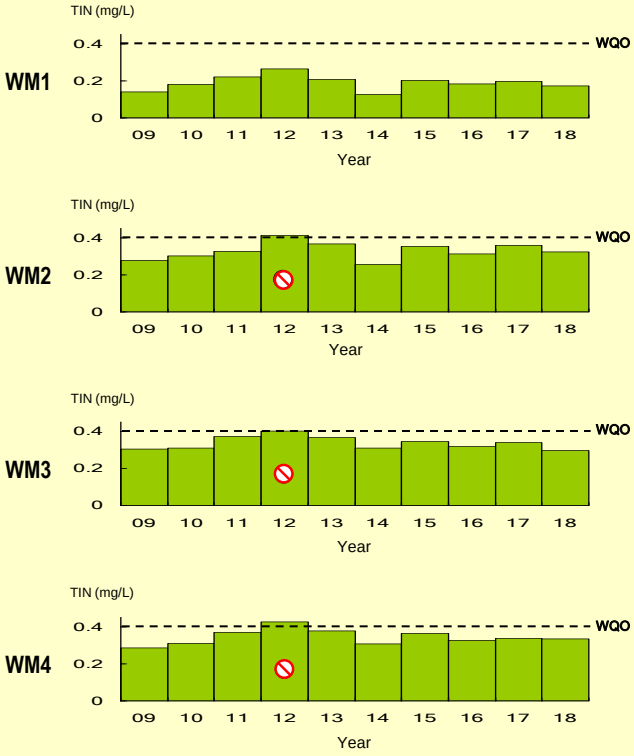
% sample with depth-averaged DO ≥ 4 mg/L



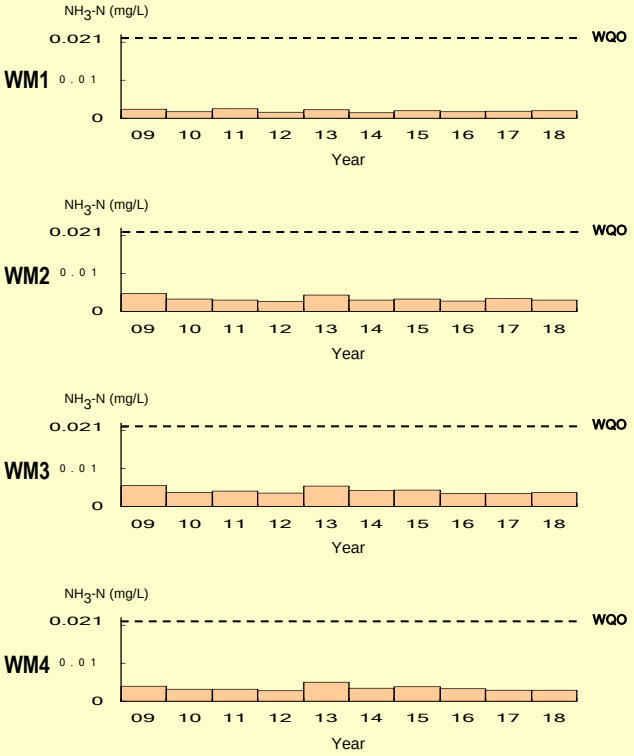
Non-compliance

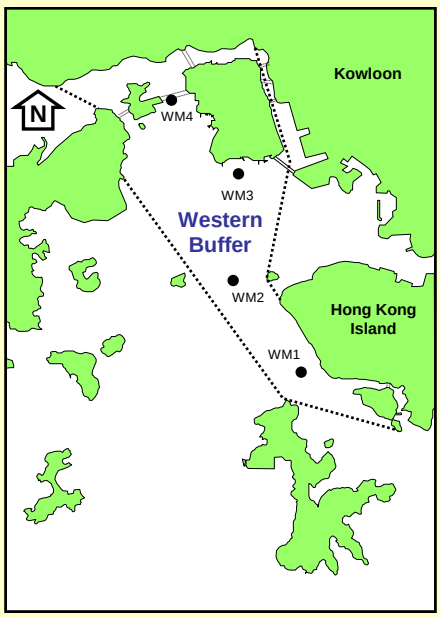
Levels of compliance with key Water Quality Objectives in the Western Buffer WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)

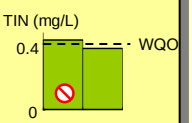




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.4 mg/L

annual mean for depth-averaged TIN

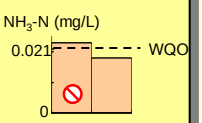


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

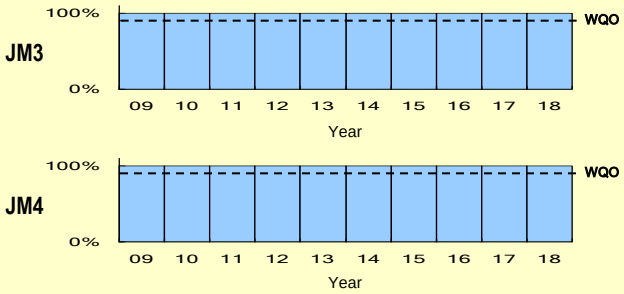
annual mean for depth-averaged NH_3-N

Non-compliance

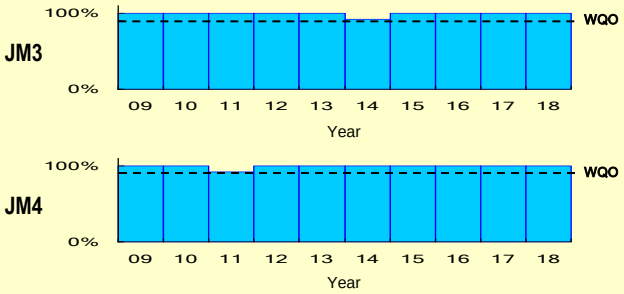


Levels of compliance with key Water Quality Objectives in the Junk Bay WCZ

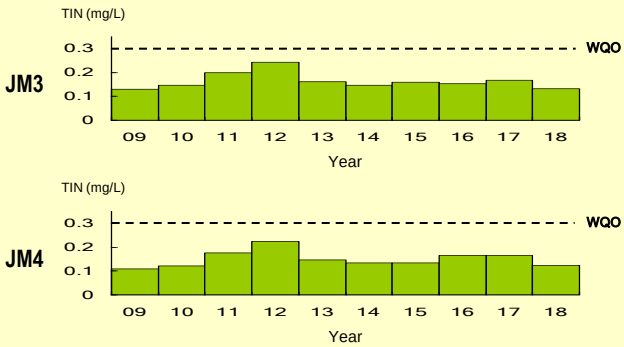
Dissolved Oxygen (DO)
(bottom)



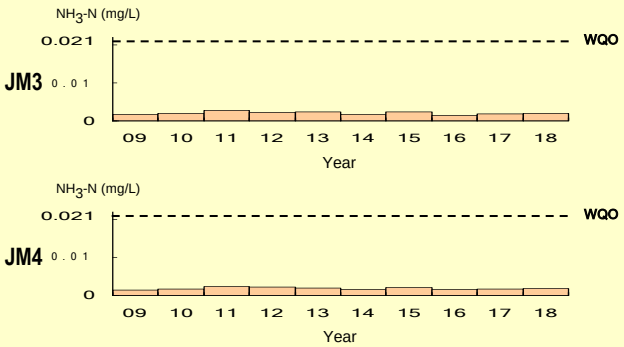
Dissolved Oxygen (DO)
(depth-averaged)

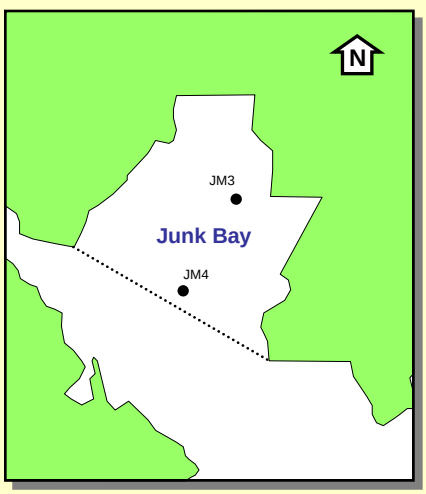


Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)



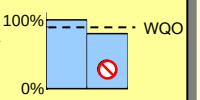


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

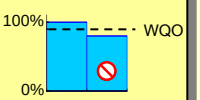
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

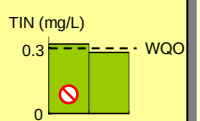
% sample with depth-averaged DO ≥ 4 mg/L



Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.3 mg/L

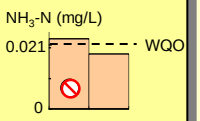
annual mean for depth-averaged TIN



Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

annual mean for depth-averaged NH_3-N



Non-compliance

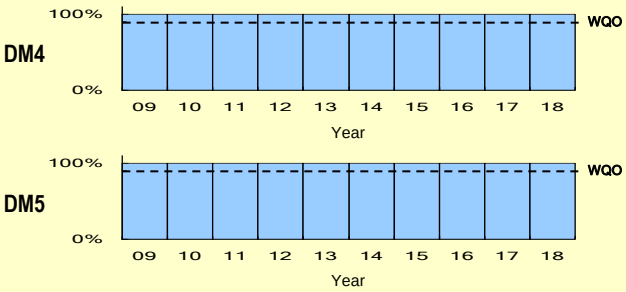
Levels of compliance with key Water Quality Objectives in the Deep Bay WCZ

Dissolved Oxygen (DO)
(bottom)

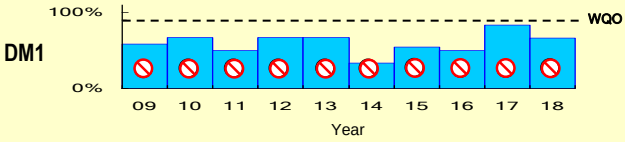
DM1 DO (bottom) not measured, water depth ≤ 3m

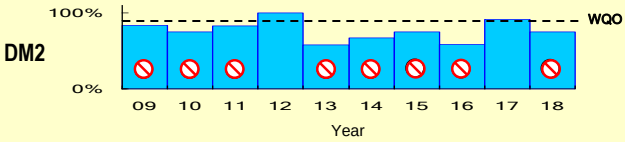
DM2 DO (bottom) not measured, water depth ≤ 3m

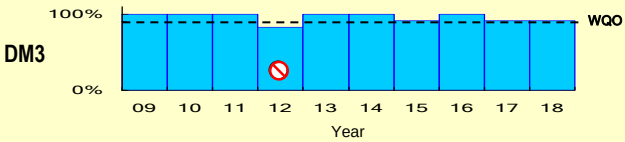
DM3 DO (bottom) not measured, water depth ≤ 3m

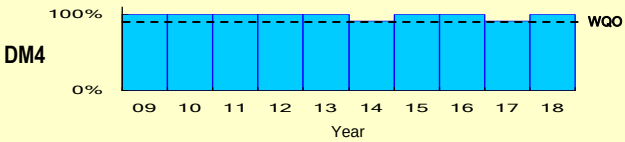


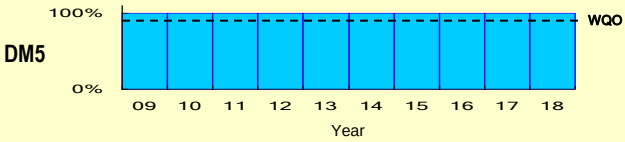
Dissolved Oxygen (DO)
(depth-averaged)

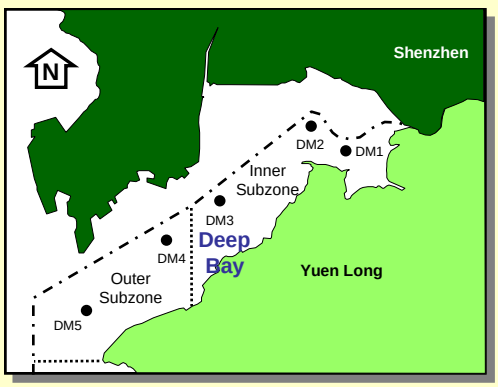










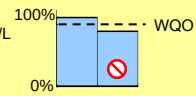


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

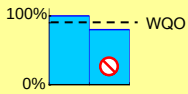
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

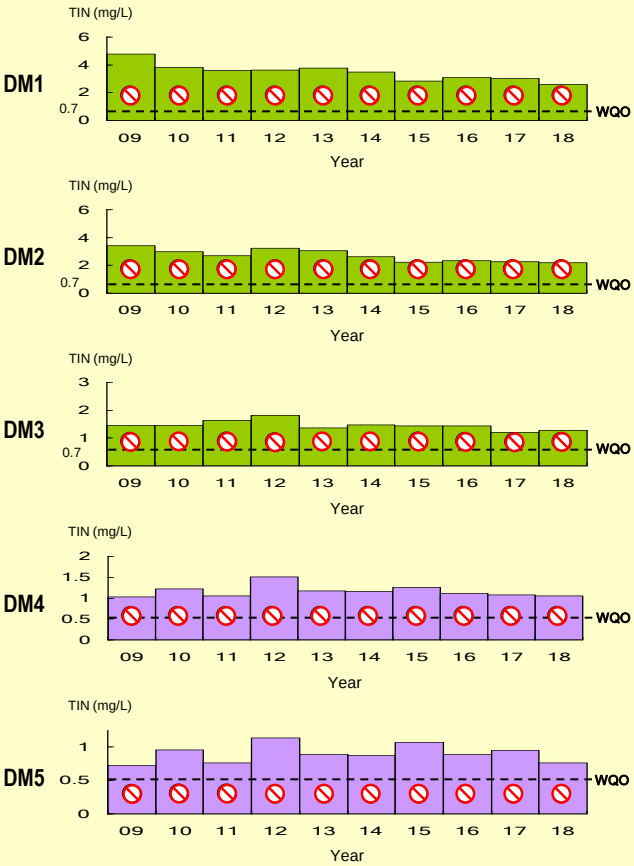
% sample with depth-averaged DO ≥ 4 mg/L



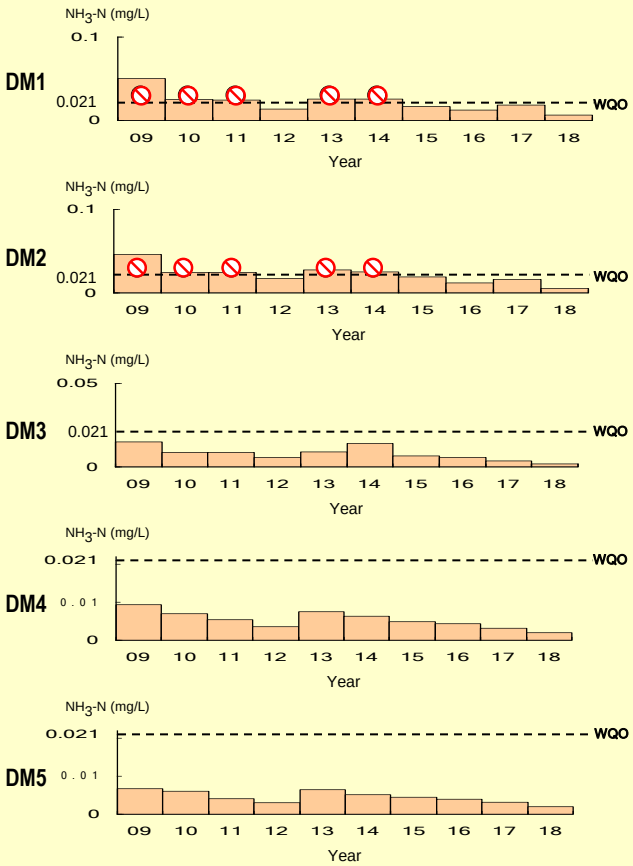
Non-compliance

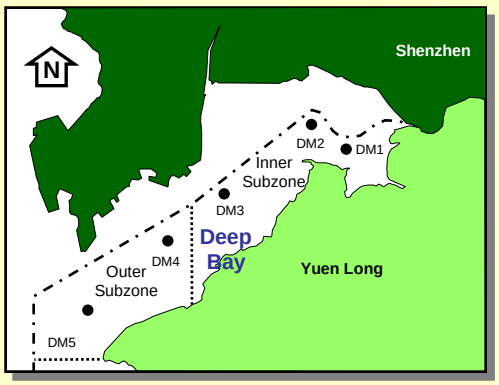
Levels of compliance with key Water Quality Objectives in the Deep Bay WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)



Unionised Ammonia (NH_3-N) (depth-averaged)



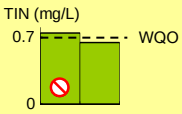


Total Inorganic Nitrogen (TIN)

Inner Subzone (DM1 - DM3)

WQO : annual mean for depth-averaged TIN ≤ 0.7 mg/L

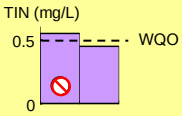
annual mean for depth-averaged TIN



Outer Subzone (DM4 - DM5)

WQO : annual mean for depth-averaged TIN ≤ 0.5 mg/L

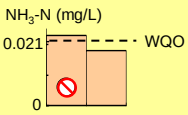
annual mean for depth-averaged TIN



Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

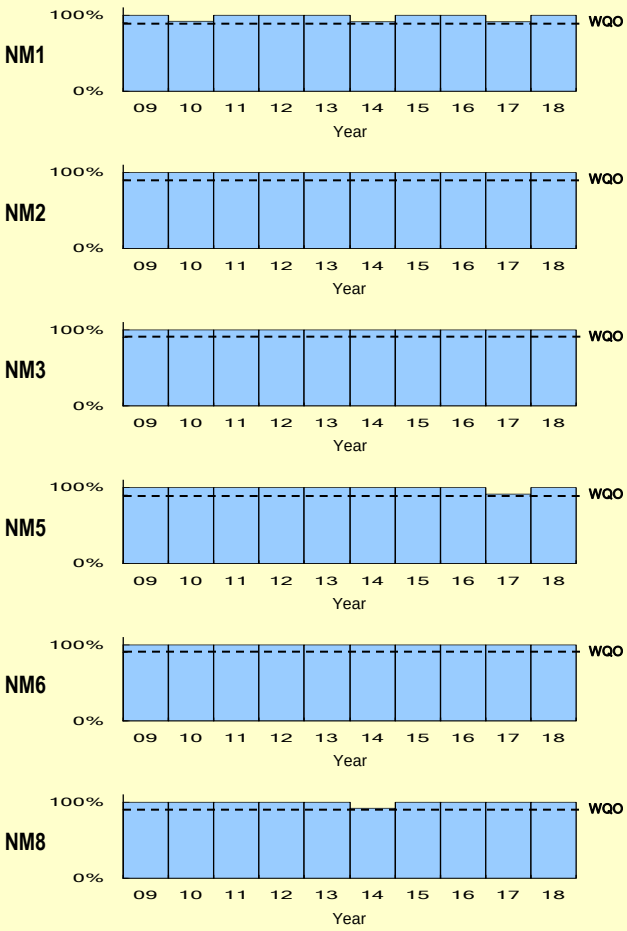
annual mean for depth-averaged NH_3-N



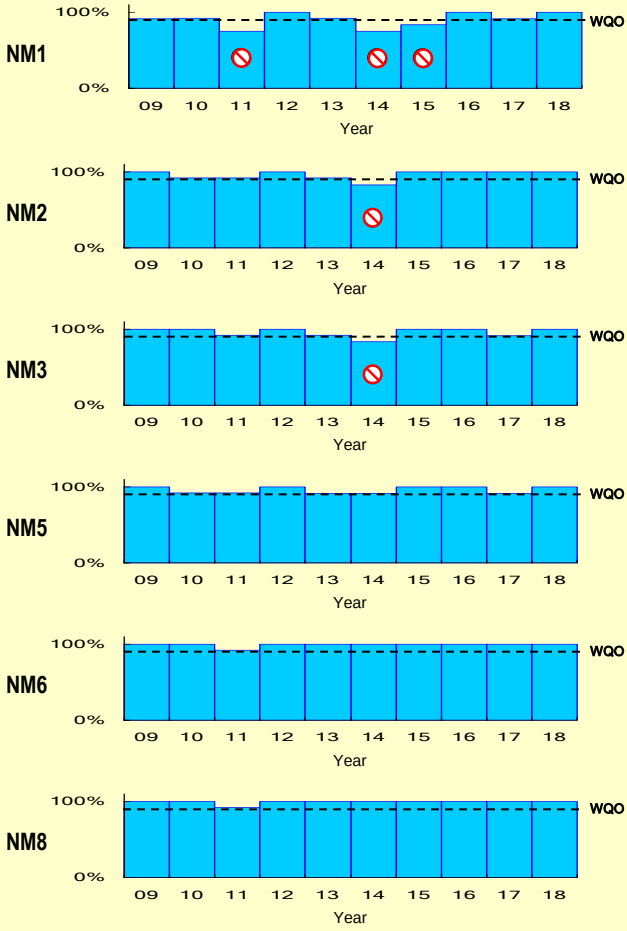
Non-compliance

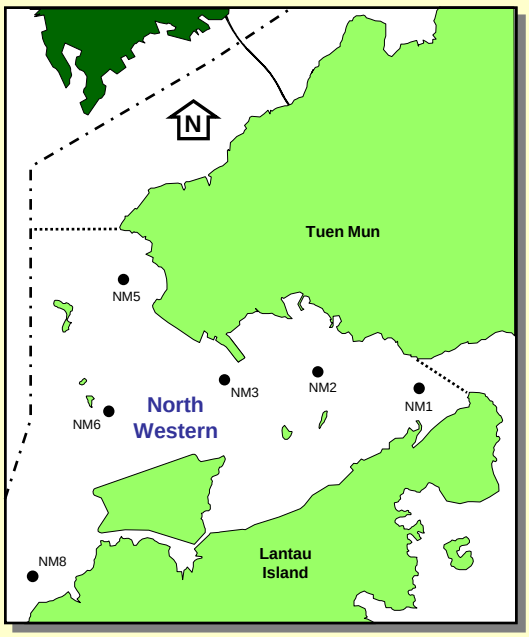
Levels of compliance with key Water Quality Objectives in the North Western WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



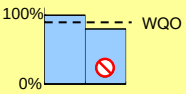


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

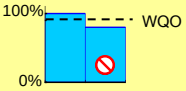
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

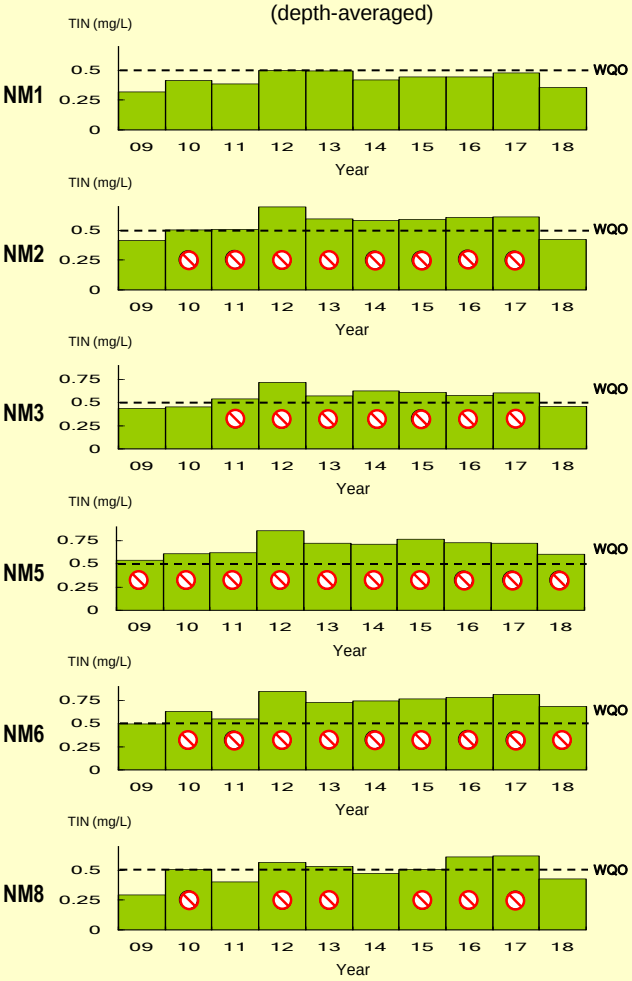
% sample with depth-averaged DO ≥ 4 mg/L



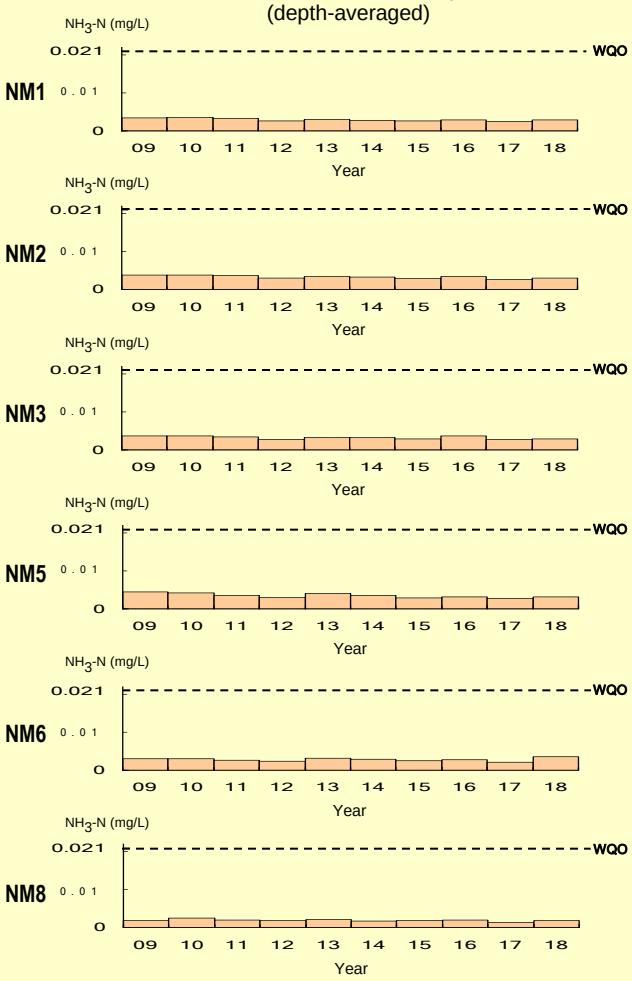
Non-compliance

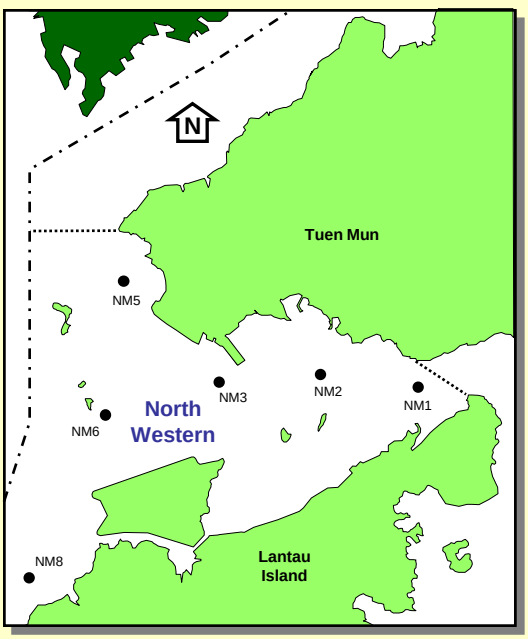
Levels of compliance with key Water Quality Objectives in the North Western WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)





Total Inorganic Nitrogen (TIN)

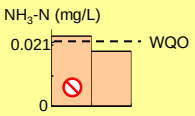
WQO : annual mean for depth-averaged TIN $\leq$ 0.5 mg/L

annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N $\leq$ 0.021 mg/L

annual mean for depth-averaged NH_3-N



Non-compliance

Results of the Seasonal Kendall Test for water quality trends in the Mirs Bay WCZ, 1991-2018

Monitoring Station		MM1	MM2	MM3	MM4	MM5	MM6	MM7
Monitoring Period		1991 I 2018	1991 I 2018	1991 I 2018	1991 I 2018	1991 I 2018	1991 I 2018	1991 I 2018
Parameter	Water Depth							
Temperature (°C)	Surface	-	-	-	-	-	-	-
	Middle	-	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗	↗
	Average	-	↗	-	-	-	↗	-
Salinity	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	↘	-	-
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (% saturation)	Surface	↘	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	-	↘	↘	↘	-	-
Turbidity (NTU)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	↘	-	-	-	↘	-
	Average	↘	-	-	-	-	↘	-
Suspended Solids (mg/L)	Surface	-	↗	↗	↗	↗	↗	↗
	Middle	-	↗	↗	↗	↗	-	↗
	Bottom	-	↗	↗	↗	↗	-	↗
	Average	-	↗	↗	↗	↗	-	↗
Volatile Suspended Solids (mg/L)	Surface	-	↗	↗	↗	↗	-	↗
	Middle	-	↗	↗	↗	↗	↗	↗
	Bottom	-	-	↗	↗	↗	-	↗
	Average	-	↗	↗	↗	↗	↗	↗
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Ammonia Nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	-	↘	-	↘	-
	Bottom	↘	-	-	↘	-	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Nitrite Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↗	↗	↗	↗	↗	-	-
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	-	-	-	-
	Middle	↗	↗	↗	-	-	-	-
	Bottom	↗	↗	-	-	-	-	-
	Average	↗	↗	↗	-	↗	-	-
Total Inorganic Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Total Nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	↘	↘	↘	-	-	-
Silica (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	↘	↗	-	↗	↗	-	↗
	Middle	-	-	↗	-	↗	-	↗
	Bottom	-	-	-	-	-	-	-
	Average	-	↗	-	↗	↗	-	↗
E. coli (cfu/100mL)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Faecal Coliforms (cfu/100mL)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Mirs Bay WCZ, 1986 - 2018 (continued)

Monitoring Station		MM8	MM13	MM14	MM15	MM16	MM17	MM19
Monitoring Period		1991 I 2018	1991 I 2018	1994 I 2018	1994 I 2018	1994 I 2018	1986 I 2018	2001 I 2018
Parameter	Water Depth							
Temperature (°C)	Surface	↗	-	-	-	-	↗	-
	Middle	↗	↗	-	-	-	↗	-
	Bottom	↗	↗	-	-	-	↗	-
	Average	↗	-	-	-	-	↗	-
Salinity	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	↘
	Bottom	-	-	-	-	-	-	↘
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	-	-	-	-	-	↘	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	↘	-	-
	Average	↘	-	-	-	-	-	-
Dissolved Oxygen (% saturation)	Surface	-	-	-	-	-	↘	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	↗	-	-	↘	-	-
	Average	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		-	-	-	↘	↘	↘	-
Turbidity (NTU)	Surface	-	-	-	-	-	-	↘
	Middle	-	-	↘	↘	↘	-	↘
	Bottom	-	-	↘	↘	↘	-	↘
	Average	-	-	↘	↘	-	-	↘
Suspended Solids (mg/L)	Surface	-	↗	↗	-	↗	-	↗
	Middle	-	-	-	-	↗	-	-
	Bottom	↗	-	-	-	-	-	-
	Average	↗	-	-	-	-	-	-
Volatile Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	↗
	Middle	-	-	-	-	-	-	↗
	Bottom	↗	-	↗	-	-	-	-
	Average	↗	↗	↗	↗	↗	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	↘	-	-	-	-	-
	Bottom	↘	↘	-	↘	-	-	↘
	Average	↘	-	-	-	-	-	↘
Ammonia Nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	-	-
	Middle	↘	↘	↘	↘	↘	-	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Nitrite Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	↗
	Bottom	↗	-	-	↗	-	-	-
	Average	↗	↗	↗	↗	↗	-	↗
Nitrate Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	↗	-	-	-
Total Inorganic Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↗	-
	Average	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (mg/L)	Surface	-	-	↗	↗	↗	-	↗
	Middle	-	-	↗	↗	↗	-	↗
	Bottom	-	-	↗	-	-	-	↗
	Average	-	-	↗	↗	↗	-	↗
Total Nitrogen (mg/L)	Surface	-	-	↗	↗	↗	-	↗
	Middle	-	-	↗	↗	↗	-	↗
	Bottom	-	-	↗	-	↗	-	↗
	Average	-	-	↗	↗	↗	-	↗
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	-
	Middle	↘	↘	↘	↘	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	-	-
	Average	↘	↘	↘	↘	↘	↘	-
Total Phosphorus (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↘	↘	-	-	-	↘	-
Silica (mg/L)	Surface	-	-	-	-	-	↘	-
	Middle	-	-	-	-	-	↘	-
	Bottom	-	-	-	-	-	↘	↗
	Average	-	-	-	-	-	↘	↗
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-	↗	-
	Middle	-	-	↘	↘	-	↗	↘
	Bottom	-	-	↘	↘	↘	-	↘
	Average	-	-	-	↘	-	↗	↘
E. coli (cfu/100mL)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Faecal Coliforms (cfu/100mL)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Port Shelter WCZ, 1986 - 2018

Monitoring Station		PM1	PM2	PM3	PM4	PM6	PM7	PM8	PM9	PM11
Monitoring Period		1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1993 I 2018
Parameter	Water Depth									
Temperature (°C)	Surface	-	-	-	-	↗	↗	↗	↗	-
	Middle	↗	-	↗	↗	↗	↗	↗	↗	-
	Bottom	↗	↗	↗	↗	↗	↗	↗	↗	-
	Average	↗	-	↗	↗	↗	↗	↗	↗	-
Salinity	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	-	↘	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	↗	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (% saturation)	Surface	-	↘	↘	-	-	↘	-	-	-
	Middle	-	-	↗	-	-	↗	-	-	-
	Bottom	↗	↗	-	↗	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	-	-	↗	-	↘	-	-
Turbidity (NTU)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	↘
	Average	-	-	-	-	-	-	-	-	-
Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	↗	-	-
	Average	-	-	-	-	-	-	-	-	-
Volatile Suspended Solids (mg/L)	Surface	↗	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	↗
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	↘	↘	-	↘	-	-	-	-
	Middle	-	↘	-	-	↘	-	↘	-	-
	Bottom	-	↘	↘	-	↘	↘	↘	↘	↘
	Average	-	↘	-	-	↘	↘	↘	-	-
Ammonia Nitrogen (mg/L)	Surface	-	-	-	-	↘	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	-	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘	↘
Nitrite Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	↗	↗	↗
	Average	-	-	-	-	-	↗	↗	↗	↗
Nitrate Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	↗	↗	-
	Bottom	-	-	-	-	-	↗	↗	↗	↗
	Average	-	-	-	-	-	↗	↗	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↗	↗	↗	↗
	Average	-	-	-	-	-	-	↗	↗	-
Total Kjeldahl Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Total Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	-	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	-	↘	-	-	↘	-	-	-	-
	Middle	-	-	-	-	↘	-	-	-	-
	Bottom	-	-	-	-	↘	-	-	-	-
	Average	↘	↘	↘	↘	↘	↘	↘	↘	-
Silica (mg/L)	Surface	-	-	-	-	-	-	↘	-	-
	Middle	↘	-	↘	-	-	↘	-	↘	-
	Bottom	↘	-	-	↘	-	-	-	-	-
	Average	↘	-	-	-	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	↗	-	↗	↗	-	↗	↗	-	-
	Middle	↗	-	↗	↗	-	↗	↗	↗	-
	Bottom	↗	↗	↗	↗	-	-	-	-	↘
	Average	↗	-	↗	↗	-	↗	↗	-	-
E. coli (cfu/100mL)	Surface	-	↘	-	-	↘	-	-	-	-
	Middle	-	↘	-	-	-	-	-	-	-
	Bottom	-	↘	-	-	-	-	-	-	-
	Average	-	↘	-	-	↘	-	-	-	-
Faecal Coliforms (cfu/100mL)	Surface	-	-	-	-	↘	-	-	-	-
	Middle	-	-	-	-	↘	-	-	-	-
	Bottom	-	↘	-	-	-	-	-	-	-
	Average	-	-	-	-	↘	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Tolo Habour and Channel WCZ, 1986 - 2018

Monitoring Station		TM2	TM3	TM4	TM5	TM6	TM7	TM8
Monitoring Period		1986 I 2018	1986 I 2018	1986 I 2018	1988 I 2018	1986 I 2018	1988 I 2018	1986 I 2018
Parameter	Water Depth							
Temperature (°C)	Surface	↗	↗	↗	↗	↗	↗	↗
	Middle	NA	↗	↗	NA	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	-	↘	↘	↘	↘	↘	↘
	Middle	NA	-	-	NA	-	-	-
	Bottom	↗	↗	↗	-	↗	-	-
	Average	↗	-	-	-	-	-	↘
Dissolved Oxygen (% saturation)	Surface	-	↘	↘	↘	↘	↘	↘
	Middle	NA	-	-	NA	↗	-	-
	Bottom	↗	↗	↗	-	↗	↗	-
	Average	↗	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗	↗	↗	-
Turbidity (NTU)	Surface	↘	-	-	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Suspended Solids (mg/L)	Surface	↘	-	↘	-	-	-	-
	Middle	NA	-	↘	NA	-	-	↘
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Volatile Suspended Solids (mg/L)	Surface	↘	-	↘	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	-	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Ammonia Nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	↘
Nitrite Nitrogen (mg/L)	Surface	↘	↘	-	-	-	-	-
	Middle	NA	↘	-	NA	-	-	-
	Bottom	↘	↘	↘	-	↘	-	-
	Average	↘	↘	↘	-	↘	↘	-
Nitrate Nitrogen (mg/L)	Surface	↘	↘	↘	-	↘	-	-
	Middle	NA	↘	↘	NA	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Total Inorganic Nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Total Kjeldahl Nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	-	-
	Average	↘	↘	↘	↘	↘	↘	↘
Total Nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	↘
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	-	↗	↗	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	↘	↘	↘	-	↘	↘	-
	Middle	NA	↘	↘	NA	-	-	-
	Bottom	↘	-	-	-	-	-	↗
	Average	↘	↘	↘	-	↘	-	-
E. coli (cfu/100mL)	Surface	↘	↘	↘	↘	↘	-	-
	Middle	NA	↘	↘	NA	↘	-	-
	Bottom	↘	↘	↘	↘	-	-	-
	Average	↘	↘	↘	↘	↘	-	-
Faecal Coliforms (cfu/100mL)	Surface	↘	↘	↘	-	↘	-	-
	Middle	NA	↘	↘	NA	↘	-	-
	Bottom	↘	↘	↘	-	↘	-	-
	Average	↘	↘	↘	-	↘	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Southern WCZ, 1986 - 2018

Monitoring Station		SM1	SM2	SM3	SM4	SM5	SM6	SM7	SM9
Monitoring Period		1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1988 I 2018
Parameter	Water Depth								
Temperature (°C)	Surface	↗	↗	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	↘
	Average	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	-	-	-	-	-	-	↘	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	↘	-	-	-	-	-
Dissolved Oxygen (% saturation)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-	-	-	-	↘
	Middle	-	-	-	-	-	-	-	↘
	Bottom	-	-	-	-	-	-	↘	↘
	Average	-	-	-	-	-	-	-	↘
Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	-	↘
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	↘
	Average	-	-	-	-	-	-	-	↘
Volatile Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↘	-	-
	Average	-	-	-	-	-	-	-	-
Ammonia Nitrogen (mg/L)	Surface	-	-	↗	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	-	-	-	-	-	↘
	Middle	↘	↘	↘	↘	↘	↘	-	↘
	Bottom	↘	↘	↘	↘	↘	↘	-	↘
	Average	↘	↘	↘	-	↘	↘	-	↘
Nitrite Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	-	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗	↗
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	-	↗	↗
	Bottom	-	↗	-	↗	↗	-	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	-	↗	↗
	Middle	↗	↗	↗	↗	-	-	↗	↗
	Bottom	-	↗	-	↗	↗	-	↗	↗
	Average	↗	↗	↗	↗	↗	-	↗	↗
Total Kjeldahl Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Total Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	-	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	-	-	-	-	-	-	-	↘
	Middle	-	-	-	-	-	-	↘	↘
	Bottom	-	-	-	-	-	-	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	↗	↗	-	-	↗	↗	↗
	Middle	-	-	-	-	-	-	↗	↗
	Bottom	-	-	-	↗	-	-	↗	↗
	Average	-	-	-	-	↗	↗	↗	↗
E. coli (cfu/100mL)	Surface	-	-	-	-	-	-	-	-
	Middle	-	↘	-	-	-	-	-	-
	Bottom	-	↘	↘	-	-	-	-	-
	Average	↘	↘	-	-	-	-	-	-
Faecal Coliforms (cfu/100mL)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Southern WCZ, 1986 - 2018 (continued)

Monitoring Station		SM10	SM11	SM12	SM13	SM17	SM18	SM19	SM20
Monitoring Period		1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1989 I 2018	1989 I 2018	1989 I 2018	1999 I 2018
Parameter	Water Depth								
Temperature (°C)	Surface	↗	↗	↗	↗	↗	↗	↗	-
	Middle	NA	↗	↗	↗	↗	↗	↗	-
	Bottom	↗	↗	↗	↗	↗	↗	↗	-
	Average	↗	↗	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	↘	↘	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	-	-	↘	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Dissolved Oxygen (% saturation)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	↘	-	-	-	-	-	-	↘
	Middle	NA	-	-	-	↘	-	-	↘
	Bottom	↘	-	-	-	↘	-	-	↘
	Average	↘	-	-	-	↘	-	-	↘
Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	↗	↘
	Average	-	-	-	-	-	-	-	-
Volatile Suspended Solids (mg/L)	Surface	-	-	-	-	-	↗	↗	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	↗	-
	Average	-	-	-	-	-	↗	↗	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↘	↘	-
	Average	-	-	-	-	-	-	-	-
Ammonia Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	↗	-	-	-	-	-	-
	Average	↗	↗	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	-	↘	↘	↘	-	↘	-
	Middle	NA	↘	↘	↘	↘	-	↘	-
	Bottom	↘	-	-	↘	↘	↘	↘	↘
	Average	↘	-	-	↘	↘	↘	↘	-
Nitrite Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗	↗	-
	Middle	NA	↗	↗	↗	↗	-	↗	-
	Bottom	↗	↗	↗	↗	-	↗	↗	-
	Average	↗	↗	↗	↗	↗	↗	↗	-
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗	↗	-
	Middle	NA	↗	↗	↗	↗	-	↗	-
	Bottom	↗	↗	↗	↗	-	-	-	-
	Average	↗	↗	↗	↗	↗	-	↗	-
Total Inorganic Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	-	-	-
	Middle	NA	↗	↗	↗	-	-	-	↗
	Bottom	↗	↗	↗	↗	-	-	-	-
	Average	↗	↗	↗	↗	-	-	-	-
Total Kjeldahl Nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	↗
	Middle	NA	-	-	-	-	-	-	↗
	Bottom	-	-	-	-	-	-	-	↗
	Average	-	-	-	-	-	-	-	↗
Total Nitrogen (mg/L)	Surface	-	↗	-	↗	-	-	-	↗
	Middle	NA	-	-	-	-	-	-	↗
	Bottom	-	-	-	-	-	-	-	↗
	Average	-	↗	-	↗	-	-	-	↗
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	-
	Middle	NA	↘	↘	↘	↘	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	↘	-
Total Phosphorus (mg/L)	Surface	↘	↘	↘	-	-	-	-	-
	Middle	NA	-	↘	-	-	-	-	-
	Bottom	↘	-	↘	↘	-	-	-	-
	Average	↘	↘	↘	↘	↘	↘	-	-
Silica (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-	↗	↗	↗	-	-	-
	Middle	NA	-	↗	↗	↗	-	-	-
	Bottom	↗	-	-	-	↗	-	-	-
	Average	↗	-	↗	↗	↗	-	-	-
E. coli (cfu/100mL)	Surface	↘	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	↘	↘	↗	-	-	-	-	-
	Average	↘	↘	-	-	-	-	-	-
Faecal Coliforms (cfu/100mL)	Surface	↘	↘	↗	-	-	-	-	-
	Middle	NA	↘	↗	-	-	-	-	-
	Bottom	↘	↘	↗	-	-	-	-	-
	Average	↘	↘	↗	↗	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Victoria Harbour WCZ, 1986 - 2018

Monitoring Station		VM1	VM2	VM4	VM5	VM6
Monitoring Period		1988 I 2018	1988 I 2018	1988 I 2018	1986 I 2018	1988 I 2018
Parameter	Water Depth					
Temperature (°C)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	↗	-	-	-	-
	Average	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Dissolved Oxygen (% saturation)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
pH	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	↘	-	-
	Average	-	-	-	-	-
Suspended Solids (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	-	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Volatile Suspended Solids (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	-	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	↘	↘	-	-
	Middle	↘	↘	↘	-	↘
	Bottom	↘	↘	↘	-	↘
	Average	↘	↘	↘	-	-
Ammonia Nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Nitrite Nitrogen (mg/L)	Surface	-	-	-	↗	-
	Middle	-	-	-	-	-
	Bottom	↘	-	-	-	-
	Average	-	-	-	-	-
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	-	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	↘	↘	↘	-	-
	Middle	↘	↘	↘	-	-
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	-	-
Total Kjeldahl Nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Total Nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	-	-	-
	Average	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	↗	-	-	-
	Average	-	↗	-	-	-
E. coli (cfu/100mL)	Surface	↘	↘	↘	-	↘
	Middle	↘	↘	↘	-	↘
	Bottom	↘	↘	↘	-	↘
	Average	↘	↘	↘	-	↘
Faecal Coliforms (cfu/100mL)	Surface	↘	↘	↘	-	-
	Middle	↘	↘	↘	-	-
	Bottom	↘	↘	↘	-	-
	Average	↘	↘	↘	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Victoria Harbour WCZ, 1986 - 2018 (continued)

Monitoring Station		VM7	VM8	VM12	VM14	VM15
Monitoring Period		1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1993 I 2018
Parameter	Water Depth					
Temperature (°C)	Surface	↗	↗	↗	↗	-
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	-
	Average	↗	↗	↗	↗	-
Salinity	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	-	↘	-
	Average	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	-	↗	-	↗
	Middle	↗	-	↗	↗	↗
	Bottom	↗	-	↗	↗	↗
	Average	↗	-	↗	↗	↗
Dissolved Oxygen (% saturation)	Surface	↗	-	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	-	↗	↗	↗
pH	Surface	↘	↘	↘	↘	-
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-	-
	Middle	-	-	-	-	↘
	Bottom	↘	-	-	-	↘
	Average	-	-	-	-	↘
Suspended Solids (mg/L)	Surface	↘	↘	-	↘	↘
	Middle	↘	↘	-	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	-	↘	↘
Volatile Suspended Solids (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	-	↘	-
	Bottom	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	↘	↘	-
	Middle	-	-	↘	↘	-
	Bottom	-	-	↘	↘	-
	Average	-	-	↘	↘	-
Ammonia Nitrogen (mg/L)	Surface	↘	↗	↘	↘	↘
	Middle	↘	↗	↘	↘	↘
	Bottom	↘	-	↘	↘	↘
	Average	↘	-	↘	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Nitrite Nitrogen (mg/L)	Surface	↗	↗	↗	↗	-
	Middle	-	↗	↗	↗	-
	Bottom	-	-	-	↗	-
	Average	-	↗	↗	↗	-
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	-	↗	-	-	-
	Middle	-	↗	-	↗	-
	Bottom	-	↗	-	↗	↘
	Average	-	↗	-	↗	-
Total Kjeldahl Nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Total Nitrogen (mg/L)	Surface	↘	-	↘	↘	-
	Middle	↘	-	↘	-	-
	Bottom	↘	-	↘	-	↘
	Average	↘	-	↘	↘	-
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	-	-	-
	Average	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	-	-	-
	Average	-	-	-	-	-
E. coli (cfu/100mL)	Surface	-	-	↘	↘	↘
	Middle	-	-	↘	↘	↘
	Bottom	-	↗	-	↘	↘
	Average	-	-	-	↘	↘
Faecal Coliforms (cfu/100mL)	Surface	-	↗	-	↘	↘
	Middle	-	↗	-	↘	↘
	Bottom	-	↗	-	-	↘
	Average	-	↗	-	↘	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Eastern Buffer WCZ, 1986 - 2018

Monitoring Station		EM1	EM2	EM3
Monitoring Period		1986 I 2018	1986 I 2018	1988 I 2018
Parameter	Water Depth			
Temperature (°C)	Surface	↗	↗	↗
	Middle	↗	↗	↗
	Bottom	↗	↗	↗
	Average	↗	↗	↗
Salinity	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	-	-
	Middle	↗	↗	-
	Bottom	↗	-	-
	Average	↗	-	-
Dissolved Oxygen (% saturation)	Surface	↗	↗	-
	Middle	↗	↗	↗
	Bottom	↗	-	-
	Average	↗	↗	-
pH	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	-
Turbidity (NTU)	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Suspended Solids (mg/L)	Surface	↘	-	-
	Middle	↘	-	-
	Bottom	↘	-	-
	Average	↘	-	-
Volatile Suspended Solids (mg/L)	Surface	-	-	-
	Middle	↘	-	-
	Bottom	↘	-	-
	Average	↘	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	-	-
	Middle	↘	↘	-
	Bottom	↘	↘	-
	Average	↘	-	-
Ammonia Nitrogen (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Nitrite Nitrogen (mg/L)	Surface	-	-	-
	Middle	↘	-	-
	Bottom	↘	-	-
	Average	↘	-	-
Nitrate Nitrogen (mg/L)	Surface	↗	↗	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Total Inorganic Nitrogen (mg/L)	Surface	↘	↘	-
	Middle	↘	↘	-
	Bottom	↘	↘	-
	Average	↘	↘	-
Total Kjeldahl Nitrogen (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	-
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Total Nitrogen (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	-
	Bottom	↘	↘	-
	Average	↘	↘	-
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Total Phosphorus (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Silica (mg/L)	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
E. coli (cfu/100mL)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Faecal Coliforms (cfu/100mL)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Western Buffer WCZ, 1986 - 2018

Monitoring Station		WM1	WM2	WM3	WM4
Monitoring Period		1988 I 2018	1988 I 2018	1986 I 2018	1986 I 2018
Parameter	Water Depth				
Temperature (°C)	Surface	↗	↗	↗	↗
	Middle	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗
	Average	↗	↗	↗	↗
Salinity	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	↘	-	↘
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Dissolved Oxygen (% saturation)	Surface	-	-	-	↘
	Middle	-	-	↗	-
	Bottom	-	↗	-	-
	Average	-	-	-	-
pH	Surface	↘	↘	↘	↘
	Middle	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘
	Average	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Suspended Solids (mg/L)	Surface	-	↘	↘	↘
	Middle	-	↘	↘	-
	Bottom	↗	-	-	-
	Average	-	↘	↘	-
Volatile Suspended Solids (mg/L)	Surface	-	-	↘	↘
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	↘	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Ammonia Nitrogen (mg/L)	Surface	-	↗	-	-
	Middle	-	↗	-	-
	Bottom	↘	-	-	-
	Average	-	↗	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘
	Middle	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘
	Average	↘	↘	↘	↘
Nitrite Nitrogen (mg/L)	Surface	↗	↗	↗	↗
	Middle	-	↗	↗	↗
	Bottom	-	↗	-	-
	Average	↗	↗	↗	↗
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	↗
	Middle	-	↗	↗	↗
	Bottom	-	↗	↗	↗
	Average	↗	↗	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	↗	↗	↗	↗
	Middle	-	↗	↗	↗
	Bottom	-	↗	-	↗
	Average	-	↗	↗	↗
Total Kjeldahl Nitrogen (mg/L)	Surface	↘	↘	↘	↘
	Middle	↘	-	↘	-
	Bottom	↘	-	↘	↘
	Average	↘	-	↘	-
Total Nitrogen (mg/L)	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	↘	-	-	-
	Average	-	-	-	-
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	↘	↘
	Middle	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘
	Average	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	↘	↘	↘	↘
	Middle	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘
	Average	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-
	Middle	-	↗	-	-
	Bottom	↗	-	-	-
	Average	-	-	-	-
E. coli (cfu/100mL)	Surface	↘	-	-	-
	Middle	↘	-	-	-
	Bottom	↘	-	-	-
	Average	↘	-	-	-
Faecal Coliforms (cfu/100mL)	Surface	-	-	-	-
	Middle	↘	-	-	-
	Bottom	↘	↗	-	-
	Average	↘	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Junk Bay WCZ, 1986 - 2018

Monitoring Station		JM3	JM4
Monitoring Period		1986 I 2018	1986 I 2018
Parameter	Water Depth		
Temperature (°C)	Surface	↗	↗
	Middle	↗	↗
	Bottom	↗	↗
	Average	↗	↗
Salinity	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Dissolved Oxygen (mg/L)	Surface	-	-
	Middle	↗	↗
	Bottom	↗	↗
	Average	↗	↗
Dissolved Oxygen (% saturation)	Surface	↗	↗
	Middle	↗	↗
	Bottom	↗	↗
	Average	↗	↗
pH	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Secchi Disc Depth (m)		↗	↗
Turbidity (NTU)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Suspended Solids (mg/L)	Surface	↘	↘
	Middle	↘	-
	Bottom	-	-
	Average	↘	-
Volatile Suspended Solids (mg/L)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-
	Middle	-	-
	Bottom	↘	↘
	Average	-	-
Ammonia Nitrogen (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Nitrite Nitrogen (mg/L)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Nitrate Nitrogen (mg/L)	Surface	↗	↗
	Middle	↗	↗
	Bottom	↗	-
	Average	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Total Kjeldahl Nitrogen (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Total Nitrogen (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Total Phosphorus (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Silica (mg/L)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
E. coli (cfu/100mL)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Faecal Coliforms (cfu/100mL)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Deep Bay WCZ, 1986 - 2018

Monitoring Station		DM1	DM2	DM3	DM4	DM5
Monitoring Period		1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1991 I 2018
Parameter	Water Depth					
Temperature (°C)	Surface	↗	↗	↗	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	↗	↗	↗	↗	↗
Salinity	Surface	↘	↘	-	-	-
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	↘	↘	↘	↘	↘
Dissolved Oxygen (mg/L)	Surface	-	-	↘	↘	↘
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	↘	-
	Average	-	-	↘	↘	-
Dissolved Oxygen (% saturation)	Surface	-	-	↘	↘	↘
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	↘	-
	Average	-	-	↘	↘	-
pH	Surface	↘	↘	↘	↘	↘
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	↘
	Average	-	-	-	-	↘
Suspended Solids (mg/L)	Surface	-	-	-	-	↘
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	-	-	-	↘	↘
Volatile Suspended Solids (mg/L)	Surface	-	↗	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	↗	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	↗	↗	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	↗	↗	-	-	-
Ammonia Nitrogen (mg/L)	Surface	-	-	-	↗	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	↘	↘	↘	-	-
Nitrite Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	↗	↗	↗	↗	↗
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	↗	↗	↗	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	-	-	↗	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	-	-	↗	↗	↗
Total Kjeldahl Nitrogen (mg/L)	Surface	-	-	↘	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	-	↘	-	-
Total Nitrogen (mg/L)	Surface	-	-	-	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	-	-	-	↗	↗
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	↘	↘	-	-	-
Total Phosphorus (mg/L)	Surface	↘	↘	↘	-	↘
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	↗	↗	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	↗	↗
	Average	↗	↗	-	-	-
Chlorophyll-*a* (µg/L)	Surface	↗	↗	-	-	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	-	↗
	Average	↗	↗	-	-	↗
E. coli (cfu/100mL)	Surface	-	-	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	-	-	-	-
Faecal Coliforms (cfu/100mL)	Surface	-	↗	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	↗	-	↗	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the North Western WCZ, 1986 - 2018

Monitoring Station		NM1	NM2	NM3	NM5	NM6	NM8
Monitoring Period		1988 I 2018	1986 I 2018	1986 I 2018	1988 I 2018	1991 I 2018	1999 I 2018
Parameter	Water Depth						
Temperature (°C)	Surface	↗	↗	↗	↗	↗	-
	Middle	-	-	↗	↗	↗	-
	Bottom	-	-	↗	↗	↗	-
	Average	-	-	↗	↗	↗	-
Salinity	Surface	-	-	-	-	-	-
	Middle	-	↘	↘	-	-	↘
	Bottom	-	-	-	-	↘	↘
	Average	-	-	↘	-	-	-
Dissolved Oxygen (mg/L)	Surface	-	-	-	↘	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	↘	-	↘	-	-
	Average	-	↘	↘	↘	-	-
Dissolved Oxygen (% saturation)	Surface	-	-	↘	↘	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	↘	-	-	-	-
	Average	-	-	↘	↘	-	-
pH	Surface	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	↘	↘	-	-	-	↘
	Middle	↘	↘	↘	↘	-	↘
	Bottom	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	-	↘
Suspended Solids (mg/L)	Surface	-	-	-	↘	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	-	↘	-	↘	-
	Average	-	↘	↘	-	-	-
Volatile Suspended Solids (mg/L)	Surface	-	-	-	-	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-
	Average	-	-	-	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	-	-	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	↘	-	-	-	-
	Average	-	↘	-	-	-	-
Ammonia Nitrogen (mg/L)	Surface	-	-	↗	-	-	-
	Middle	-	-	↗	-	-	-
	Bottom	↗	↗	↗	-	-	-
	Average	-	-	↗	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	-	-	-	-	-
	Middle	↘	↘	-	↘	-	-
	Bottom	↘	↘	-	-	-	-
	Average	↘	↘	-	↘	-	-
Nitrite Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗
Total Kjeldahl Nitrogen (mg/L)	Surface	-	-	-	↘	-	-
	Middle	-	-	-	-	-	↗
	Bottom	-	-	-	-	-	↗
	Average	-	-	-	-	-	↗
Total Nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗
	Middle	-	↗	-	↗	↗	↗
	Bottom	-	-	-	-	-	↗
	Average	-	-	↗	↗	↗	↗
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	-	-	-	-
	Middle	-	-	-	↘	↘	-
	Bottom	↘	↘	-	-	↘	-
	Average	↘	↘	-	-	↘	-
Total Phosphorus (mg/L)	Surface	-	-	-	-	-	-
	Middle	-	-	-	-	-	-
	Bottom	↘	↘	↘	↘	↘	-
	Average	↘	↘	-	↘	↘	-
Silica (mg/L)	Surface	-	-	-	-	-	↗
	Middle	-	↗	-	-	-	↗
	Bottom	-	-	-	-	-	↗
	Average	-	-	-	-	-	↗
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	-	-	-	↗	-
	Average	-	-	-	-	-	-
E. coli (cfu/100mL)	Surface	-	↘	↘	-	-	-
	Middle	-	↘	↘	-	-	-
	Bottom	-	↘	↘	-	-	-
	Average	-	↘	↘	-	-	-
Faecal Coliforms (cfu/100mL)	Surface	-	↘	↘	-	-	-
	Middle	-	↘	-	-	-	-
	Bottom	-	↘	↘	-	-	-
	Average	-	↘	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Summary statistics for bottom sediment quality in the Tolo Harbour and Channel and Southern WCZs, 2014 - 2018

	Tolo Harbour and Channel				Hong Kong Island (South)		West Lamma Channel	
	Harbour Subzone		Buffer Subzone	Channel Subzone				
Parameter	TS2	TS3	TS4	TS5	SS1	SS2	SS3	SS4
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	78 (57 - 94)	89 (70 - 97)	78 (57 - 98)	94 (86 - 99)	60 (38 - 90)	77 (58 - 85)	79 (70 - 93)	88 (73 - 96)
Electrochemical Potential (mV)	-326 (-408 - -231)	-329 (-418 - -188)	-336 (-419 - -226)	-353 (-444 - -308)	-201 (-433 - -85)	-210 (-443 - -71)	-173 (-419 - -40)	-203 (-424 - -84)
Total Solids (%w/w)	37 (29 - 45)	34 (29 - 44)	32 (23 - 39)	31 (29 - 34)	59 (53 - 64)	50 (48 - 54)	50 (42 - 54)	46 (42 - 51)
Total Volatile Soilds (%TS)	10.1 (8.3 - 12.0)	10.1 (7.9 - 11.0)	11.1 (9.0 - 13.0)	11.1 (11.0 - 12.0)	5.6 (5.0 - 6.5)	7.0 (6.8 - 7.2)	7.0 (6.4 - 7.8)	7.4 (6.6 - 9.5)
Chemical Oxygen Demand (mg/kg)	21100 (18000 - 24000)	20700 (18000 - 25000)	18300 (16000 - 25000)	17800 (15000 - 22000)	10010 (8500 - 11000)	12500 (11000 - 16000)	13100 (10000 - 16000)	11930 (9600 - 14000)
Total Carbon (%w/w)	0.9 (0.6 - 1.2)	0.7 (0.6 - 0.8)	1.0 (0.5 - 1.5)	0.8 (0.7 - 0.9)	1.0 (0.8 - 1.1)	0.7 (0.6 - 0.9)	0.8 (0.6 - 0.9)	0.7 (0.5 - 1.1)
Ammonical Nitrogen (mg/kg)	5.10 (1.70 - 9.50)	3.60 (<0.05 - 8.20)	13.04 (1.30 - 27.00)	11.83 (8.50 - 17.00)	5.81 (0.26 - 16.00)	8.53 (1.50 - 43.00)	4.09 (<0.05 - 10.00)	4.61 (0.27 - 13.00)
Total Kjeldahl Nitrogen (mg/kg)	650 (500 - 780)	620 (500 - 780)	720 (520 - 1300)	760 (500 - 940)	430 (330 - 610)	550 (460 - 600)	490 (420 - 580)	530 (440 - 670)
Total Phosphorus (mg/kg)	190 (150 - 250)	180 (160 - 190)	190 (140 - 230)	210 (160 - 250)	230 (170 - 290)	250 (230 - 270)	250 (220 - 260)	230 (220 - 250)
Total Sulphide (mg/kg)	106.1 (0.8 - 260.0)	96.5 (31.0 - 160.0)	178.0 (93.0 - 310.0)	121.1 (42.0 - 230.0)	19.3 (2.5 - 54.0)	23.6 (4.2 - 64.0)	23.8 (11.0 - 34.0)	34.7 (6.8 - 100.0)
Total Cyanide (mg/kg)	0.2 (<0.1 - 0.2)	0.2 (0.1 - 0.3)	0.1 (<0.1 - 0.3)	0.2 (<0.1 - 0.3)	<0.1 (<0.1 - 0.1)	<0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	10.6 (7.4 - 15.0)	11.5 (9.6 - 15.0)	9.7 (7.8 - 13.0)	6.9 (3.6 - 12.0)	7.0 (5.7 - 11.0)	8.5 (6.6 - 11.0)	7.3 (5.9 - 9.3)	8.0 (6.2 - 12.0)
Cadmium (mg/kg)	0.6 (0.4 - 0.8)	0.6 (0.4 - 0.7)	0.5 (0.4 - 0.6)	0.3 (0.2 - 0.7)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)
Chromium (mg/kg)	23 (14 - 32)	26 (21 - 28)	27 (21 - 34)	33 (26 - 39)	20 (15 - 24)	28 (25 - 32)	28 (21 - 34)	31 (25 - 39)
Copper (mg/kg)	40 (21 - 92)	40 (29 - 59)	39 (21 - 150)	23 (18 - 34)	9 (7 - 11)	17 (15 - 20)	16 (13 - 21)	25 (18 - 34)
Lead (mg/kg)	81 (46 - 110)	91 (50 - 110)	68 (36 - 100)	53 (35 - 86)	26 (21 - 32)	32 (20 - 38)	32 (20 - 39)	37 (25 - 42)
Mercury (mg/kg)	0.10 (<0.05 - 0.38)	0.09 (<0.05 - 0.30)	0.09 (<0.05 - 0.30)	0.08 (<0.05 - 0.30)	0.06 (<0.05 - 0.07)	0.09 (0.05 - 0.18)	0.09 (0.06 - 0.17)	0.12 (0.09 - 0.17)
Nickel (mg/kg)	15 (5 - 38)	14 (5 - 18)	18 (12 - 24)	23 (20 - 29)	14 (12 - 17)	19 (17 - 23)	19 (15 - 21)	20 (17 - 25)
Silver (mg/kg)	0.4 (0.2 - 0.5)	0.5 (0.2 - 0.8)	0.3 (<0.2 - 0.4)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	0.2 (<0.2 - 0.3)
Zinc (mg/kg)	260 (170 - 410)	300 (170 - 360)	190 (140 - 410)	140 (120 - 220)	63 (50 - 74)	93 (80 - 130)	88 (69 - 110)	110 (92 - 130)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	160 (90 - 420)	150 (90 - 410)	170 (90 - 670)	130 (94 - 220)	110 (90 - 180)	110 (90 - 190)	130 (90 - 230)	140 (90 - 270)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	62 (34 - 100)	53 (28 - 93)	74 (33 - 160)	74 (33 - 110)	35 (19 - 50)	98 (21 - 270)	57 (26 - 91)	84 (46 - 130)

Note:

1 Data presented are arithmetic means ; data in brackets indicate ranges.

2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.

3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.

5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.

6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for bottom sediment quality in the Southern, Junk Bay and Deep Bay WCZs, 2014 - 2018

	Lantau Island (East)	Lantau Island (South)	Junk Bay	Inner Deep Bay		Outer Deep Bay	
Parameter	SS5	SS6	JS2	DS1	DS2	DS3	DS4
Number of samples	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	96 (88 - 99)	62 (50 - 71)	91 (69 - 99)	77 (47 - 98)	76 (33 - 93)	87 (54 - 99)	56 (34 - 86)
Electrochemical Potential (mV)	-239 (-408 - -68)	-222 (-379 - -102)	-271 (-382 - -133)	-307 (-458 - -93)	-307 (-455 - -94)	-278 (-454 - -90)	-275 (-450 - -90)
Total Solids (%w/w)	38 (36 - 43)	64 (59 - 68)	46 (39 - 62)	45 (36 - 56)	49 (45 - 53)	49 (40 - 57)	58 (46 - 68)
Total Volatile Soilds (%TS)	8.1 (7.7 - 8.6)	3.9 (3.5 - 4.6)	7.6 (5.1 - 9.9)	7.5 (5.5 - 9.1)	7.2 (5.7 - 8.4)	7.3 (4.9 - 9.2)	5.9 (4.0 - 8.2)
Chemical Oxygen Demand (mg/kg)	13300 (11000 - 15000)	8410 (6500 - 9700)	13890 (8900 - 17000)	19200 (15000 - 24000)	13600 (10000 - 16000)	11540 (8200 - 14000)	11440 (7400 - 14000)
Total Carbon (%w/w)	0.5 (0.5 - 0.6)	0.5 (0.4 - 0.7)	0.7 (0.6 - 0.8)	0.7 (0.4 - 1.2)	0.6 (0.5 - 0.9)	0.5 (0.3 - 0.6)	0.7 (0.4 - 1.3)
Ammonical Nitrogen (mg/kg)	8.75 (<0.05 - 13.00)	8.51 (<0.05 - 20.00)	3.46 (0.16 - 9.00)	28.75 (0.67 - 96.00)	2.85 (<0.05 - 13.00)	1.51 (<0.05 - 4.40)	2.64 (0.11 - 9.00)
Total Kjeldahl Nitrogen (mg/kg)	580 (490 - 660)	320 (260 - 420)	570 (480 - 660)	670 (460 - 1000)	450 (340 - 560)	460 (380 - 590)	380 (270 - 560)
Total Phosphorus (mg/kg)	210 (180 - 230)	200 (170 - 240)	210 (200 - 230)	420 (290 - 630)	290 (200 - 370)	260 (230 - 310)	210 (160 - 270)
Total Sulphide (mg/kg)	33.3 (6.4 - 67.0)	9.0 (1.2 - 21.0)	30.5 (10.0 - 77.0)	226.9 (44.0 - 660.0)	8.5 (1.2 - 44.0)	11.5 (0.5 - 30.0)	8.1 (1.0 - 30.0)
Total Cyanide (mg/kg)	0.2 (<0.1 - 0.2)	<0.1 (<0.1 - 0.1)	<0.1 (<0.1 - 0.1)	0.2 (<0.1 - 0.3)	0.2 (<0.1 - 0.2)	0.2 (0.1 - 0.3)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	8.3 (6.5 - 11.0)	6.0 (4.7 - 9.0)	7.5 (5.7 - 9.6)	13.4 (8.0 - 19.0)	14.4 (6.3 - 19.0)	12.5 (9.4 - 16.0)	10.8 (6.6 - 17.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - 0.1)	0.4 (0.2 - 0.8)	0.2 (0.1 - 0.7)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - 0.1)
Chromium (mg/kg)	39 (32 - 42)	20 (14 - 29)	38 (24 - 46)	51 (31 - 64)	39 (22 - 45)	39 (27 - 50)	27 (17 - 40)
Copper (mg/kg)	37 (28 - 56)	9 (3 - 14)	64 (38 - 85)	73 (38 - 110)	42 (24 - 56)	47 (34 - 65)	27 (15 - 44)
Lead (mg/kg)	48 (42 - 53)	24 (19 - 36)	44 (31 - 54)	57 (35 - 82)	55 (24 - 120)	45 (29 - 57)	36 (23 - 53)
Mercury (mg/kg)	0.15 (0.12 - 0.25)	0.06 (<0.05 - 0.10)	0.25 (0.10 - 0.64)	0.21 (0.10 - 0.31)	0.13 (0.06 - 0.18)	0.11 (0.10 - 0.13)	0.08 (<0.05 - 0.10)
Nickel (mg/kg)	24 (20 - 26)	12 (9 - 19)	19 (13 - 25)	29 (15 - 41)	22 (13 - 26)	24 (16 - 32)	17 (11 - 26)
Silver (mg/kg)	0.3 (0.2 - 0.4)	<0.2 (<0.2 - <0.2)	0.9 (0.5 - 1.1)	0.7 (0.3 - 1.1)	0.3 (<0.2 - 0.5)	0.3 (0.3 - 0.4)	0.2 (<0.2 - 0.3)
Zinc (mg/kg)	140 (120 - 170)	63 (44 - 99)	140 (83 - 160)	300 (170 - 410)	160 (97 - 210)	140 (110 - 160)	99 (64 - 130)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	120 (90 - 190)	100 (90 - 190)	140 (90 - 350)	230 (90 - 830)	140 (90 - 260)	110 (90 - 260)	110 (90 - 170)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	83 (51 - 130)	39 (19 - 120)	240 (110 - 330)	360 (75 - 1600)	88 (54 - 130)	85 (39 - 140)	57 (22 - 90)

Note:
1 Data presented are arithmetic means ; data in brackets indicate ranges.
2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for bottom sediment quality in the Port Shelter and Mirs Bay WCZs, 2014 - 2018

	Inner Port Shelter	Outer Port Shelter		Starling Inlet	Crooked Island		Port Island	Mirs Bay (North)
Parameter	PS3	PS5	PS6	MS1	MS2	MS7	MS17	MS3
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	93 (83 - 97)	58 (39 - 85)	79 (60 - 90)	91 (60 - 99)	96 (88 - 99)	89 (38 - 99)	94 (90 - 98)	85 (73 - 94)
Electrochemical Potential (mV)	-311 (-399 - -101)	-260 (-407 - -88)	-267 (-400 - -126)	-290 (-395 - -161)	-347 (-401 - -285)	-359 (-415 - -314)	-269 (-388 - -80)	-289 (-395 - -130)
Total Solids (%w/w)	36 (30 - 39)	52 (40 - 64)	50 (45 - 54)	40 (37 - 43)	33 (30 - 38)	31 (27 - 36)	35 (31 - 39)	43 (38 - 49)
Total Volatile Soilds (%TS)	12.1 (11.0 - 13.0)	8.6 (6.4 - 12.0)	8.8 (7.6 - 10.0)	7.7 (7.0 - 8.4)	9.5 (8.6 - 10.0)	11.4 (10.0 - 15.0)	10.2 (9.4 - 11.0)	8.0 (6.4 - 9.0)
Chemical Oxygen Demand (mg/kg)	16200 (11000 - 19000)	12600 (10000 - 17000)	12500 (11000 - 14000)	13900 (11000 - 16000)	16100 (13000 - 21000)	17400 (13000 - 21000)	15400 (12000 - 18000)	13230 (8300 - 20000)
Total Carbon (%w/w)	1.2 (0.9 - 1.3)	1.8 (1.1 - 2.4)	1.4 (1.0 - 1.7)	0.5 (<0.1 - 0.8)	0.6 (0.5 - 0.8)	0.8 (0.6 - 1.0)	0.7 (0.5 - 0.9)	0.7 (0.4 - 1.3)
Ammonical Nitrogen (mg/kg)	7.15 (1.10 - 12.00)	4.18 (0.57 - 7.70)	5.42 (0.92 - 8.90)	8.74 (4.00 - 19.00)	10.57 (8.60 - 17.00)	9.99 (7.20 - 13.00)	8.61 (7.10 - 11.00)	9.00 (2.20 - 18.00)
Total Kjeldahl Nitrogen (mg/kg)	760 (630 - 1000)	580 (440 - 730)	660 (570 - 770)	510 (390 - 620)	640 (450 - 770)	680 (520 - 770)	700 (590 - 880)	510 (400 - 660)
Total Phosphorus (mg/kg)	210 (190 - 240)	220 (190 - 280)	250 (210 - 280)	190 (170 - 210)	190 (150 - 220)	200 (170 - 240)	220 (190 - 280)	210 (150 - 310)
Total Sulphide (mg/kg)	40.9 (12.0 - 64.0)	17.4 (2.1 - 42.0)	35.6 (23.0 - 54.0)	39.2 (2.7 - 170.0)	70.1 (34.0 - 140.0)	63.5 (1.3 - 100.0)	28.4 (5.7 - 55.0)	39.0 (1.3 - 130.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.3)	0.2 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.3)
Arsenic (mg/kg)	6.2 (4.8 - 7.8)	5.0 (4.1 - 6.1)	6.5 (5.2 - 9.4)	9.3 (7.1 - 12.0)	8.2 (6.0 - 11.0)	7.3 (5.8 - 9.5)	7.1 (5.6 - 9.6)	7.0 (5.6 - 9.8)
Cadmium (mg/kg)	<0.1 (<0.1 - 0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.2)	0.3 (0.2 - 0.4)	0.4 (0.2 - 0.5)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - 0.1)
Chromium (mg/kg)	26 (23 - 29)	20 (14 - 31)	25 (21 - 30)	32 (28 - 36)	35 (30 - 41)	31 (25 - 40)	32 (26 - 37)	27 (21 - 34)
Copper (mg/kg)	22 (18 - 25)	10 (7 - 16)	11 (9 - 16)	21 (14 - 25)	24 (19 - 29)	21 (13 - 28)	17 (15 - 19)	12 (10 - 17)
Lead (mg/kg)	38 (29 - 44)	27 (21 - 38)	32 (24 - 40)	44 (31 - 54)	47 (34 - 54)	42 (27 - 51)	42 (34 - 45)	30 (22 - 38)
Mercury (mg/kg)	0.09 (0.07 - 0.11)	0.05 (<0.05 - 0.06)	0.05 (<0.05 - 0.07)	0.05 (<0.05 - 0.07)	0.06 (<0.05 - 0.09)	0.07 (<0.05 - 0.11)	0.05 (<0.05 - 0.07)	0.05 (<0.05 - 0.06)
Nickel (mg/kg)	17 (15 - 19)	14 (10 - 21)	17 (15 - 22)	19 (15 - 22)	22 (18 - 27)	21 (17 - 28)	23 (18 - 26)	17 (13 - 24)
Silver (mg/kg)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - 0.2)	<0.2 (<0.2 - <0.2)	0.3 (<0.2 - 0.5)	0.3 (0.2 - 0.3)	0.2 (<0.2 - 0.3)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - <0.2)
Zinc (mg/kg)	110 (86 - 130)	74 (46 - 110)	81 (64 - 100)	110 (82 - 130)	120 (89 - 140)	100 (82 - 140)	100 (82 - 120)	75 (56 - 92)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	130 (90 - 230)	110 (90 - 150)	130 (90 - 330)	140 (90 - 210)	160 (90 - 360)	150 (90 - 320)	110 (90 - 180)	120 (90 - 340)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	64 (43 - 95)	34 (18 - 51)	41 (20 - 75)	48 (24 - 89)	51 (26 - 88)	82 (31 - 270)	52 (23 - 140)	40 (18 - 66)

Note:

1 Data presented are arithmetic means ; data in brackets indicate ranges.

2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.

3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.

5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.

6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for bottom sediment quality in the Mirs Bay WCZ, 2014 - 2018

	Mirs Bay (North)		Long Harbour	Waglan Island	Mirs Bay (South)		Mirs Bay (Central)	
Parameter	MS4	MS5	MS6	MS8	MS13	MS14	MS15	MS16
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	85 (18 - 99)	92 (77 - 99)	94 (83 - 98)	91 (65 - 96)	86 (44 - 96)	91 (75 - 99)	89 (83 - 93)	76 (59 - 91)
Electrochemical Potential (mV)	-286 (-392 - -68)	-268 (-383 - -127)	-276 (-394 - -145)	-230 (-366 - -120)	-235 (-360 - -117)	-235 (-389 - -130)	-228 (-384 - -102)	-217 (-380 - -99)
Total Solids (%w/w)	41 (33 - 57)	39 (32 - 44)	33 (30 - 36)	47 (36 - 61)	51 (44 - 65)	51 (48 - 53)	53 (51 - 58)	56 (51 - 62)
Total Volatile Soilds (%TS)	8.3 (3.8 - 9.6)	8.9 (7.2 - 11.0)	11.3 (11.0 - 13.0)	7.1 (6.0 - 8.9)	6.3 (4.8 - 7.7)	6.5 (5.4 - 7.0)	6.3 (5.9 - 6.6)	6.1 (5.1 - 6.9)
Chemical Oxygen Demand (mg/kg)	13300 (10000 - 17000)	13350 (9500 - 15000)	15600 (11000 - 18000)	10270 (8600 - 12000)	8410 (6400 - 9600)	9230 (7300 - 12000)	9500 (7300 - 11000)	10110 (8000 - 12000)
Total Carbon (%w/w)	0.8 (0.6 - 1.1)	0.7 (0.5 - 0.8)	0.9 (0.8 - 1.3)	0.6 (0.4 - 1.0)	0.6 (0.5 - 0.7)	0.6 (0.5 - 0.6)	0.6 (0.6 - 0.7)	0.7 (0.5 - 0.7)
Ammonical Nitrogen (mg/kg)	8.00 (4.80 - 13.00)	5.28 (0.60 - 10.00)	6.93 (0.78 - 11.00)	2.49 (0.08 - 3.60)	3.90 (0.68 - 9.30)	3.13 (0.74 - 6.30)	3.27 (0.08 - 10.00)	4.76 (2.70 - 8.70)
Total Kjeldahl Nitrogen (mg/kg)	650 (490 - 730)	630 (550 - 700)	730 (660 - 790)	510 (390 - 680)	470 (310 - 550)	510 (400 - 620)	500 (450 - 560)	510 (400 - 730)
Total Phosphorus (mg/kg)	220 (190 - 240)	210 (180 - 240)	220 (200 - 230)	220 (200 - 240)	250 (190 - 360)	250 (230 - 270)	260 (240 - 270)	260 (220 - 320)
Total Sulphide (mg/kg)	33.3 (3.4 - 85.0)	21.0 (3.5 - 35.0)	39.5 (3.0 - 78.0)	15.0 (2.0 - 41.0)	16.6 (4.9 - 35.0)	10.3 (1.7 - 21.0)	9.9 (0.8 - 27.0)	13.5 (3.2 - 37.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - 0.1)	<0.1 (<0.1 - 0.1)	<0.1 (<0.1 - 0.1)	<0.1 (<0.1 - 0.1)
Arsenic (mg/kg)	7.1 (5.0 - 9.7)	7.4 (6.0 - 9.9)	6.3 (3.5 - 10.0)	7.5 (6.5 - 9.0)	7.9 (5.7 - 10.0)	7.6 (6.1 - 9.9)	7.2 (5.9 - 8.2)	7.3 (6.3 - 9.9)
Cadmium (mg/kg)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - 0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)
Chromium (mg/kg)	32 (17 - 39)	31 (26 - 39)	30 (26 - 35)	31 (23 - 35)	29 (19 - 34)	30 (26 - 34)	28 (22 - 35)	26 (22 - 40)
Copper (mg/kg)	15 (7 - 19)	15 (12 - 20)	16 (7 - 19)	14 (12 - 18)	13 (8 - 17)	31 (9 - 200)	11 (9 - 16)	92 (7 - 830)
Lead (mg/kg)	36 (29 - 44)	39 (26 - 46)	40 (32 - 45)	33 (30 - 36)	31 (23 - 37)	31 (26 - 35)	30 (26 - 35)	29 (24 - 35)
Mercury (mg/kg)	0.05 (<0.05 - 0.06)	0.05 (<0.05 - 0.06)	0.06 (<0.05 - 0.07)	0.06 (<0.05 - 0.10)	0.05 (<0.05 - 0.07)	<0.05 (<0.05 - <0.05)	0.05 (<0.05 - 0.06)	<0.05 (<0.05 - <0.05)
Nickel (mg/kg)	22 (12 - 27)	22 (19 - 28)	22 (19 - 26)	21 (16 - 25)	21 (13 - 24)	21 (18 - 24)	20 (16 - 24)	20 (16 - 38)
Silver (mg/kg)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - 0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)
Zinc (mg/kg)	87 (47 - 110)	94 (85 - 120)	100 (92 - 120)	84 (70 - 97)	81 (50 - 94)	110 (71 - 400)	71 (63 - 75)	100 (56 - 420)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 20)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	140 (90 - 300)	130 (90 - 260)	120 (90 - 220)	110 (90 - 210)	120 (90 - 200)	110 (90 - 171)	130 (90 - 300)	120 (90 - 200)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	63 (30 - 150)	51 (22 - 170)	68 (30 - 160)	74 (23 - 200)	36 (18 - 84)	38 (21 - 85)	34 (18 - 69)	31 (18 - 62)

Note:
1 Data presented are arithmetic means ; data in brackets indicate ranges.
2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for bottom sediment quality in the North Western and Western Buffer WCZs, 2014 - 2018

Parameter	Pearl Island NS2	Pillar Point NS3	Urmston Road NS4	Chek Lap Kok (North) NS6	Tsing Yi (South) WS1	Hong Kong Island (West) WS2
Number of samples	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	57 (29 - 97)	65 (35 - 96)	55 (36 - 81)	77 (33 - 99)	79 (72 - 91)	84 (65 - 91)
Electrochemical Potential (mV)	-179 (-317 - -59)	-228 (-382 - -129)	-220 (-388 - -139)	-206 (-380 - -81)	-258 (-351 - -109)	-203 (-347 - -102)
Total Solids (%w/w)	54 (39 - 65)	51 (42 - 63)	58 (48 - 65)	55 (42 - 70)	47 (41 - 51)	47 (44 - 51)
Total Volatile Soilds (%TS)	6.5 (4.8 - 9.2)	7.2 (5.0 - 9.6)	5.9 (4.7 - 7.5)	6.1 (3.0 - 7.8)	7.3 (6.6 - 9.1)	7.5 (6.1 - 9.8)
Chemical Oxygen Demand (mg/kg)	11290 (6900 - 15000)	12800 (11000 - 15000)	13600 (11000 - 17000)	11240 (8700 - 15000)	15300 (12000 - 21000)	13100 (11000 - 16000)
Total Carbon (%w/w)	0.9 (0.5 - 1.3)	0.8 (0.6 - 1.1)	0.6 (<0.1 - 0.8)	0.7 (0.4 - 1.2)	0.8 (0.5 - 1.1)	0.7 (0.5 - 1.2)
Ammonical Nitrogen (mg/kg)	5.22 (<0.05 - 13.00)	6.78 (0.07 - 31.00)	4.49 (0.17 - 24.00)	13.09 (<0.05 - 76.00)	8.50 (1.40 - 27.00)	5.07 (0.65 - 12.00)
Total Kjeldahl Nitrogen (mg/kg)	370 (280 - 500)	460 (370 - 540)	420 (290 - 600)	410 (340 - 510)	540 (500 - 660)	480 (370 - 620)
Total Phosphorus (mg/kg)	210 (170 - 280)	230 (210 - 260)	220 (170 - 260)	220 (160 - 310)	240 (210 - 270)	220 (170 - 250)
Total Sulphide (mg/kg)	21.0 (0.9 - 100.0)	52.4 (1.6 - 230.0)	23.4 (4.3 - 57.0)	14.1 (<0.2 - 51.0)	129.5 (52.0 - 320.0)	19.2 (<0.2 - 46.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	9.1 (7.0 - 14.0)	11.3 (7.7 - 16.0)	10.8 (7.8 - 13.0)	14.9 (7.1 - 22.0)	8.8 (7.5 - 11.0)	8.7 (7.1 - 13.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.2)	0.1 (0.1 - 0.2)	<0.1 (<0.1 - <0.1)
Chromium (mg/kg)	29 (20 - 48)	29 (19 - 45)	27 (20 - 36)	32 (21 - 40)	34 (26 - 43)	32 (25 - 34)
Copper (mg/kg)	27 (17 - 48)	27 (13 - 51)	28 (17 - 44)	23 (13 - 34)	51 (35 - 100)	25 (18 - 33)
Lead (mg/kg)	37 (23 - 53)	36 (26 - 53)	35 (30 - 40)	38 (25 - 48)	38 (33 - 52)	33 (24 - 42)
Mercury (mg/kg)	0.09 (0.06 - 0.15)	0.10 (0.07 - 0.14)	0.08 (0.06 - 0.11)	0.09 (0.05 - 0.13)	0.23 (0.11 - 0.88)	0.13 (0.07 - 0.47)
Nickel (mg/kg)	18 (12 - 30)	17 (11 - 27)	17 (12 - 26)	20 (12 - 25)	19 (16 - 23)	20 (18 - 22)
Silver (mg/kg)	0.2 (<0.2 - 0.4)	0.2 (<0.2 - 0.4)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - 0.2)	0.7 (0.3 - 1.7)	0.3 (<0.2 - 0.5)
Zinc (mg/kg)	120 (79 - 220)	100 (68 - 160)	110 (90 - 130)	94 (61 - 120)	130 (110 - 180)	110 (86 - 170)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 19)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	110 (90 - 150)	110 (90 - 220)	120 (90 - 240)	110 (90 - 200)	130 (90 - 320)	130 (90 - 220)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	62 (36 - 100)	73 (33 - 120)	79 (28 - 200)	58 (24 - 130)	180 (100 - 400)	340 (29 - 1500)

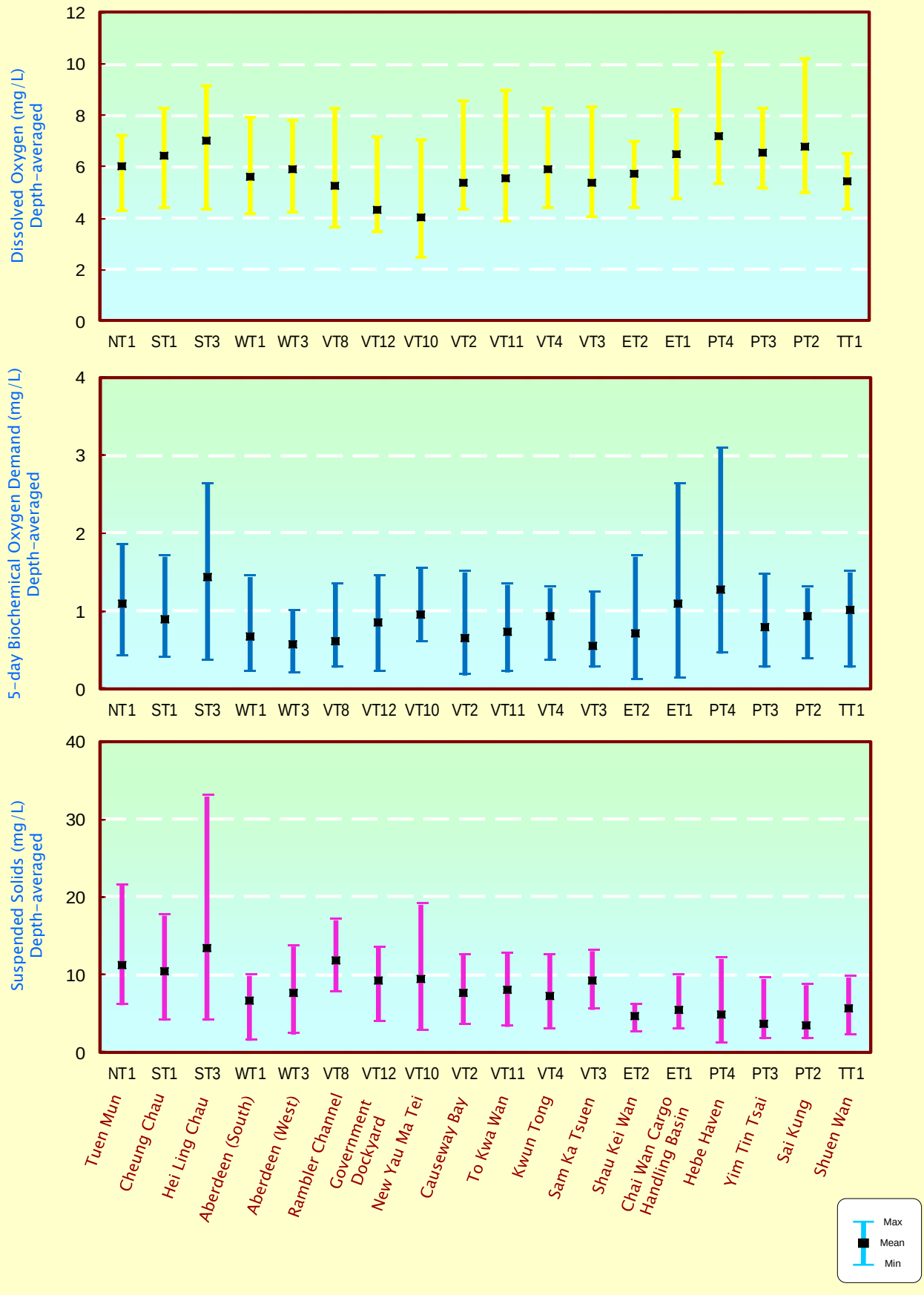
Note:
1 Data presented are arithmetic means ; data in brackets indicate ranges.
2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for bottom sediment quality in the Eastern Buffer and Victoria Harbour WCZs, 2014 - 2018

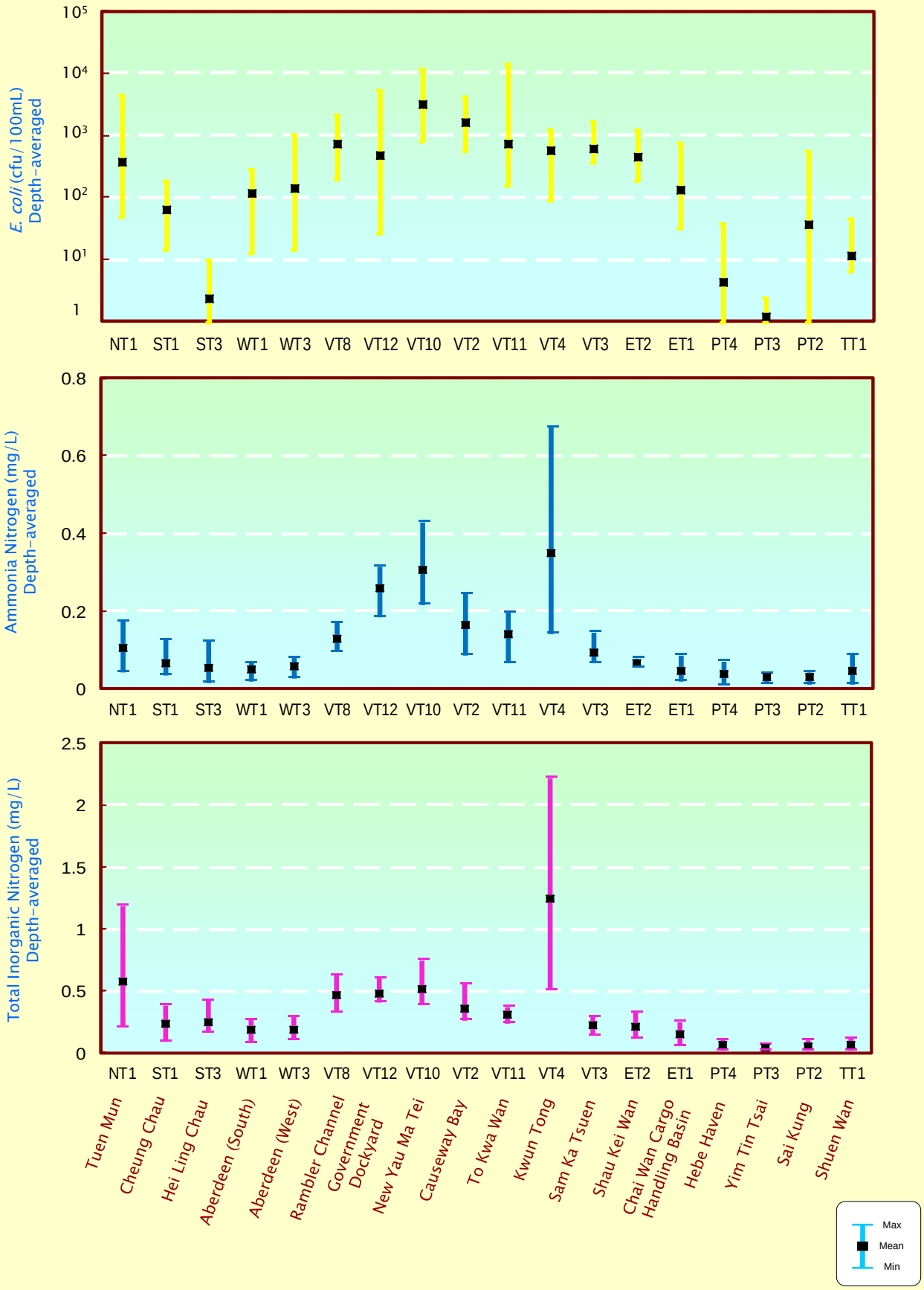
	Eastern Buffer			Victoria Harbour			Rambler Channel	
	Chai Wan	Tathong Channel		(East)	(Central)	(West)		
Parameter	ES1	ES2	ES4	VS3	VS5	VS6	VS9	VS10
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	63 (33 - 99)	68 (36 - 94)	67 (42 - 95)	50 (16 - 80)	83 (69 - 97)	68 (11 - 97)	81 (59 - 97)	80 (37 - 98)
Electrochemical Potential (mV)	-254 (-381 - -127)	-255 (-380 - -144)	-270 (-389 - -115)	-256 (-394 - -104)	-331 (-438 - -168)	-279 (-430 - -65)	-287 (-382 - -194)	-278 (-342 - -178)
Total Solids (%w/w)	60 (43 - 69)	54 (41 - 72)	55 (42 - 66)	48 (38 - 70)	46 (35 - 73)	44 (33 - 54)	45 (35 - 56)	42 (33 - 52)
Total Volatile Soilds (%TS)	5.9 (4.2 - 9.0)	6.9 (4.5 - 8.5)	6.4 (5.1 - 8.3)	7.1 (3.7 - 8.7)	8.5 (7.6 - 9.6)	8.3 (7.0 - 11.0)	7.2 (5.3 - 10.0)	7.7 (6.2 - 8.5)
Chemical Oxygen Demand (mg/kg)	10180 (7200 - 15000)	10800 (8300 - 13000)	14100 (10000 - 21000)	17600 (13000 - 22000)	19200 (11000 - 24000)	16700 (11000 - 24000)	14870 (9700 - 18000)	15400 (11000 - 20000)
Total Carbon (%w/w)	1.1 (0.8 - 1.3)	0.8 (0.6 - 1.1)	1.0 (0.7 - 1.9)	0.8 (0.4 - 1.3)	0.9 (0.6 - 1.4)	0.8 (0.6 - 1.2)	0.7 (0.5 - 0.9)	0.7 (0.5 - 0.9)
Ammonical Nitrogen (mg/kg)	3.23 (0.15 - 11.00)	3.09 (0.09 - 9.40)	7.15 (0.15 - 17.00)	11.89 (<0.05 - 58.00)	17.68 (<0.05 - 44.00)	13.84 (0.11 - 46.00)	10.74 (0.28 - 34.00)	5.57 (1.00 - 17.00)
Total Kjeldahl Nitrogen (mg/kg)	390 (280 - 500)	490 (280 - 700)	500 (380 - 590)	530 (270 - 700)	700 (490 - 1200)	610 (400 - 770)	480 (400 - 550)	490 (370 - 600)
Total Phosphorus (mg/kg)	190 (130 - 250)	210 (160 - 240)	210 (180 - 240)	200 (140 - 250)	210 (160 - 250)	240 (200 - 290)	210 (170 - 260)	210 (170 - 250)
Total Sulphide (mg/kg)	23.8 (6.9 - 48.0)	37.9 (7.9 - 78.0)	41.0 (9.6 - 70.0)	146.3 (14.0 - 400.0)	199.1 (11.0 - 420.0)	176.6 (15.0 - 530.0)	116.2 (40.0 - 210.0)	89.1 (2.1 - 500.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.4)
Arsenic (mg/kg)	5.4 (3.6 - 8.7)	6.0 (4.4 - 9.5)	6.3 (4.1 - 8.7)	7.4 (2.8 - 11.0)	8.1 (6.1 - 11.0)	9.1 (6.5 - 12.0)	8.6 (5.4 - 12.0)	9.6 (6.8 - 15.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.2)	0.3 (<0.1 - 0.5)	0.5 (0.2 - 0.8)	0.3 (<0.1 - 0.5)	0.2 (0.2 - 0.5)	0.3 (0.2 - 0.7)
Chromium (mg/kg)	21 (14 - 36)	27 (11 - 49)	32 (19 - 42)	35 (16 - 50)	45 (20 - 55)	38 (27 - 47)	40 (28 - 58)	50 (42 - 67)
Copper (mg/kg)	22 (14 - 38)	18 (9 - 32)	49 (28 - 85)	89 (33 - 160)	130 (42 - 210)	74 (28 - 110)	69 (41 - 140)	120 (77 - 220)
Lead (mg/kg)	27 (15 - 43)	31 (18 - 42)	38 (25 - 66)	46 (33 - 56)	60 (41 - 72)	61 (29 - 110)	37 (27 - 43)	50 (37 - 60)
Mercury (mg/kg)	0.12 (0.07 - 0.31)	0.08 (0.05 - 0.13)	0.19 (0.09 - 0.38)	0.30 (0.13 - 0.43)	0.46 (0.18 - 0.81)	0.40 (0.18 - 0.70)	0.23 (0.09 - 0.86)	0.23 (0.09 - 0.75)
Nickel (mg/kg)	13 (9 - 21)	17 (7 - 31)	17 (10 - 23)	16 (7 - 24)	20 (10 - 25)	18 (12 - 23)	21 (14 - 28)	24 (17 - 43)
Silver (mg/kg)	0.3 (<0.2 - 0.5)	0.2 (<0.2 - 0.4)	0.9 (0.4 - 2.8)	1.8 (0.7 - 4.1)	2.6 (0.7 - 4.6)	1.2 (0.3 - 1.8)	1.2 (0.7 - 2.9)	1.8 (1.0 - 2.8)
Zinc (mg/kg)	70 (48 - 120)	75 (39 - 110)	110 (71 - 150)	150 (58 - 200)	230 (120 - 320)	180 (91 - 250)	140 (110 - 160)	190 (130 - 360)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	20 (18 - 25)	19 (18 - 23)	23 (18 - 51)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	120 (90 - 220)	110 (90 - 180)	160 (90 - 340)	190 (99 - 430)	180 (120 - 300)	180 (90 - 340)	120 (95 - 250)	110 (90 - 160)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	150 (48 - 440)	76 (36 - 180)	220 (120 - 430)	1100 (170 - 3300)	640 (340 - 980)	860 (51 - 3200)	160 (120 - 240)	270 (94 - 1100)

Note:
1. Data presented are arithmetic means ; data in brackets indicate ranges.
2. All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3. Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4. Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5. High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6. Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Water quality of typhoon shelters, sheltered anchorages and Government Dockyard in Hong Kong in 2018



Water quality of typhoon shelters, sheltered anchorages and Government Dockyard in Hong Kong in 2018 (continued)



Results of the Seasonal Kendall Test for water quality trends in typhoon shelters, sheltered anchorages and Governemnt Dockyard, 1986 - 2018

Monitoring Station		NT1	ST1	ST3	WT3	WT1	VT2	VT8	VT10	VT11
Monitoring Period		1986 I 2018	1986 I 2018	2000 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1993 I 2018	1994 I 2018
Parameter	Water Depth									
Temperature (°C)	Surface	↗	↗	-	-	-	↗	↗	↗	↗
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	↗	↗	-	-	-	↗	↗	↗	↗
	Average	↗	↗	-	-	-	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-	-	-
	Middle	NA	-	↘	-	-	NA	NA	NA	-
	Bottom	-	-	↘	-	-	-	-	-	-
	Average	-	-	↘	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	-	-	-	-	↗	↗	-	↗
	Middle	NA	-	-	-	-	NA	NA	NA	↗
	Bottom	↗	-	-	-	↗	↗	↗	↗	↗
	Average	↗	-	-	-	-	↗	↗	↗	↗
Dissolved Oxygen (% saturation)	Surface	↗	-	-	-	-	↗	↗	-	↗
	Middle	NA	-	-	-	↗	NA	NA	NA	↗
	Bottom	↗	-	-	↗	↗	↗	↗	↗	↗
	Average	↗	-	-	-	↗	↗	↗	↗	↗
pH	Surface	↘	↘	↘	↘	↘	-	↘	-	-
	Middle	NA	↘	↘	↘	↘	NA	NA	NA	-
	Bottom	-	↘	↘	↘	↘	-	↘	-	-
	Average	↘	↘	↘	↘	↘	-	↘	-	-
Secchi Disc Depth (m)		↗	↗	↗	↗	↗	↗	↗	↗	-
Turbidity (NTU)	Surface	↘	↘	↘	↘	↘	-	-	↘	-
	Middle	NA	↘	↘	↘	↘	NA	NA	NA	-
	Bottom	-	↘	↘	↘	↘	-	-	↘	-
	Average	↘	↘	↘	↘	↘	-	-	↘	-
Suspended Solids (mg/L)	Surface	↘	-	-	-	-	-	↘	↘	-
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	-	-	-	-	-	-	-	↘	-
	Average	↘	-	-	-	-	-	↘	↘	-
Volatile Suspended Solids (mg/L)	Surface	↘	-	-	-	-	-	↘	↘	-
	Middle	NA	-	↗	-	-	NA	NA	NA	-
	Bottom	-	-	↗	-	-	-	↘	-	-
	Average	↘	-	↗	-	-	-	↘	↘	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	↘	-	-	-	↘	↘	-	↘
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	-	-	-	↘	-	↘	↘	-	↘
	Average	↘	↘	-	-	-	↘	↘	-	↘
Ammonia Nitrogen (mg/L)	Surface	↘	-	-	-	-	↘	↘	↘	↘
	Middle	NA	-	-	-	-	NA	NA	NA	↘
	Bottom	↘	-	-	↘	-	↘	↘	↘	↘
	Average	↘	-	-	-	-	↘	↘	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	-	↘
	Middle	NA	↘	↘	↘	↘	NA	NA	NA	↘
	Bottom	-	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	-	↘
Nitrite Nitrogen (mg/L)	Surface	↗	-	-	-	-	-	↗	-	↗
	Middle	NA	-	-	-	-	NA	NA	NA	↗
	Bottom	-	-	-	-	-	-	↗	-	↗
	Average	↗	-	-	-	-	-	↗	-	↗
Nitrate Nitrogen (mg/L)	Surface	↗	↗	↗	-	-	↗	↗	↗	↗
	Middle	NA	-	↗	-	-	NA	NA	NA	↗
	Bottom	↗	-	↗	-	-	↗	↗	↗	↗
	Average	↗	↗	↗	-	-	↗	↗	↗	↗
Total Inorganic Nitrogen (mg/L)	Surface	↗	-	↗	-	-	↘	-	↘	-
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	↗	-	-	-	-	↘	-	↘	-
	Average	↗	-	-	-	-	↘	-	↘	-
Total Kjeldahl Nitrogen (mg/L)	Surface	↘	-	↗	-	-	↘	↘	↘	↘
	Middle	NA	-	↗	-	-	NA	NA	NA	↘
	Bottom	-	-	-	↗	↗	↘	↘	↘	↘
	Average	↘	-	↗	↗	-	↘	↘	↘	↘
Total Nitrogen (mg/L)	Surface	-	↗	↗	-	-	↘	↘	↘	-
	Middle	NA	↗	↗	↗	↗	NA	NA	NA	-
	Bottom	-	-	↗	↗	↗	↘	↘	↘	-
	Average	-	↗	↗	↗	↗	↘	↘	↘	-
Orthophosphate Phosphorus (mg/L)	Surface	↘	↘	-	-	↘	↘	↘	↘	↘
	Middle	NA	↘	-	↘	↘	NA	NA	NA	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	-	-	↘	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	↘	-	-	-	-	↘	↘	↘	↘
	Middle	NA	-	-	-	-	NA	NA	NA	↘
	Bottom	-	-	-	-	-	↘	↘	↘	↘
	Average	↘	-	-	-	-	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
E. coli (cfu/100mL)	Surface	↘	↘	-	↘	↘	↘	↘	↘	↘
	Middle	NA	-	-	↘	↘	NA	NA	NA	↘
	Bottom	-	↘	-	↘	↘	↘	↘	↘	↘
	Average	↘	↘	-	↘	↘	↘	↘	↘	↘
Faecal Coliforms (cfu/100mL)	Surface	↘	↘	-	↘	↘	↘	-	↘	↘
	Middle	NA	↘	-	↘	↘	NA	NA	NA	-
	Bottom	-	-	-	↘	-	↘	-	↘	↘
	Average	↘	-	-	↘	↘	↘	-	↘	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in typhoon shelters, sheltered anchorages and Governemnt Dockyard, 1986 - 2018 (continued)

Monitoring Station		VT12	VT4	VT3	ET2	ET1	PT4	PT3	PT2	TT1
Monitoring Period		2000 I 2018	1987 I 2018	1986 I 2018	1993 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018	1986 I 2018
Parameter	Water Depth									
Temperature (°C)	Surface	↗	↗	↗	-	-	↗	↗	-	↗
	Middle	NA	↗	NA	-	-	NA	↗	NA	↗
	Bottom	↗	↗	↗	-	-	↗	↗	NA	↗
	Average	↗	↗	↗	-	-	↗	↗	↗	↗
Salinity	Surface	-	↘	-	-	-	-	-	-	-
	Middle	NA	-	NA	-	-	NA	↘	NA	-
	Bottom	-	-	-	-	-	-	↘	NA	-
	Average	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	-	↗	↗	↗	-	↘	-	-	↘
	Middle	NA	↗	NA	↗	↗	NA	-	NA	↘
	Bottom	-	↗	↗	↗	↗	↗	-	NA	-
	Average	-	↗	↗	↗	-	-	-	-	-
Dissolved Oxygen (% saturation)	Surface	-	↗	↗	↗	-	-	-	-	↘
	Middle	NA	↗	NA	↗	↗	NA	-	NA	-
	Bottom	-	↗	↗	↗	↗	↗	-	NA	-
	Average	-	↗	↗	↗	↗	-	-	-	-
pH	Surface	-	↗	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↗	NA	↘	↘	NA	↘	NA	↘
	Bottom	-	-	↘	↘	↘	↘	↘	NA	↘
	Average	-	-	↘	↘	↘	↘	↘	↘	↘
Secchi Disc Depth (m)		↗	↗	↗	↗	↗	↗	-	-	↗
Turbidity (NTU)	Surface	↘	↘	-	-	↘	-	↘	↘	-
	Middle	NA	↘	NA	-	↘	NA	↘	NA	-
	Bottom	↘	-	-	-	↘	-	↘	NA	-
	Average	↘	↘	-	-	↘	-	↘	↘	-
Suspended Solids (mg/L)	Surface	-	↘	↘	↘	-	-	-	-	-
	Middle	NA	-	NA	↘	-	NA	-	NA	-
	Bottom	-	-	-	-	↘	-	-	NA	-
	Average	-	↘	↘	↘	-	-	-	-	-
Volatile Suspended Solids (mg/L)	Surface	-	↘	-	-	-	-	-	-	↘
	Middle	NA	↘	NA	-	-	NA	↗	NA	-
	Bottom	-	-	-	-	-	-	-	NA	-
	Average	-	↘	-	-	-	-	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	↘	↘	↘	-	↘	-	↘	↘
	Middle	NA	↘	NA	↘	-	NA	-	NA	↘
	Bottom	-	↘	↘	↘	-	↘	-	NA	↘
	Average	-	↘	↘	↘	-	↘	-	↘	↘
Ammonia Nitrogen (mg/L)	Surface	-	↘	↘	↘	-	-	-	-	↘
	Middle	NA	↘	NA	↘	↘	NA	↗	NA	↘
	Bottom	-	↘	↘	↘	↘	-	-	NA	↘
	Average	-	↘	↘	↘	↘	-	-	-	↘
Unionised Ammonia (mg/L)	Surface	-	↘	↘	↘	↘	↘	-	↘	↘
	Middle	NA	↘	NA	↘	↘	NA	-	NA	↘
	Bottom	↘	↘	↘	↘	↘	↘	-	NA	↘
	Average	↘	↘	↘	↘	↘	↘	-	↘	↘
Nitrite Nitrogen (mg/L)	Surface	-	↗	-	-	-	-	-	-	-
	Middle	NA	↗	NA	-	-	NA	-	NA	-
	Bottom	-	↗	-	-	-	-	-	NA	-
	Average	-	↗	-	-	-	-	-	-	-
Nitrate Nitrogen (mg/L)	Surface	-	↗	↗	-	-	-	-	-	-
	Middle	NA	↗	NA	-	-	NA	-	NA	-
	Bottom	-	↗	↗	-	-	-	-	NA	-
	Average	-	↗	↗	-	-	-	-	-	-
Total Inorganic Nitrogen (mg/L)	Surface	-	-	↘	↘	-	-	-	-	↘
	Middle	NA	↘	NA	↘	-	NA	↗	NA	↘
	Bottom	-	↘	↘	↘	-	-	-	NA	↘
	Average	-	↘	↘	↘	-	-	-	-	↘
Total Kjeldahl Nitrogen (mg/L)	Surface	-	↘	↘	↘	-	↘	↗	↗	↘
	Middle	NA	↘	NA	↘	-	NA	↗	NA	-
	Bottom	-	↘	↘	↘	-	-	↗	NA	-
	Average	-	↘	↘	↘	-	-	↗	↗	↘
Total Nitrogen (mg/L)	Surface	-	↘	↘	↘	-	-	↗	↗	↘
	Middle	NA	↘	NA	↘	-	NA	↗	NA	-
	Bottom	-	↘	↘	↘	-	-	↗	NA	↘
	Average	-	↘	↘	↘	-	-	↗	↗	↘
Orthophosphate Phosphorus (mg/L)	Surface	↘	-	↘	↘	↘	↘	-	↘	↘
	Middle	NA	↘	NA	↘	↘	NA	-	NA	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	NA	↘
	Average	↘	-	↘	↘	↘	↘	↘	↘	↘
Total Phosphorus (mg/L)	Surface	-	-	↘	↘	↘	↘	-	-	↘
	Middle	NA	↘	NA	↘	↘	NA	-	NA	↘
	Bottom	↘	↘	↘	↘	↘	↘	-	NA	↘
	Average	-	↘	↘	↘	↘	↘	-	-	↘
Silica (mg/L)	Surface	-	-	-	↘	-	↗	-	-	-
	Middle	NA	↘	NA	↘	-	NA	-	NA	-
	Bottom	-	-	-	-	-	-	-	NA	-
	Average	-	-	-	↘	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	↗	-	-	-	-	-	-	↘
	Middle	NA	↗	NA	-	-	NA	-	NA	↘
	Bottom	-	↗	↗	-	-	-	-	NA	-
	Average	-	↗	-	-	-	-	-	-	↘
E. coli (cfu/100mL)	Surface	-	↘	↘	↘	-	↘	-	-	↘
	Middle	NA	↘	NA	↘	-	NA	-	NA	↘
	Bottom	-	↘	↘	↘	-	↘	-	NA	↘
	Average	-	↘	↘	↘	-	↘	-	-	↘
Faecal Coliforms (cfu/100mL)	Surface	-	↘	↘	↘	-	↘	-	-	↘
	Middle	NA	↘	NA	↘	-	NA	-	NA	↘
	Bottom	-	↘	↘	↘	-	↘	-	NA	↘
	Average	-	↘	↘	↘	-	↘	-	-	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Summary of water quality statistics for typhoon shelters, sheltered anchorages and Government Dockyard in 2018

Parameter		Tuen Mun NT1	Cheung Chau ST1	Hei Ling Chau ST3	Aberdeen (South) WT1	Aberdeen (West) WT3	Rambler Channel VT8
Number of samples		6	6	6	6	6	6
Temperature (°C)		23.9 (16.4 - 28.5)	23.7 (16.5 - 30.0)	23.7 (16.7 - 29.9)	23.3 (17.2 - 27.0)	23.2 (17.1 - 27.2)	24.1 (18.0 - 28.0)
Salinity		26.6 (18.1 - 31.4)	31.1 (27.6 - 32.6)	30.8 (27.6 - 32.4)	31.7 (30.3 - 32.9)	31.8 (30.5 - 32.8)	29.5 (27.2 - 32.2)
Dissolved Oxygen (mg/L)		6.0 (4.3 - 7.2)	6.4 (4.4 - 8.2)	7.0 (4.3 - 9.1)	5.6 (4.2 - 7.9)	5.9 (4.2 - 7.8)	5.2 (3.6 - 8.2)
	Bottom	6.0 (4.3 - 7.2)	6.1 (3.8 - 7.8)	6.5 (3.9 - 8.6)	5.7 (3.9 - 7.9)	5.8 (3.6 - 7.9)	5.4 (3.3 - 8.4)
Dissolved Oxygen (% saturation)		83 (61 - 105)	91 (64 - 127)	99 (63 - 140)	78 (62 - 101)	82 (63 - 99)	73 (53 - 104)
	Bottom	83 (62 - 105)	87 (56 - 120)	92 (57 - 126)	79 (57 - 102)	80 (55 - 99)	74 (49 - 107)
pH		7.9 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	7.9 (7.6 - 8.2)	7.9 (7.6 - 8.1)	7.9 (7.6 - 8.3)
Secchi Disc Depth (m)		2.3 (2.0 - 2.6)	2.2 (1.8 - 3.0)	2.1 (1.8 - 2.5)	2.8 (2.0 - 3.5)	2.5 (2.0 - 3.0)	2.1 (1.9 - 2.4)
Turbidity (NTU)		6.2 (1.6 - 9.9)	5.1 (1.3 - 9.5)	7.7 (1.7 - 23.3)	3.4 (0.2 - 7.1)	3.7 (0.3 - 7.9)	4.3 (3.1 - 5.9)
Suspended Solids (mg/L)		11.3 (6.1 - 21.5)	10.5 (4.1 - 17.7)	13.4 (4.0 - 33.0)	6.7 (1.5 - 9.9)	7.5 (2.3 - 13.7)	11.7 (7.8 - 17.0)
5-day Biochemical Oxygen Demand (mg/L)		1.1 (0.4 - 1.9)	0.9 (0.4 - 1.7)	1.4 (0.4 - 2.6)	0.7 (0.2 - 1.4)	0.6 (0.2 - 1.0)	0.6 (0.3 - 1.4)
Ammonia Nitrogen (mg/L)		0.103 (0.042 - 0.175)	0.066 (0.034 - 0.127)	0.054 (0.014 - 0.123)	0.049 (0.019 - 0.069)	0.056 (0.026 - 0.079)	0.129 (0.095 - 0.170)
Unionised Ammonia (mg/L)		0.004 (0.002 - 0.007)	0.003 (0.001 - 0.006)	0.002 (<0.001 - 0.004)	0.002 (<0.001 - 0.004)	0.002 (<0.001 - 0.005)	0.004 (0.002 - 0.009)
Nitrite Nitrogen (mg/L)		0.072 (0.021 - 0.275)	0.022 (<0.002 - 0.064)	0.028 (0.002 - 0.079)	0.015 (0.010 - 0.021)	0.016 (0.011 - 0.027)	0.048 (0.015 - 0.092)
Nitrate Nitrogen (mg/L)		0.399 (0.125 - 0.865)	0.144 (0.054 - 0.250)	0.168 (0.110 - 0.310)	0.114 (0.029 - 0.187)	0.115 (0.034 - 0.187)	0.284 (0.120 - 0.445)
Total Inorganic Nitrogen (mg/L)		0.57 (0.20 - 1.19)	0.23 (0.09 - 0.38)	0.25 (0.16 - 0.42)	0.18 (0.09 - 0.27)	0.19 (0.11 - 0.29)	0.46 (0.33 - 0.62)
Total Kjeldahl Nitrogen (mg/L)		0.34 (0.19 - 0.63)	0.40 (0.25 - 0.65)	0.38 (0.25 - 0.74)	0.28 (0.17 - 0.47)	0.32 (0.21 - 0.41)	0.42 (0.23 - 0.61)
Total Nitrogen (mg/L)		0.81 (0.45 - 1.33)	0.56 (0.40 - 0.71)	0.58 (0.40 - 0.87)	0.41 (0.26 - 0.63)	0.45 (0.29 - 0.63)	0.76 (0.53 - 0.91)
Orthophosphate Phosphorus (mg/L)		0.016 (0.008 - 0.032)	0.014 (0.004 - 0.023)	0.015 (0.005 - 0.026)	0.010 (0.004 - 0.015)	0.010 (0.005 - 0.017)	0.021 (0.012 - 0.033)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.06)	0.04 (<0.02 - 0.07)	0.03 (<0.02 - 0.05)	0.02 (<0.02 - 0.03)	0.02 (0.02 - 0.03)	0.04 (0.04 - 0.05)
Silica (as SiO_2) (mg/L)		1.90 (0.54 - 6.50)	0.76 (0.07 - 1.57)	0.79 (0.06 - 1.90)	0.66 (0.40 - 1.00)	0.70 (0.45 - 1.10)	1.23 (0.16 - 2.45)
Chlorophyll-*a* (µg/L)		8.2 (1.1 - 32.5)	5.8 (1.0 - 16.7)	6.6 (0.9 - 17.7)	1.5 (0.7 - 3.1)	1.1 (0.5 - 2.5)	3.5 (0.5 - 17.0)
E.coli (cfu/100mL)		370 (50 - 4500)	63 (14 - 190)	2 (<1 - 10)	110 (13 - 290)	140 (14 - 1000)	740 (200 - 2100)
Faecal Coliforms (cfu/100mL)		2200 (270 - 30000)	120 (20 - 340)	5 (1 - 30)	440 (23 - 2300)	360 (51 - 4800)	1800 (330 - 5600)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for typhoon shelters, sheltered anchorages and Government Dockyard in 2018 (continued)

Parameter		Government Dockyard VT12	New Yau Ma Tei VT10	Causeway Bay VT2	To Kwa Wan VT11	Kwun Tong VT4	Sam Ka Tsuen VT3
Number of samples		6	6	6	6	6	6
Temperature (°C)		24.4 (18.4 - 28.2)	24.1 (18.2 - 27.8)	23.9 (17.9 - 27.7)	23.7 (17.7 - 27.7)	23.9 (18.0 - 27.5)	23.6 (17.5 - 27.6)
Salinity		30.3 (28.0 - 32.1)	30.6 (29.2 - 32.3)	30.8 (29.0 - 32.5)	31.4 (29.9 - 32.8)	29.2 (24.5 - 31.0)	31.7 (30.5 - 32.8)
Dissolved Oxygen (mg/L)		4.3 (3.4 - 7.1)	4.0 (2.4 - 7.0)	5.4 (4.3 - 8.5)	5.6 (3.8 - 9.0)	5.9 (4.4 - 8.2)	5.4 (4.0 - 8.3)
	Bottom	4.3 (2.9 - 7.1)	4.0 (2.4 - 7.2)	5.2 (4.0 - 8.6)	5.5 (3.5 - 8.9)	5.6 (3.7 - 8.4)	5.4 (3.8 - 8.4)
Dissolved Oxygen (% saturation)		60 (50 - 91)	56 (36 - 90)	75 (63 - 109)	78 (58 - 114)	82 (66 - 103)	75 (61 - 105)
	Bottom	60 (44 - 91)	55 (34 - 92)	73 (60 - 109)	77 (53 - 113)	78 (55 - 107)	75 (57 - 107)
pH		7.7 (7.4 - 8.2)	7.7 (7.4 - 8.2)	7.8 (7.5 - 8.3)	7.9 (7.5 - 8.3)	7.8 (7.5 - 8.2)	7.9 (7.5 - 8.3)
Secchi Disc Depth (m)		2.5 (2.0 - 3.0)	2.0 (1.8 - 2.2)	2.5 (2.1 - 3.0)	2.4 (1.8 - 3.0)	2.4 (1.8 - 3.0)	2.3 (1.9 - 3.0)
Turbidity (NTU)		3.5 (1.6 - 7.7)	3.3 (1.3 - 5.0)	2.4 (1.2 - 3.5)	2.5 (1.0 - 4.2)	1.7 (0.7 - 2.9)	2.7 (0.8 - 4.0)
Suspended Solids (mg/L)		9.2 (4.0 - 13.5)	9.5 (2.8 - 19.0)	7.6 (3.6 - 12.5)	8.0 (3.2 - 12.7)	7.2 (2.9 - 12.5)	9.2 (5.5 - 13.0)
5-day Biochemical Oxygen Demand (mg/L)		0.9 (0.2 - 1.5)	0.9 (0.6 - 1.6)	0.6 (0.2 - 1.5)	0.7 (0.2 - 1.3)	0.9 (0.4 - 1.3)	0.6 (0.3 - 1.3)
Ammonia Nitrogen (mg/L)		0.260 (0.185 - 0.315)	0.304 (0.215 - 0.430)	0.165 (0.086 - 0.245)	0.141 (0.065 - 0.197)	0.351 (0.140 - 0.677)	0.093 (0.067 - 0.145)
Unionised Ammonia (mg/L)		0.007 (0.002 - 0.017)	0.008 (0.003 - 0.018)	0.005 (0.002 - 0.013)	0.005 (0.002 - 0.011)	0.009 (0.003 - 0.012)	0.003 (0.001 - 0.008)
Nitrite Nitrogen (mg/L)		0.030 (0.023 - 0.045)	0.034 (0.021 - 0.058)	0.026 (0.017 - 0.042)	0.026 (0.016 - 0.042)	0.178 (0.048 - 0.447)	0.023 (0.010 - 0.041)
Nitrate Nitrogen (mg/L)		0.184 (0.110 - 0.275)	0.179 (0.096 - 0.280)	0.162 (0.094 - 0.290)	0.136 (0.077 - 0.190)	0.716 (0.317 - 1.310)	0.110 (0.056 - 0.150)
Total Inorganic Nitrogen (mg/L)		0.47 (0.41 - 0.61)	0.52 (0.39 - 0.75)	0.35 (0.26 - 0.56)	0.30 (0.24 - 0.37)	1.24 (0.51 - 2.22)	0.23 (0.14 - 0.29)
Total Kjeldahl Nitrogen (mg/L)		0.61 (0.40 - 0.97)	0.64 (0.42 - 0.77)	0.47 (0.30 - 0.66)	0.50 (0.27 - 1.06)	0.78 (0.34 - 1.33)	0.47 (0.22 - 0.89)
Total Nitrogen (mg/L)		0.82 (0.64 - 1.15)	0.85 (0.69 - 1.00)	0.65 (0.50 - 0.81)	0.66 (0.43 - 1.18)	1.67 (0.70 - 2.69)	0.60 (0.38 - 0.96)
Orthophosphate Phosphorus (mg/L)		0.042 (0.031 - 0.052)	0.038 (0.028 - 0.049)	0.026 (0.018 - 0.034)	0.025 (0.017 - 0.031)	0.225 (0.066 - 0.460)	0.020 (0.006 - 0.026)
Total Phosphorus (mg/L)		0.06 (0.06 - 0.08)	0.06 (0.05 - 0.09)	0.04 (0.04 - 0.05)	0.04 (0.04 - 0.05)	0.26 (0.08 - 0.53)	0.03 (0.02 - 0.04)
Silica (as SiO_2) (mg/L)		1.21 (0.25 - 2.10)	1.09 (0.11 - 2.00)	0.86 (0.12 - 1.28)	0.79 (0.11 - 1.27)	1.75 (1.13 - 2.87)	0.74 (0.27 - 1.21)
Chlorophyll-*a* (µg/L)		2.9 (0.6 - 10.0)	3.2 (0.6 - 13.5)	3.1 (0.7 - 14.0)	3.5 (0.8 - 16.3)	5.6 (1.9 - 10.5)	2.5 (0.8 - 10.3)
E.coli (cfu/100mL)		480 (26 - 5300)	3100 (830 - 12000)	1600 (550 - 4200)	710 (150 - 14000)	580 (90 - 1200)	600 (380 - 1700)
Faecal Coliforms (cfu/100mL)		1100 (40 - 12000)	6800 (1500 - 19000)	3700 (930 - 9000)	1400 (200 - 26000)	1600 (410 - 3000)	1300 (800 - 2400)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for typhoon shelters, sheltered anchorages and Government Dockyard in 2018 (continued)

Parameter		Shau Kei Wan ET2	Chai Wan Cargo Handling Basin ET1	Hebe Haven PT4	Yim Tin Tsai PT3	Sai Kung PT2	Shuen Wan TT1
Number of samples		6	6	6	6	6	6
Temperature (°C)		22.3 (17.1 - 25.2)	22.8 (16.4 - 27.2)	24.8 (18.0 - 29.6)	24.9 (18.1 - 30.0)	24.9 (17.9 - 29.9)	24.2 (18.1 - 28.2)
Salinity		32.2 (31.2 - 33.2)	31.7 (30.3 - 33.3)	31.1 (27.9 - 32.8)	31.9 (29.5 - 33.3)	31.6 (28.8 - 33.3)	31.0 (27.4 - 32.7)
Dissolved Oxygen (mg/L)		5.8 (4.4 - 6.9)	6.5 (4.7 - 8.2)	7.2 (5.3 - 10.4)	6.5 (5.1 - 8.2)	6.8 (4.9 - 10.2)	5.5 (4.4 - 6.5)
	Bottom	5.4 (3.1 - 7.4)	6.5 (4.9 - 8.0)	7.2 (5.5 - 10.4)	6.6 (5.3 - 8.6)	NA	5.2 (4.4 - 6.5)
Dissolved Oxygen (% saturation)		79 (64 - 95)	91 (68 - 122)	102 (77 - 133)	93 (79 - 106)	97 (75 - 130)	78 (56 - 94)
	Bottom	73 (44 - 94)	91 (70 - 118)	101 (79 - 132)	94 (79 - 110)	NA	74 (56 - 91)
pH		8.0 (7.8 - 8.1)	8.1 (7.8 - 8.4)	8.0 (7.7 - 8.4)	8.0 (7.7 - 8.4)	8.0 (7.8 - 8.5)	8.1 (7.8 - 8.3)
Secchi Disc Depth (m)		3.0 (2.0 - 4.0)	2.7 (2.0 - 3.5)	2.7 (2.0 - 4.0)	3.0 (2.0 - 4.0)	2.1 (2.0 - 2.5)	3.0 (2.0 - 4.0)
Turbidity (NTU)		3.6 (1.2 - 7.2)	3.8 (1.2 - 8.3)	2.4 (<0.1 - 7.8)	1.9 (0.5 - 6.2)	2.3 (0.5 - 7.7)	2.9 (0.9 - 7.3)
Suspended Solids (mg/L)		4.5 (2.6 - 6.1)	5.4 (3.0 - 9.8)	4.9 (1.2 - 12.0)	3.6 (1.7 - 9.5)	3.5 (1.7 - 8.7)	5.6 (2.1 - 9.7)
5-day Biochemical Oxygen Demand (mg/L)		0.7 (0.1 - 1.7)	1.1 (0.1 - 2.6)	1.3 (0.5 - 3.1)	0.8 (0.3 - 1.5)	0.9 (0.4 - 1.3)	1.0 (0.3 - 1.5)
Ammonia Nitrogen (mg/L)		0.065 (0.056 - 0.078)	0.044 (0.019 - 0.085)	0.039 (0.009 - 0.071)	0.027 (0.013 - 0.039)	0.029 (0.011 - 0.042)	0.045 (0.011 - 0.088)
Unionised Ammonia (mg/L)		0.002 (0.002 - 0.004)	0.002 (<0.001 - 0.004)	0.002 (<0.001 - 0.004)	0.002 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.008)
Nitrite Nitrogen (mg/L)		0.028 (0.006 - 0.054)	0.019 (0.003 - 0.042)	0.003 (<0.002 - 0.007)	0.003 (<0.002 - 0.005)	0.003 (<0.002 - 0.007)	0.003 (<0.002 - 0.004)
Nitrate Nitrogen (mg/L)		0.119 (0.053 - 0.210)	0.089 (0.023 - 0.190)	0.014 (<0.002 - 0.059)	0.008 (<0.002 - 0.033)	0.014 (<0.002 - 0.057)	0.013 (<0.002 - 0.026)
Total Inorganic Nitrogen (mg/L)		0.21 (0.12 - 0.32)	0.15 (0.06 - 0.25)	0.06 (0.01 - 0.10)	0.04 (0.02 - 0.07)	0.05 (0.02 - 0.10)	0.06 (0.02 - 0.12)
Total Kjeldahl Nitrogen (mg/L)		0.29 (0.08 - 0.58)	0.31 (0.14 - 0.58)	0.33 (0.24 - 0.49)	0.26 (0.17 - 0.34)	0.27 (0.12 - 0.46)	0.41 (0.27 - 0.59)
Total Nitrogen (mg/L)		0.43 (0.28 - 0.64)	0.42 (0.24 - 0.60)	0.35 (0.24 - 0.49)	0.27 (0.18 - 0.35)	0.29 (0.12 - 0.46)	0.43 (0.28 - 0.59)
Orthophosphate Phosphorus (mg/L)		0.018 (0.007 - 0.033)	0.014 (0.005 - 0.030)	0.006 (0.004 - 0.010)	0.004 (<0.002 - 0.009)	0.004 (<0.002 - 0.008)	0.007 (<0.002 - 0.013)
Total Phosphorus (mg/L)		0.03 (0.03 - 0.04)	0.03 (<0.02 - 0.03)	0.03 (<0.02 - 0.04)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.03 (<0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.83 (0.10 - 1.50)	0.64 (0.06 - 1.53)	0.46 (0.06 - 0.76)	0.53 (0.09 - 1.03)	0.47 (0.18 - 0.88)	0.67 (0.06 - 2.03)
Chlorophyll-*a* (µg/L)		3.8 (0.6 - 10.0)	6.0 (0.7 - 15.0)	4.3 (<0.2 - 10.9)	2.3 (0.5 - 4.3)	3.9 (1.2 - 9.9)	5.8 (1.1 - 11.5)
E.coli (cfu/100mL)		440 (190 - 1200)	130 (32 - 750)	4 (1 - 38)	1 (<1 - 3)	35 (1 - 580)	11 (7 - 45)
Faecal Coliforms (cfu/100mL)		1100 (310 - 3500)	360 (94 - 1400)	12 (1 - 180)	2 (1 - 12)	140 (2 - 1900)	28 (15 - 140)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

4. NA (Not Applicable) indicates the measurement was not made due to shallow water.

Summary statistics of bottom sediment quality of typhoon shelters, sheltered anchorages and Government Dockyard, 2014- 2018

Parameter	Tuen Mun NS5	Cheung Chau SS7	Hei Ling Chau SS8	Rambler Channel VS17	Government Dockyard VS21	New Yau Ma Tei VS19	Causeway Bay VS12
Number of samples	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	79 (37 - 95)	85 (27 - 99)	97 (95 - 99)	67 (23 - 85)	84 (3 - 99)	81 (43 - 95)	71 (26 - 99)
Electrochemical Potential (mV)	-233 (-386 - -129)	-287 (-390 - -118)	-280 (-403 - -160)	-299 (-395 - -169)	-340 (-402 - -230)	-360 (-412 - -156)	-328 (-405 - -214)
Total Solids (%w/w)	45 (35 - 53)	38 (30 - 48)	35 (31 - 40)	45 (36 - 70)	36 (28 - 46)	48 (37 - 61)	49 (35 - 64)
Total Volatile Soilds (%TS)	7.6 (6.3 - 9.2)	7.7 (6.6 - 9.0)	8.1 (7.2 - 8.7)	7.7 (4.1 - 9.6)	8.0 (6.4 - 9.9)	7.3 (5.8 - 8.3)	7.3 (5.0 - 10.0)
Chemical Oxygen Demand (mg/kg)	15400 (13000 - 20000)	15200 (13000 - 18000)	12290 (8900 - 17000)	19800 (15000 - 24000)	17000 (14000 - 20000)	17100 (12000 - 22000)	18560 (9600 - 33000)
Total Carbon (%w/w)	0.8 (0.5 - 1.2)	0.6 (0.5 - 0.9)	0.5 (0.4 - 0.6)	1.0 (0.7 - 1.9)	0.5 (0.4 - 0.7)	0.8 (0.6 - 1.1)	1.0 (0.4 - 2.0)
Ammonical Nitrogen (mg/kg)	7.22 (0.13 - 14.00)	11.06 (<0.05 - 27.00)	8.90 (<0.05 - 18.00)	4.64 (0.23 - 9.10)	9.45 (3.60 - 15.00)	22.17 (6.10 - 32.00)	13.93 (0.92 - 65.00)
Total Kjeldahl Nitrogen (mg/kg)	460 (330 - 550)	530 (410 - 680)	540 (410 - 630)	580 (200 - 1000)	440 (370 - 610)	530 (420 - 610)	500 (300 - 750)
Total Phosphorus (mg/kg)	220 (190 - 290)	240 (180 - 340)	180 (160 - 230)	210 (120 - 260)	180 (160 - 200)	250 (180 - 360)	200 (120 - 310)
Total Sulphide (mg/kg)	62.4 (15.0 - 130.0)	99.9 (0.9 - 360.0)	39.3 (0.5 - 80.0)	155.6 (23.0 - 280.0)	64.6 (6.7 - 180.0)	98.0 (3.2 - 240.0)	157.3 (11.0 - 410.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.5)	<0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.2)
Arsenic (mg/kg)	9.3 (7.2 - 14.0)	8.8 (6.5 - 14.0)	7.8 (6.1 - 11.0)	10.2 (6.4 - 15.0)	8.7 (4.3 - 12.0)	6.4 (4.2 - 10.0)	7.9 (4.6 - 11.0)
Cadmium (mg/kg)	0.2 (0.1 - 0.6)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - 0.1)	0.7 (0.2 - 1.8)	0.4 (0.3 - 0.5)	0.4 (0.2 - 0.6)	0.4 (0.2 - 0.8)
Chromium (mg/kg)	34 (26 - 43)	47 (37 - 60)	38 (32 - 43)	120 (28 - 330)	42 (28 - 50)	34 (23 - 42)	39 (18 - 54)
Copper (mg/kg)	43 (26 - 64)	100 (66 - 130)	34 (27 - 43)	220 (33 - 730)	150 (89 - 220)	78 (36 - 120)	120 (40 - 180)
Lead (mg/kg)	49 (27 - 68)	68 (44 - 230)	45 (38 - 51)	79 (59 - 110)	48 (33 - 57)	39 (24 - 48)	63 (42 - 90)
Mercury (mg/kg)	0.09 (0.07 - 0.12)	0.18 (0.13 - 0.30)	0.13 (0.10 - 0.23)	0.21 (0.07 - 0.33)	0.20 (0.16 - 0.27)	0.23 (<0.05 - 0.77)	0.51 (0.12 - 0.69)
Nickel (mg/kg)	19 (14 - 24)	22 (15 - 30)	24 (20 - 29)	44 (12 - 160)	22 (19 - 27)	19 (13 - 25)	19 (8 - 28)
Silver (mg/kg)	1.7 (0.3 - 9.7)	0.3 (<0.2 - 0.4)	0.3 (0.2 - 0.4)	3.3 (0.4 - 12.0)	1.3 (1.0 - 1.9)	1.1 (0.5 - 1.8)	2.0 (0.7 - 4.4)
Zinc (mg/kg)	160 (98 - 260)	180 (150 - 230)	140 (110 - 220)	280 (110 - 400)	230 (110 - 340)	200 (100 - 300)	210 (99 - 300)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 19)	18 (18 - 18)	29 (18 - 40)	20 (18 - 24)	18 (18 - 19)	62 (18 - 400)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	180 (90 - 340)	110 (90 - 230)	120 (90 - 360)	150 (96 - 280)	130 (95 - 250)	120 (90 - 160)	160 (94 - 290)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	130 (76 - 210)	220 (97 - 650)	220 (40 - 1500)	1300 (260 - 5200)	230 (110 - 350)	200 (37 - 360)	670 (140 - 2100)

Note:

1 Data presented are arithmetic means ; data in brackets indicate ranges.

2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.

3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.

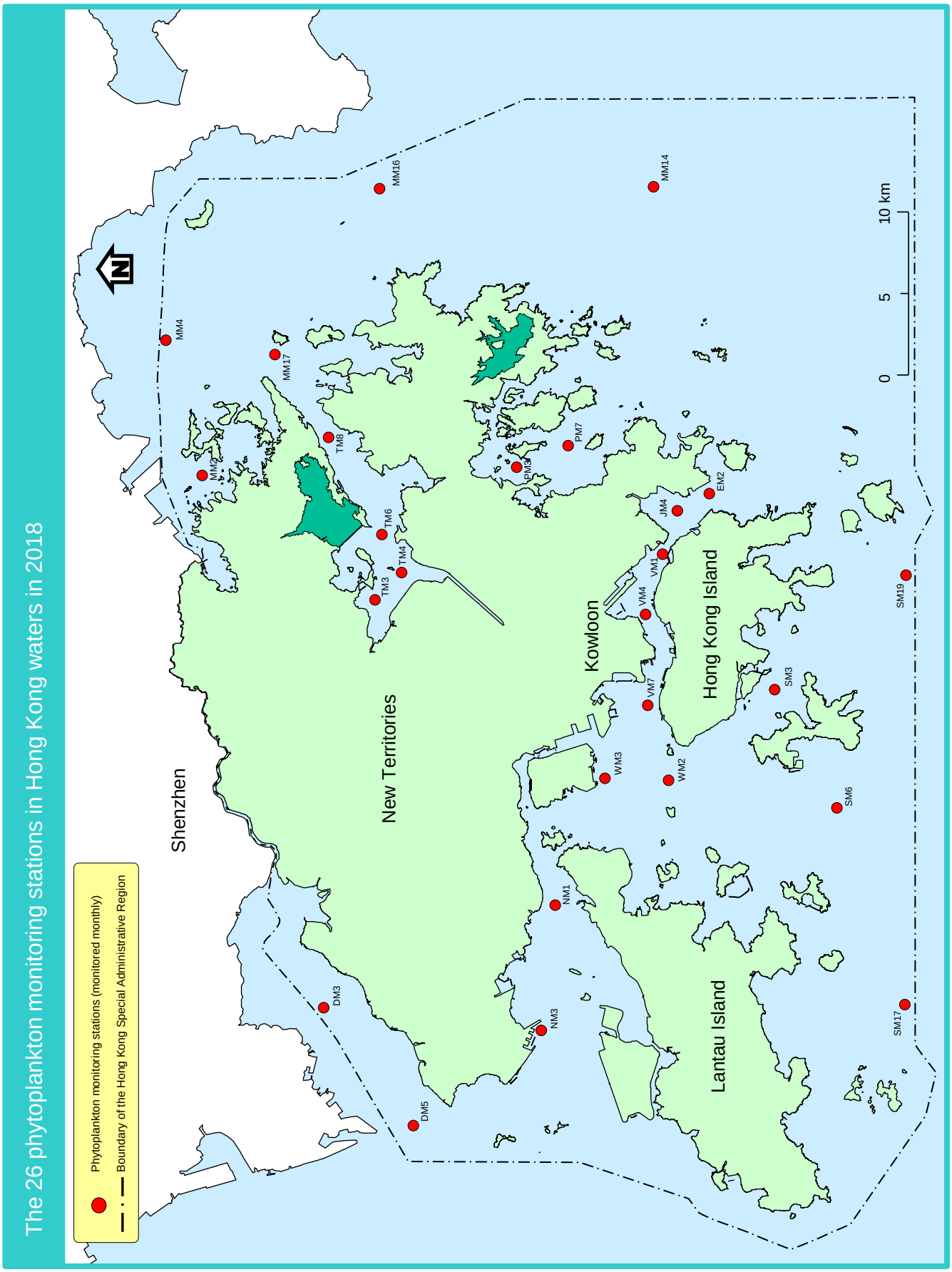
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.

6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

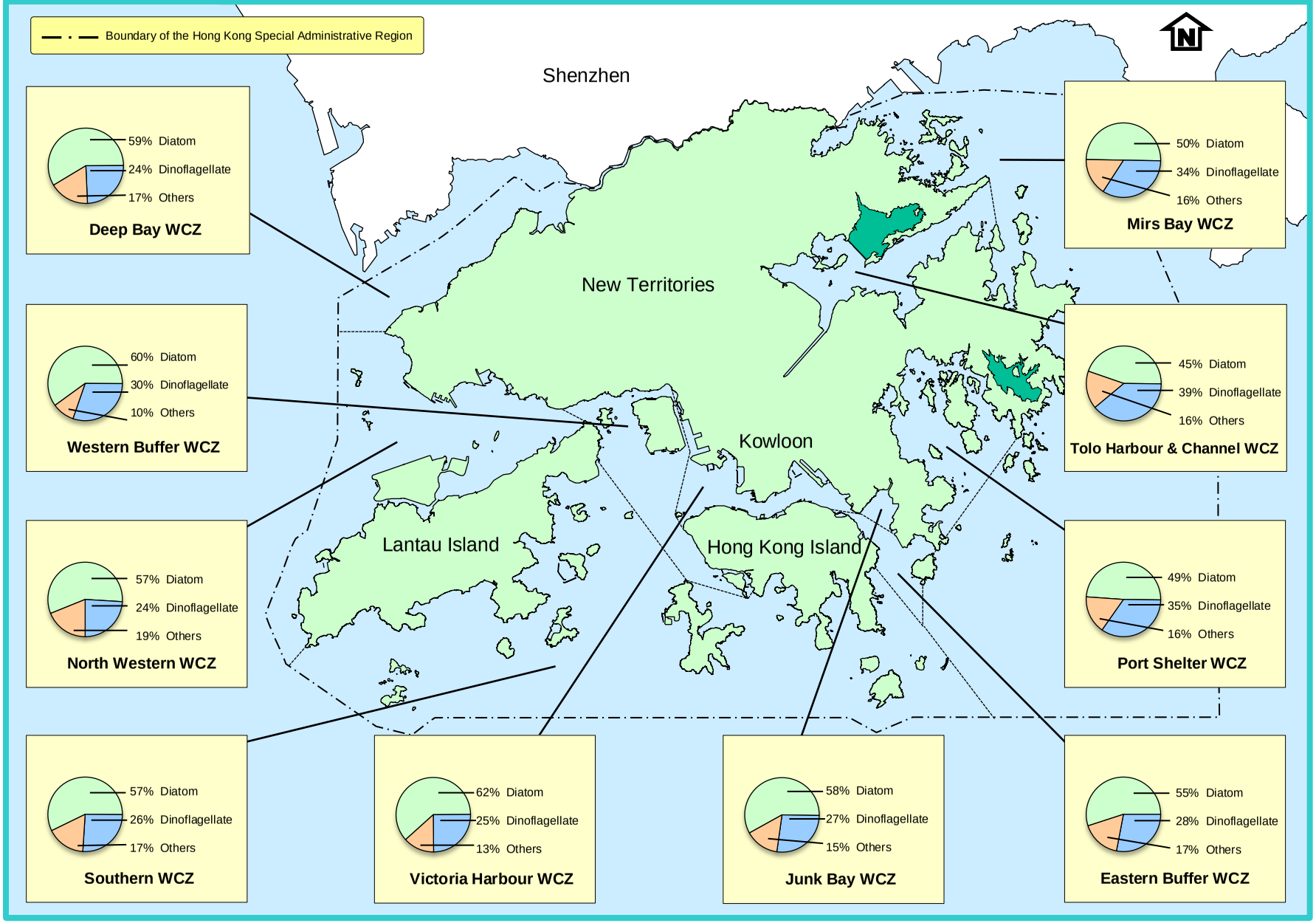
Summary statistics of bottom sediment quality of typhoon shelters, sheltered anchorages and Government Dockyard, 2014- 2018 (continued)

Parameter	To Kwa Wan VS20	Kwun Tong VS14	Sam Ka Tsuen VS13	Shau Kei Wan ES5	Chai Wan Cargo Handling Basin ES3	Hebe Haven PS4	Yim Tin Tsai PS2	Shuen Wan TS7
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	80 (30 - 98)	81 (52 - 96)	87 (80 - 96)	97 (87 - 100)	89 (83 - 93)	92 (78 - 97)	80 (33 - 91)	81 (68 - 91)
Electrochemical Potential (mV)	-357 (-402 - -295)	-279 (-405 - -132)	-307 (-457 - -141)	-366 (-411 - -291)	-324 (-389 - -267)	-285 (-366 - -164)	-279 (-398 - -101)	-328 (-451 - -239)
Total Solids (%w/w)	44 (35 - 72)	34 (27 - 41)	38 (29 - 43)	28 (25 - 31)	40 (36 - 50)	45 (38 - 52)	51 (38 - 72)	37 (29 - 50)
Total Volatile Soilds (%TS)	9.5 (2.9 - 20.0)	10.8 (8.5 - 12.0)	9.8 (8.6 - 11.0)	9.9 (8.8 - 11.0)	8.5 (7.2 - 9.0)	10.0 (9.5 - 11.0)	9.9 (5.8 - 12.0)	9.4 (6.8 - 12.0)
Chemical Oxygen Demand (mg/kg)	23600 (16000 - 35000)	22600 (18000 - 32000)	22400 (18000 - 27000)	16600 (12000 - 21000)	23200 (20000 - 30000)	21500 (13000 - 24000)	16640 (9400 - 19000)	24100 (19000 - 29000)
Total Carbon (%w/w)	1.3 (0.5 - 3.7)	1.0 (0.7 - 1.8)	1.0 (0.7 - 1.1)	0.6 (0.5 - 0.7)	0.9 (0.8 - 1.0)	1.1 (1.0 - 1.3)	2.3 (0.9 - 6.0)	0.8 (0.7 - 1.0)
Ammonical Nitrogen (mg/kg)	11.70 (1.90 - 25.00)	19.28 (5.80 - 34.00)	17.47 (0.42 - 74.00)	30.20 (23.00 - 37.00)	3.67 (0.19 - 10.00)	5.48 (2.90 - 10.00)	10.37 (4.10 - 23.00)	6.04 (0.46 - 13.00)
Total Kjeldahl Nitrogen (mg/kg)	550 (310 - 760)	750 (610 - 1200)	640 (380 - 760)	540 (410 - 720)	530 (400 - 630)	820 (610 - 1000)	770 (310 - 1300)	700 (430 - 1100)
Total Phosphorus (mg/kg)	220 (140 - 340)	260 (190 - 420)	280 (170 - 360)	180 (140 - 310)	230 (190 - 290)	220 (180 - 250)	200 (79 - 260)	220 (160 - 320)
Total Sulphide (mg/kg)	142.6 (43.0 - 350.0)	103.4 (<0.2 - 350.0)	272.0 (120.0 - 380.0)	444.0 (200.0 - 650.0)	167.2 (56.0 - 350.0)	59.5 (4.9 - 140.0)	32.5 (7.9 - 83.0)	87.6 (18.0 - 150.0)
Total Cyanide (mg/kg)	0.2 (<0.1 - 0.2)	0.3 (<0.1 - 0.5)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.2)	0.1 (0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.2 (0.1 - 0.4)
Arsenic (mg/kg)	8.9 (5.8 - 11.0)	8.6 (6.2 - 13.0)	9.3 (6.7 - 13.0)	8.2 (7.0 - 11.0)	9.8 (7.5 - 11.0)	8.9 (7.5 - 13.0)	5.1 (3.8 - 6.1)	10.3 (6.4 - 15.0)
Cadmium (mg/kg)	0.8 (0.3 - 1.2)	2.1 (0.9 - 4.9)	0.8 (0.4 - 1.0)	0.4 (0.3 - 0.5)	0.5 (0.3 - 0.8)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - <0.1)	0.4 (0.2 - 0.6)
Chromium (mg/kg)	81 (37 - 110)	220 (58 - 510)	70 (50 - 140)	52 (46 - 68)	84 (58 - 170)	24 (19 - 28)	17 (13 - 21)	24 (15 - 33)
Copper (mg/kg)	480 (150 - 840)	1600 (220 - 4300)	260 (120 - 1000)	170 (120 - 300)	250 (140 - 550)	51 (35 - 71)	15 (11 - 17)	93 (15 - 150)
Lead (mg/kg)	98 (47 - 160)	120 (84 - 170)	88 (61 - 110)	63 (55 - 80)	83 (61 - 100)	40 (35 - 45)	34 (25 - 41)	94 (44 - 110)
Mercury (mg/kg)	1.13 (0.31 - 2.70)	0.92 (0.56 - 1.40)	1.01 (0.41 - 1.60)	0.28 (0.17 - 0.45)	0.40 (0.28 - 0.52)	0.13 (0.11 - 0.19)	0.07 (<0.05 - 0.10)	0.25 (0.05 - 1.50)
Nickel (mg/kg)	28 (15 - 40)	69 (18 - 160)	23 (16 - 40)	24 (20 - 31)	26 (17 - 49)	8 (7 - 10)	12 (6 - 21)	13 (7 - 23)
Silver (mg/kg)	3.6 (1.8 - 5.3)	8.1 (1.7 - 23.0)	2.2 (1.8 - 3.5)	2.9 (1.5 - 9.2)	10.8 (6.0 - 23.0)	0.3 (0.2 - 0.3)	0.2 (<0.2 - 0.3)	0.3 (<0.2 - 0.5)
Zinc (mg/kg)	260 (130 - 350)	440 (300 - 820)	340 (280 - 410)	270 (230 - 370)	360 (240 - 490)	170 (110 - 250)	99 (65 - 250)	280 (110 - 450)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	72 (18 - 110)	190 (45 - 380)	39 (29 - 58)	18 (18 - 19)	34 (23 - 53)	18 (18 - 19)	18 (18 - 18)	19 (18 - 25)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	760 -	370 (96 - 1400)	230 (110 - 550)	220 (94 - 520)	240 (110 - 580)	160 (90 - 390)	120 (90 - 350)	140 (90 - 290)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	9700 -	1200 (750 - 2100)	790 (620 - 1200)	460 (280 - 710)	600 (310 - 950)	97 (53 - 140)	52 (21 - 95)	150 (53 - 210)

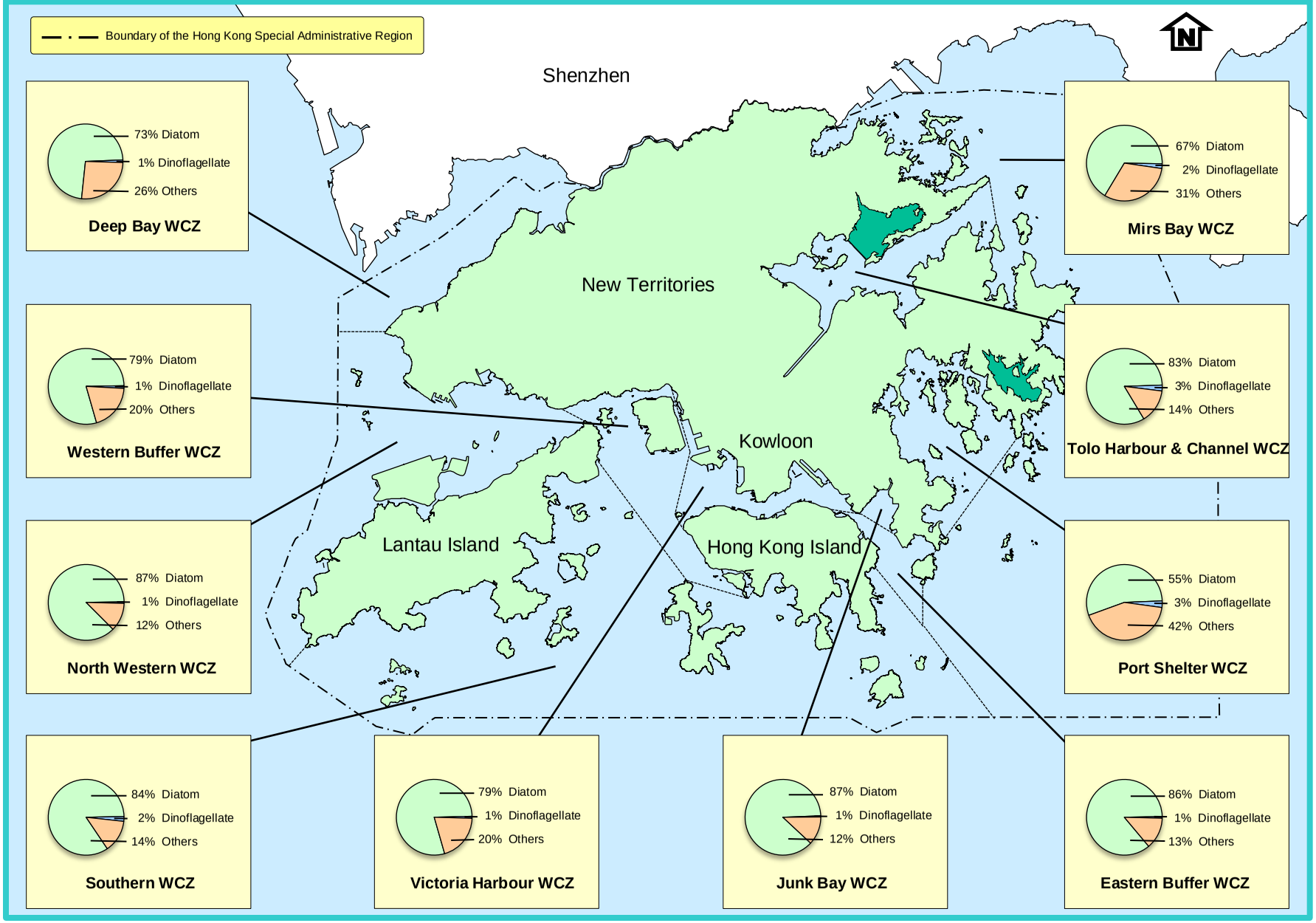
Note:
1 Data presented are arithmetic means ; data in brackets indicate ranges.
2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

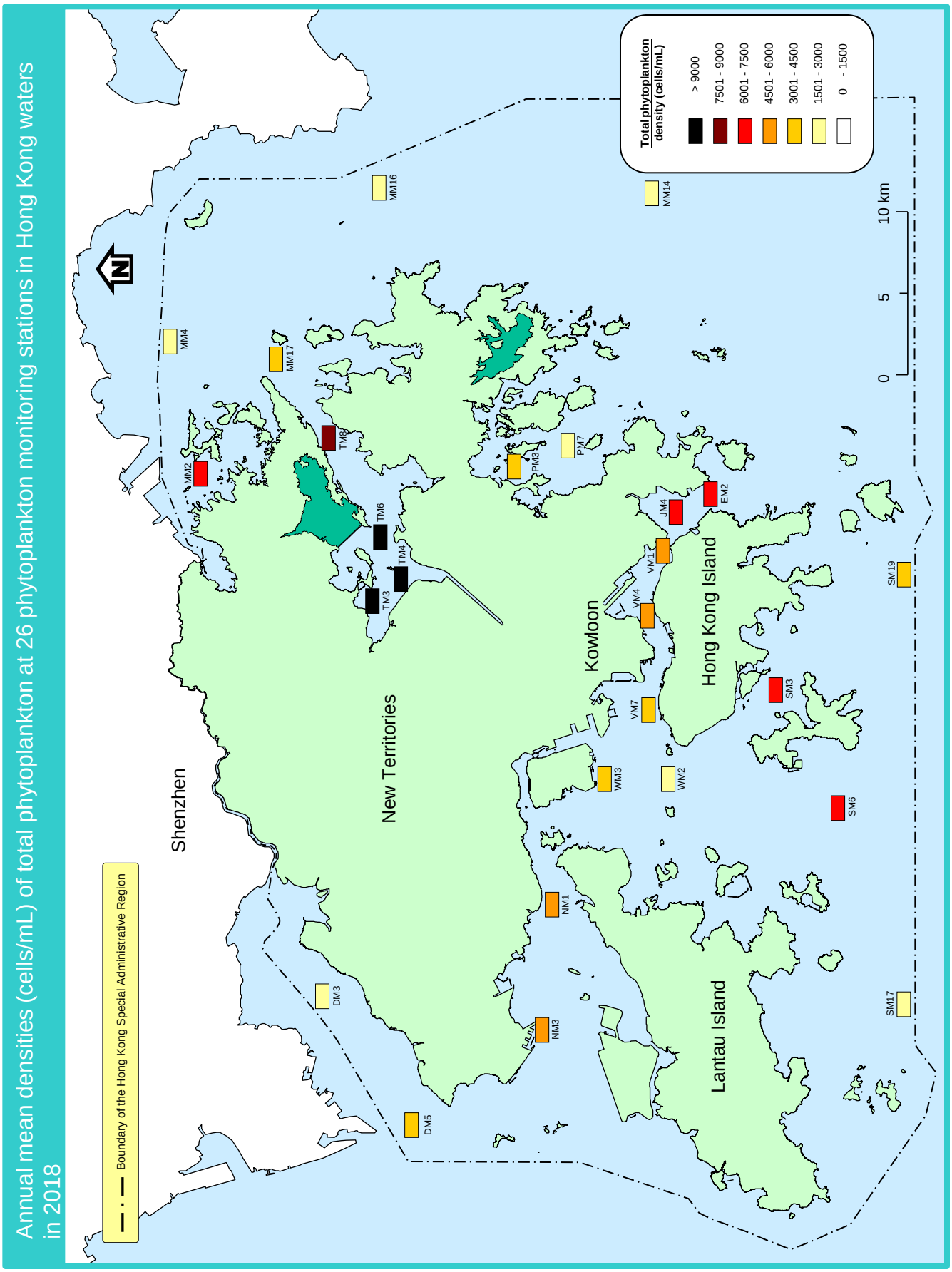

The 26 phytoplankton monitoring stations in Hong Kong waters in 2018
Phytoplankton monitoring stations (monitored monthly)
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM4
MM17
MM2
TM8
TM6
TM4
TM3
MM16
MM14
PM7
PM3
JM4
EM2
VM1
VM4
VM7
SM19
SM3
SM6
WM3
WM2
NM1
NM3
DM3
DM5
SM17
0
5
10 km

Percentage contribution of phytoplankton groups to the total number of species in the 10 Water Control Zones (WCZs) (2018)

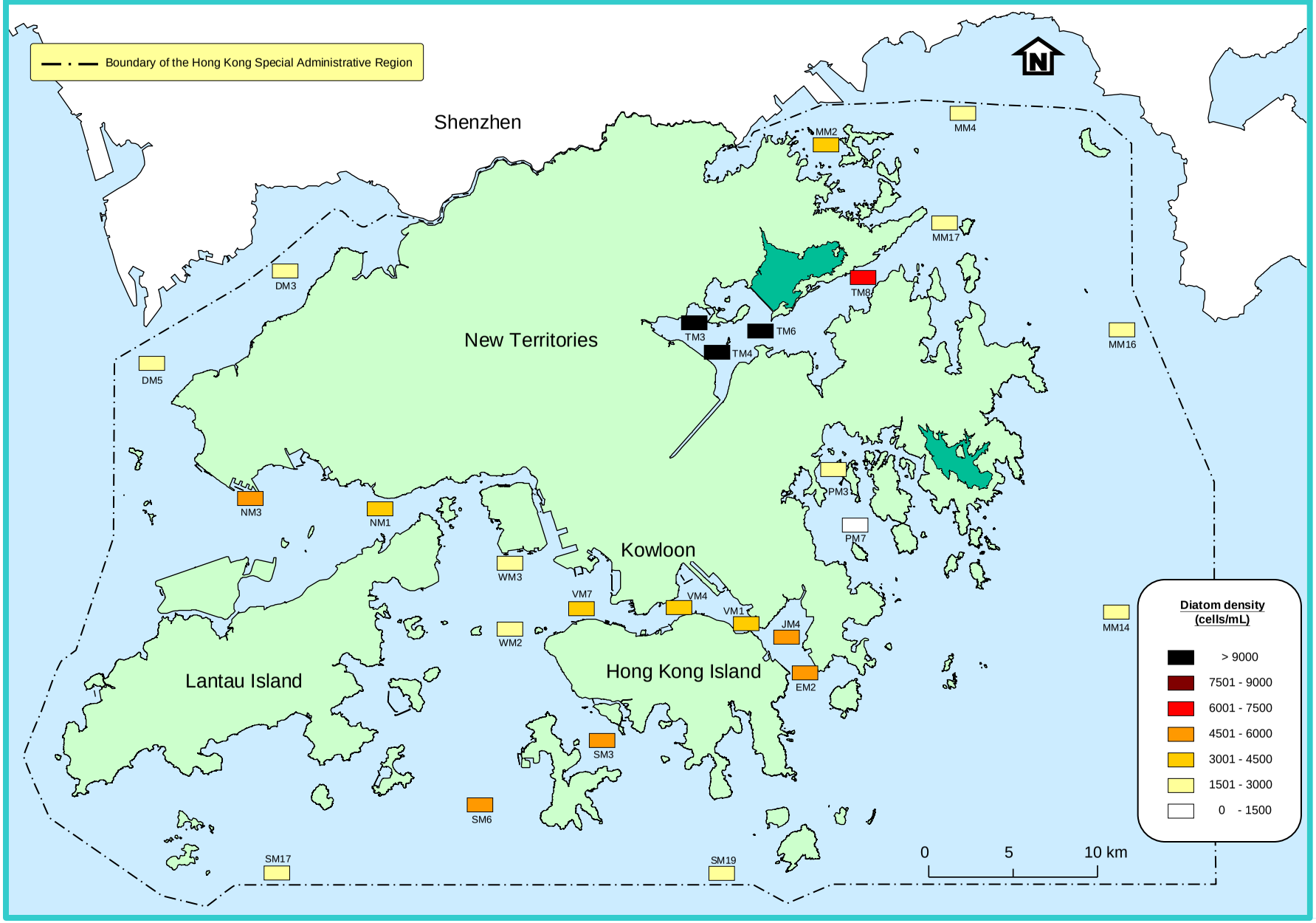


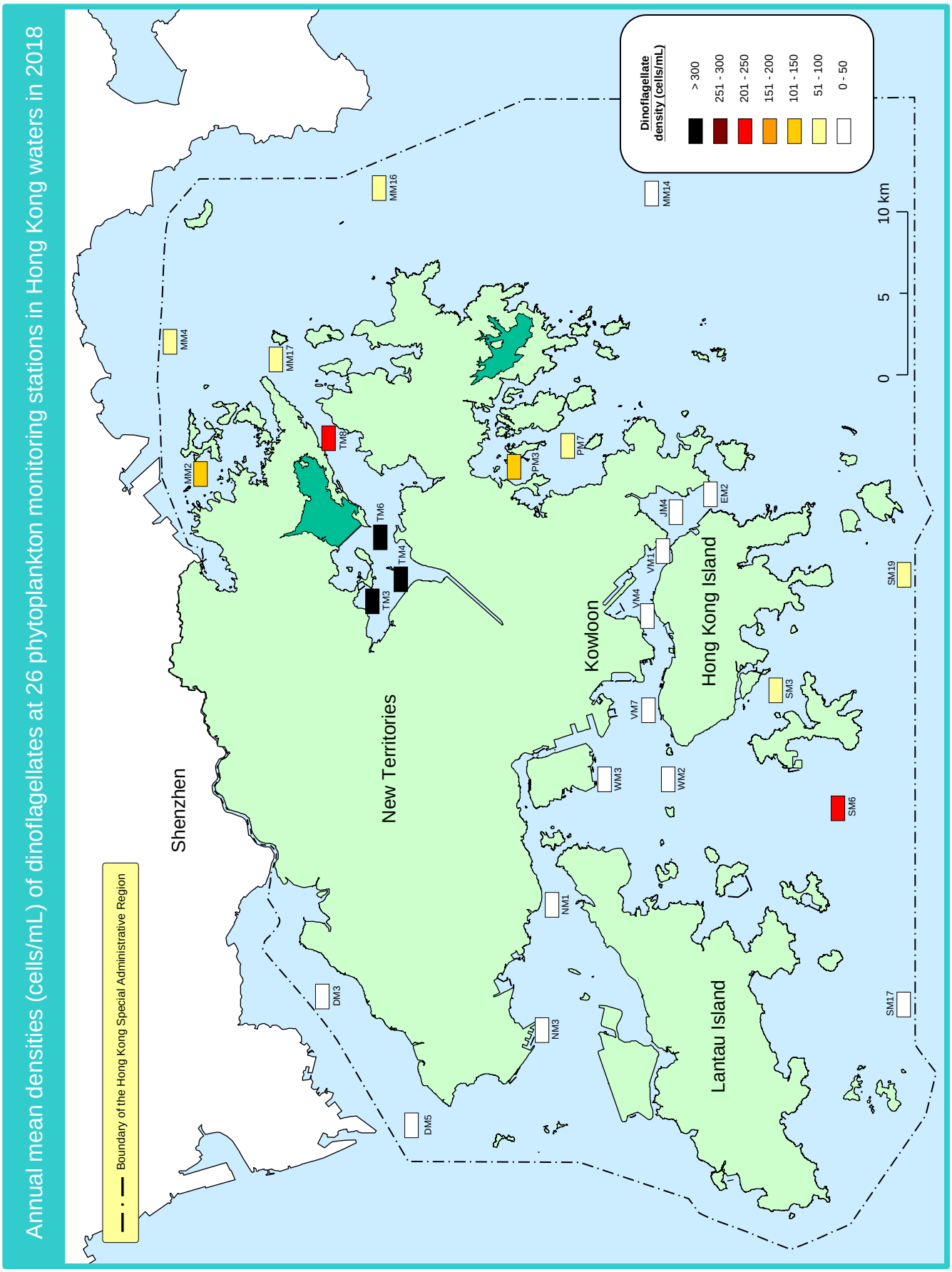
Percentage contribution of phytoplankton groups to the total density in the 10 Water Control Zones (WCZs) (2018)



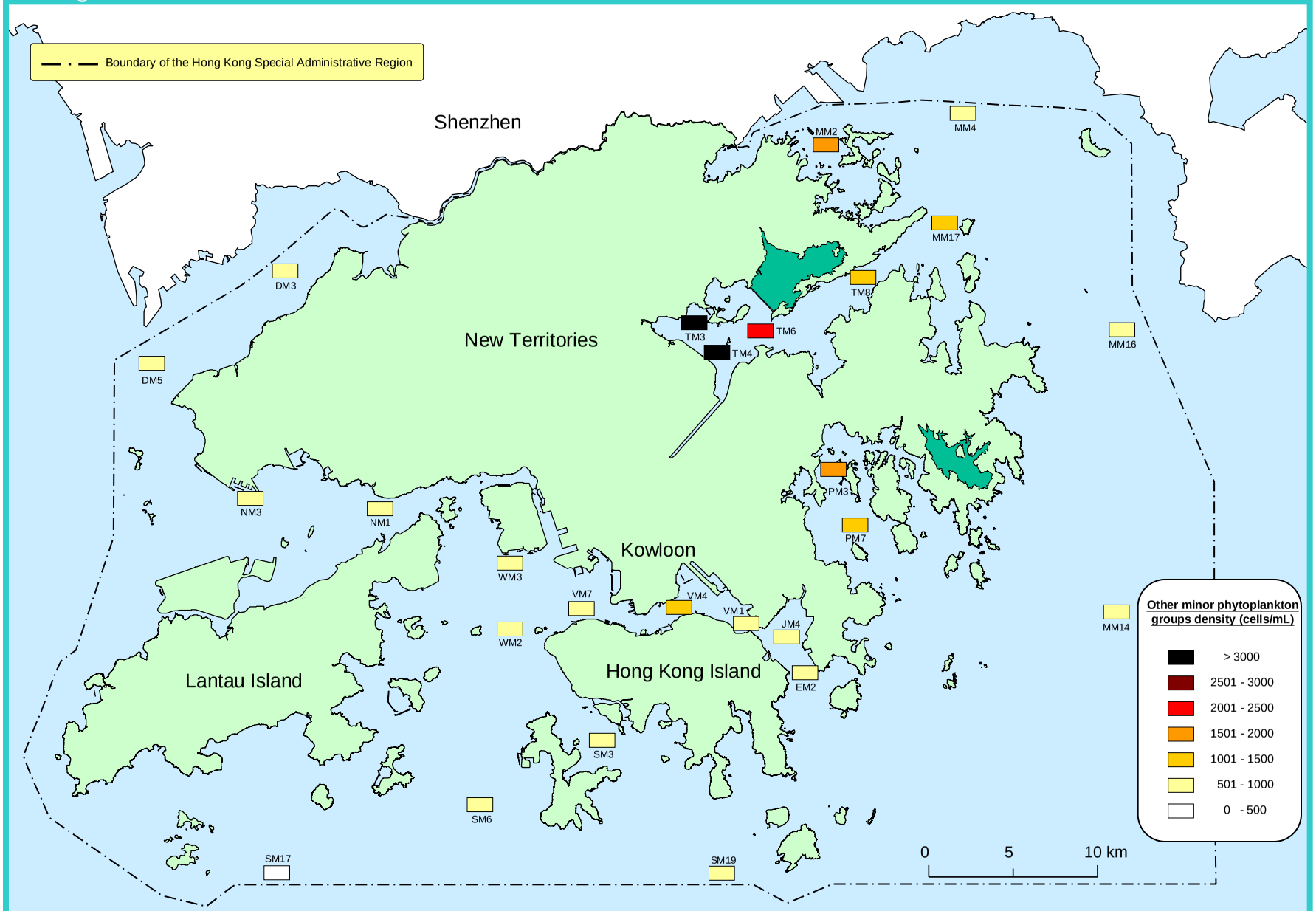

Annual mean densities (cells/mL) of total phytoplankton at 26 phytoplankton monitoring stations in Hong Kong waters in 2018
Boundary of the Hong Kong Special Administrative Region
Total phytoplankton density (cells/mL)
> 9000
7501 - 9000
6001 - 7500
4501 - 6000
3001 - 4500
1501 - 3000
0 - 1500
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM14
MM16
MM4
MM17
MM2
TM8
TM6
TM4
TM3
PM7
PM3
JM4
EM2
VM1
VM4
VM7
SM19
SM3
WM3
WM2
SM6
NM1
NM3
DM3
DM5
SM17

Annual mean densities (cells/mL) of diatoms at 26 phytoplankton monitoring stations in Hong Kong waters in 2018



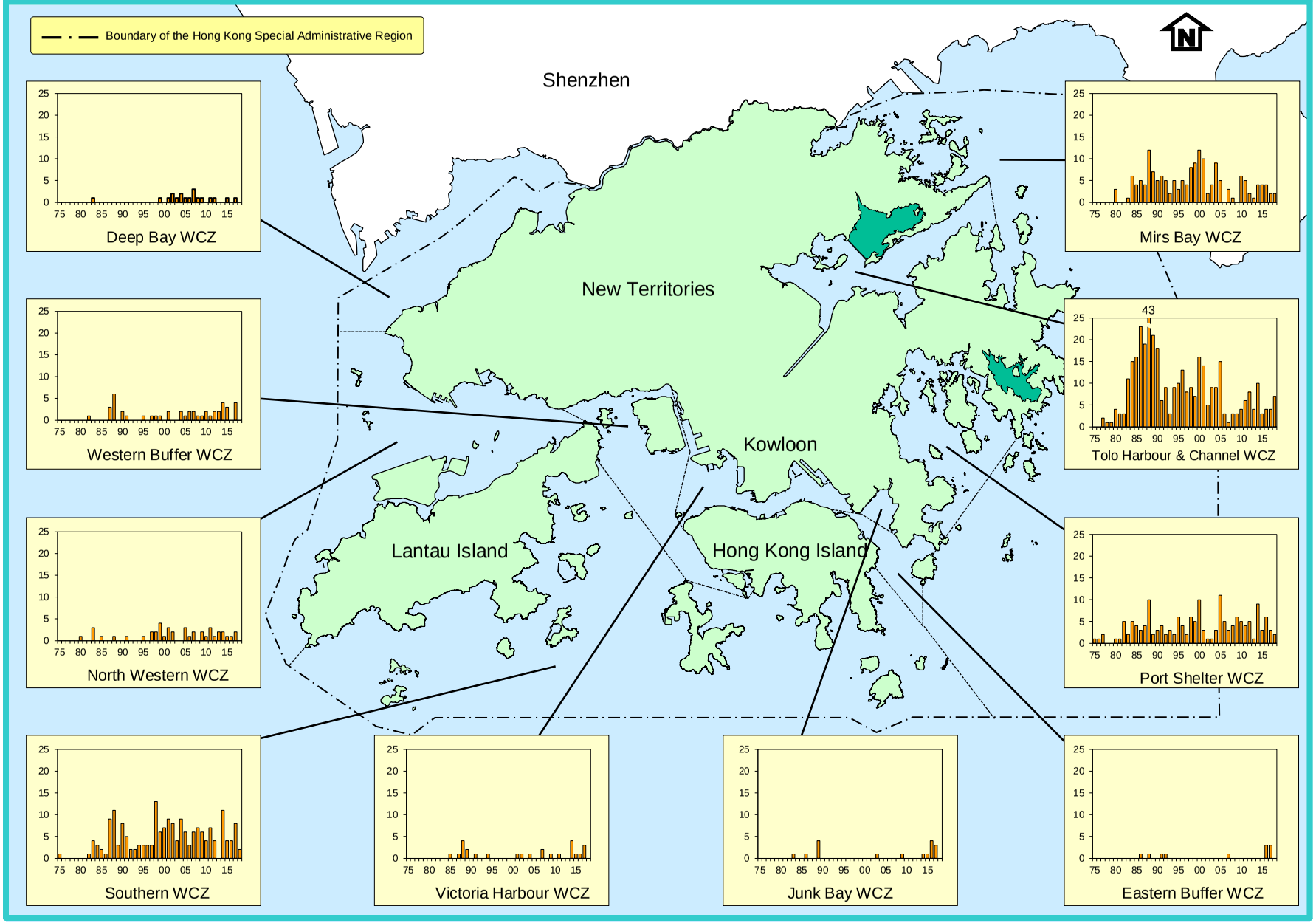

Annual mean densities (cells/mL) of dinoflagellates at 26 phytoplankton monitoring stations in Hong Kong waters in 2018
Dinoflagellate density (cells/mL)
> 300
251 - 300
201 - 250
151 - 200
101 - 150
51 - 100
0 - 50
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
0
5
10 km
MM14
MM16
MM4
MM17
MM2
TM8
TM6
TM4
TM3
PM7
PM3
JM4
EM2
VM1
VM4
VM7
WM3
WM2
SM19
SM3
SM6
NM1
NM3
DM3
DM5
SM17

Annual mean densities (cells/mL) of other minor phytoplankton groups at 26 phytoplankton monitoring stations in Hong Kong waters in 2018



Occurrence of red tides in 10 Water Control Zones (WCZs) in Hong Kong waters, 1975 - 2018

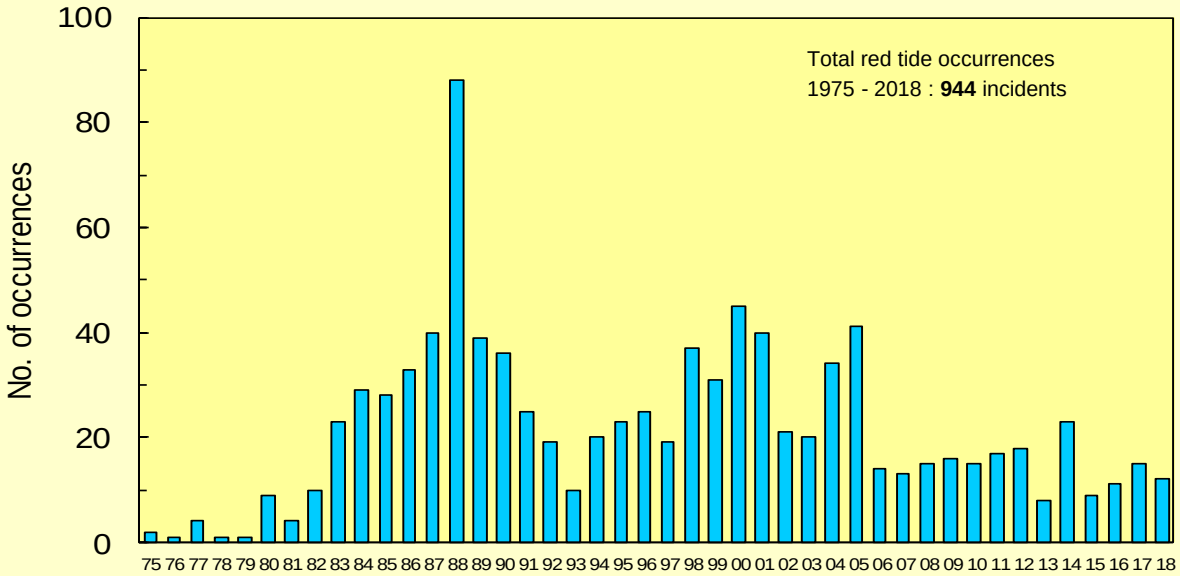
(Source: Agriculture, Fisheries and Conservation Department)



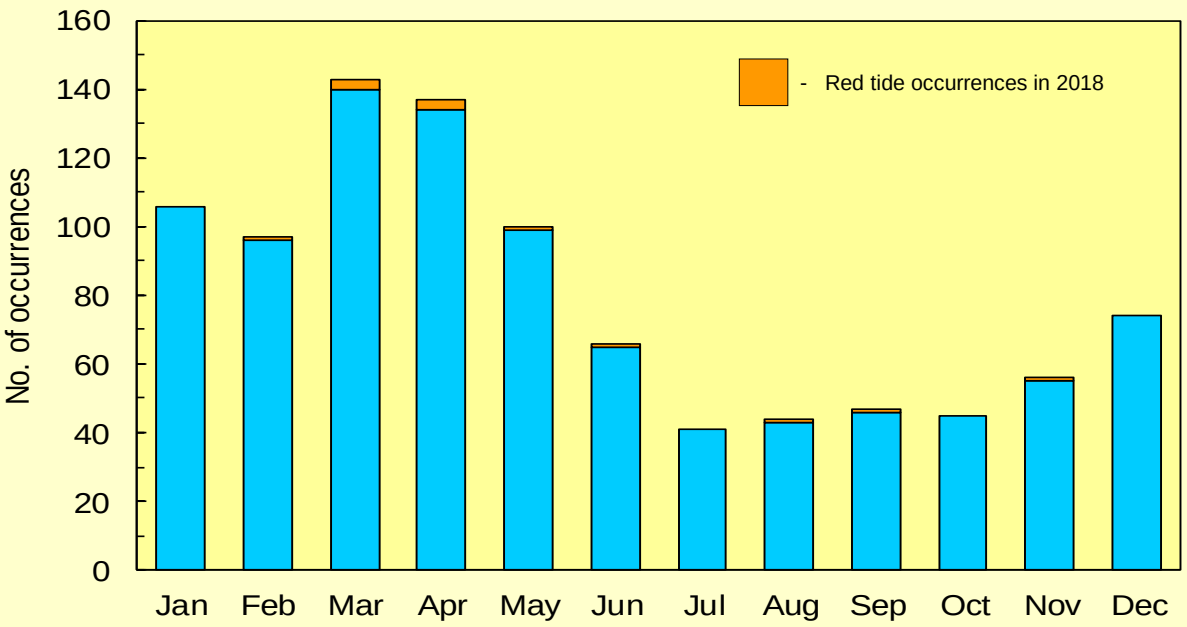
Occurrence of red tides in Hong Kong waters, 1975-2018

(Source: Agriculture, Fisheries and Conservation Department)

Yearly Distribution

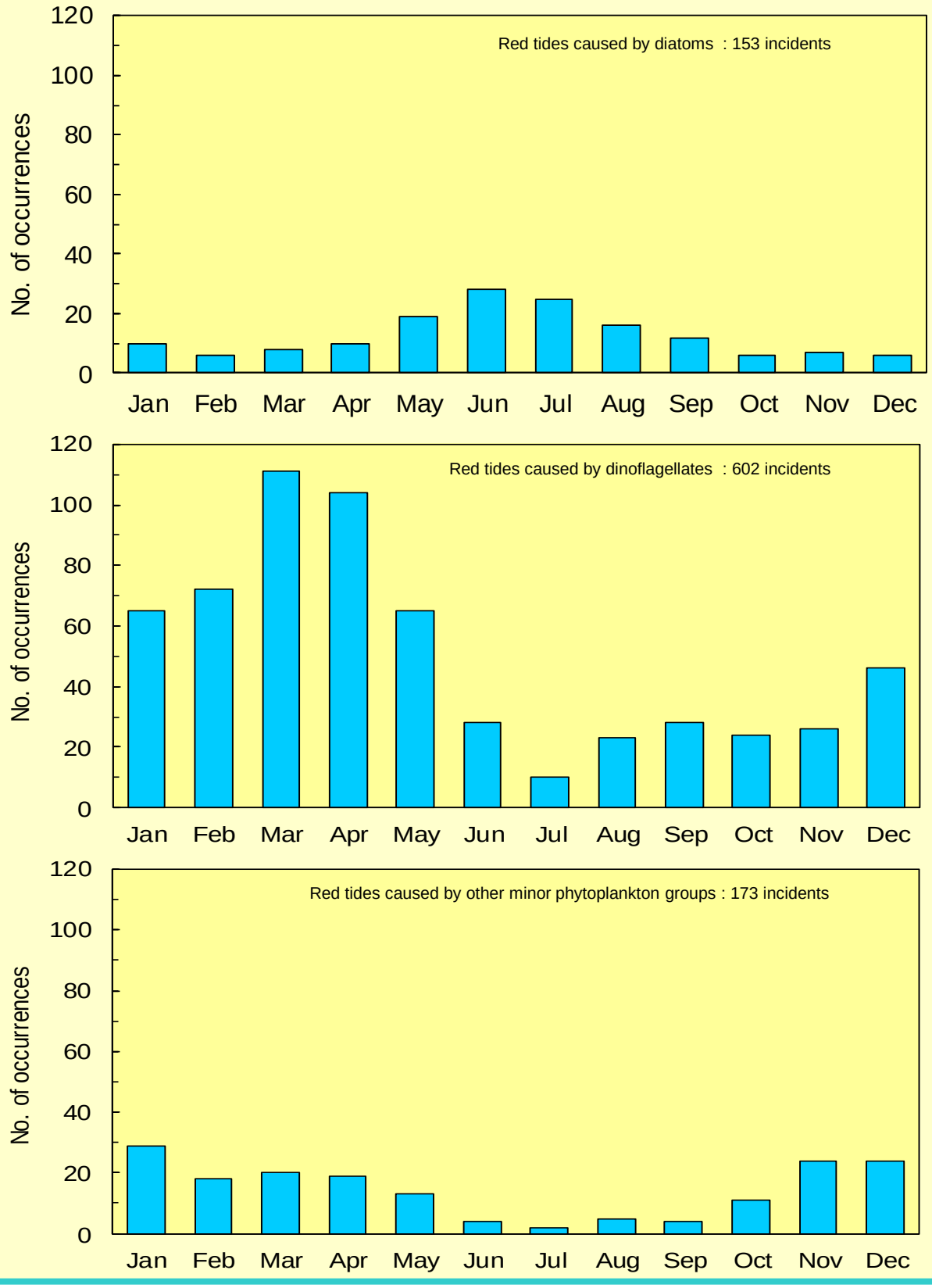


Seasonal Distribution



Seasonal distribution of red tides caused by different phytoplankton groups in Hong Kong, 1975-2018

(Source: Agriculture, Fisheries and Conservation Department)



Abundance and frequency of the dominant phytoplankton species in different Water Control Zones (WCZs) in 2018

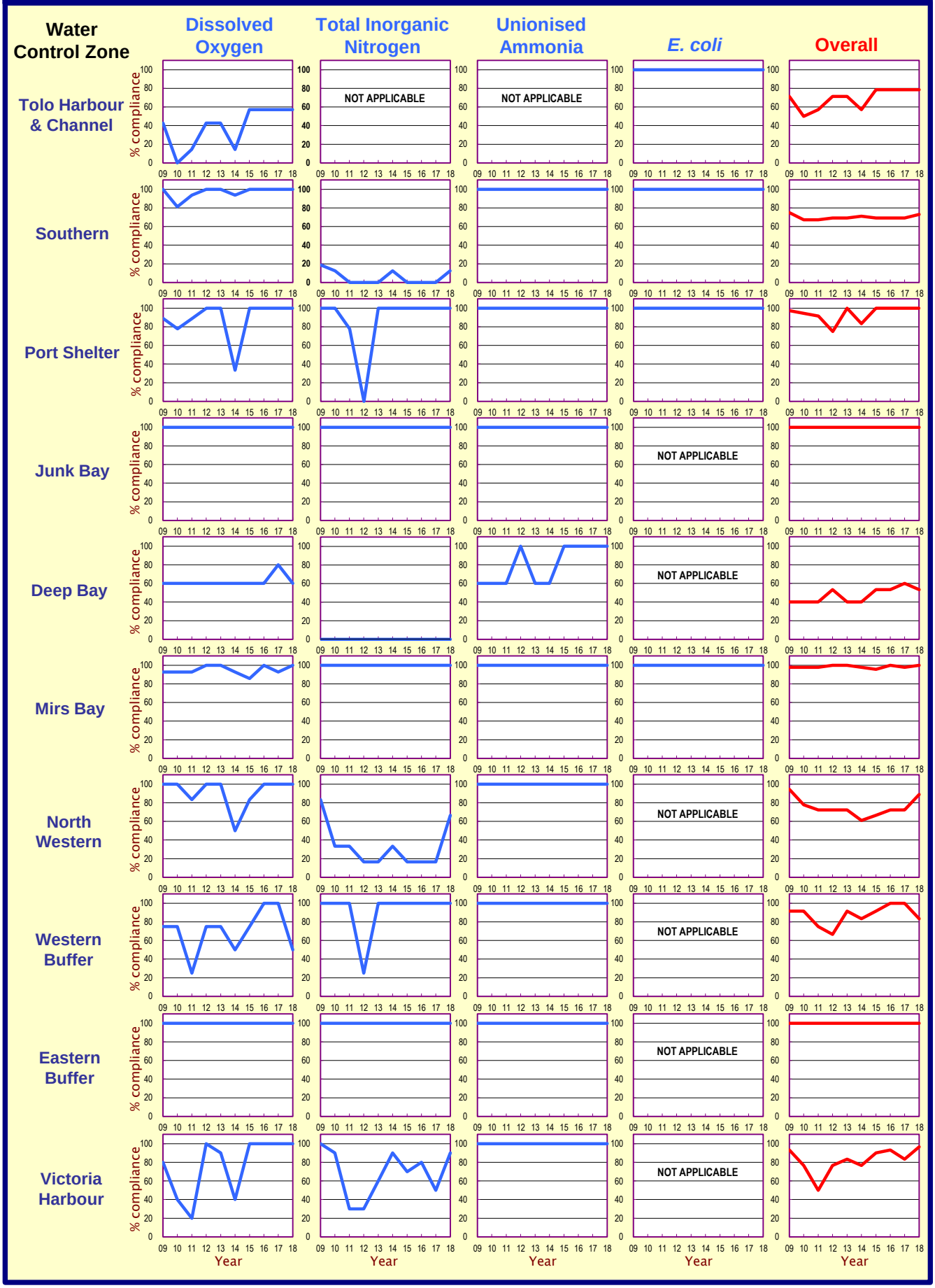
Species	% Abundance[1]	Frequency[2]	Species	% Abundance	Frequency
Deep Bay WCZ			**Mirs Bay WCZ**		
Diatoms			Diatoms		
Thalassiosira spp.	72.28	12	*Chaetoceros* spp.	25.12	12
Cyclotella spp.	10.35	7	*Thalassiosira* spp.	19.05	12
Skeletonema costatum	7.45	11	*Pseudo-nitzschia* spp.	17.53	12
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	43.30	9	*Gymnodinium* spp.	58.81	12
Akashiwo sanguinea	40.43	2	*Amphidinium* spp.	8.19	11
Amphidinium spp.	4.63	4	*Prorocentrum triestinum*	8.14	5
Others[3]			Others		
Teleaulax acuta	43.00	12	small flagellates	74.33	12
small flagellates	37.35	12	*Plagioselmis prolonga*	14.59	12
Plagioselmis prolonga	17.19	11	*Teleaulax acuta*	10.31	12
Western Buffer WCZ			**Tolo Harbour & Channel WCZ**		
Diatoms			Diatoms		
Thalassiosira spp.	30.63	12	*Chaetoceros* spp.	31.72	12
Chaetoceros spp.	28.02	12	*Ceratoneis closterium*	19.82	9
Skeletonema costatum	20.88	11	*Skeletonema costatum*	12.94	10
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	51.75	11	*Gymnodinium* spp.	43.10	12
Amphidinium spp.	19.17	8	*Prorocentrum cordatum*	28.72	6
Prorocentrum triestinum	4.39	1	*Scrippsiella* spp.	6.92	10
Others			Others		
small flagellates	58.21	12	small flagellates	77.14	12
Teleaulax acuta	29.55	12	*Plagioselmis prolonga*	14.74	12
Plagioselmis prolonga	11.52	11	*Teleaulax acuta*	7.38	12
North Western WCZ			**Port Shelter WCZ**		
Diatoms			Diatoms		
Thalassiosira spp.	47.21	12	*Thalassiosira* spp.	32.37	10
Skeletonema costatum	36.21	10	*Chaetoceros* spp.	28.51	11
Chaetoceros spp.	10.66	12	*Pseudo-nitzschia* spp.	11.67	12
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	46.03	10	*Gymnodinium* spp.	66.86	11
Amphidinium spp.	35.40	8	*Cochlodinium cf. geminatum*	4.76	1
Protoperidinium spp.	3.86	5	*Amphidinium* spp.	3.84	6
Others			Others		
small flagellates	61.83	12	small flagellates	62.23	12
Teleaulax acuta	24.82	11	*Plagioselmis prolonga*	24.89	12
Plagioselmis prolonga	9.59	11	*Teleaulax acuta*	11.88	12
Southern WCZ			**Eastern Buffer WCZ**		
Diatoms			Diatoms		
Chaetoceros spp.	31.89	11	*Chaetoceros* spp.	45.82	12
Pseudo-nitzschia spp.	25.71	12	*Pseudo-nitzschia* spp.	29.18	11
Thalassiosira spp.	18.37	12	*Thalassiosira* spp.	9.74	12
Dinoflagellates			Dinoflagellates		
Prorocentrum triestinum	41.58	4	*Gymnodinium* spp.	74.23	12
Gymnodinium spp.	33.85	12	*Scrippsiella* spp.	6.31	2
Amphidinium spp.	7.39	10	*Protoperidinium* spp.	3.78	2
Others			Others		
small flagellates	70.65	12	small flagellates	73.12	12
Teleaulax acuta	13.41	12	*Plagioselmis prolonga*	13.31	11
Plagioselmis prolonga	13.04	12	*Teleaulax acuta*	12.84	10
Victoria Harbour WCZ			**Junk Bay WCZ**		
Diatoms			Diatoms		
Chaetoceros spp.	32.54	12	*Chaetoceros* spp.	51.61	10
Thalassiosira spp.	26.64	12	*Pseudo-nitzschia* spp.	22.50	10
Skeletonema costatum	19.76	12	*Dactyliosolen fragilissimus*	8.07	5
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	64.67	12	*Gymnodinium* spp.	36.97	7
Amphidinium spp.	9.11	8	*Gyrodinium* spp.	36.97	2
Protoperidinium spp.	8.76	3	*Prorocentrum cordatum*	5.21	2
Others			Others		
small flagellates	71.12	12	small flagellates	70.97	12
Teleaulax acuta	15.55	12	*Plagioselmis prolonga*	16.23	12
Plagioselmis prolonga	12.56	11	*Teleaulax acuta*	12.46	11

Note: 1 The % abundance of dominant species of diatoms, dinoflagellates and other minor phytoplankton groups in different WCZs.

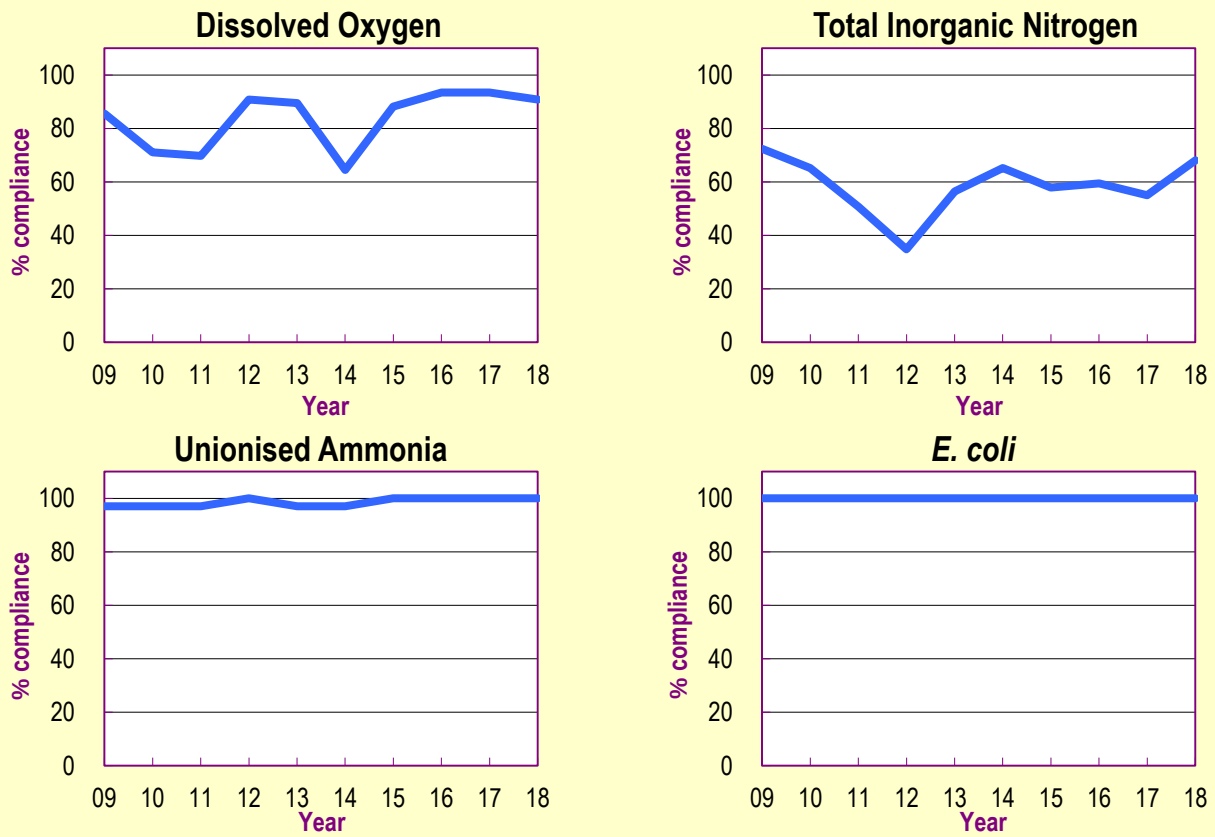
2 Number of occurrences out of 12 sampling occasions.

3 Other minor phytoplankton groups.

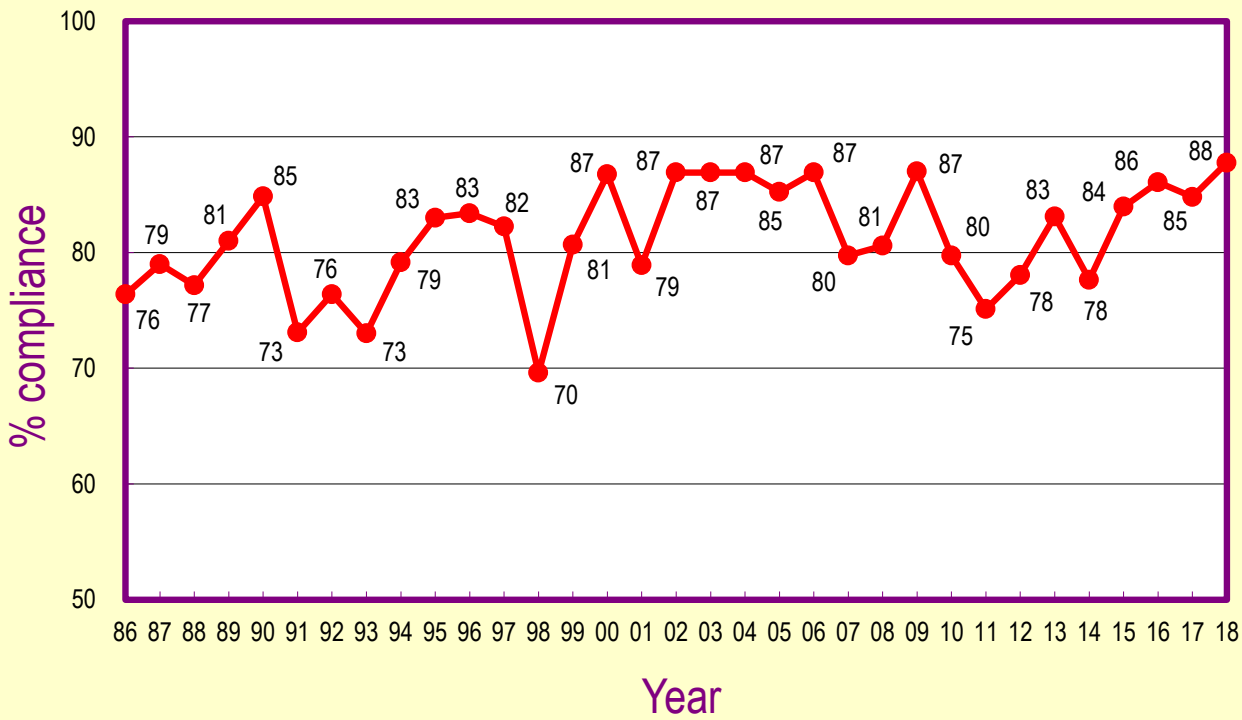
Level of compliance with key marine Water Quality Objectives for 10 Water Control Zones in Hong Kong, 2009 - 2018



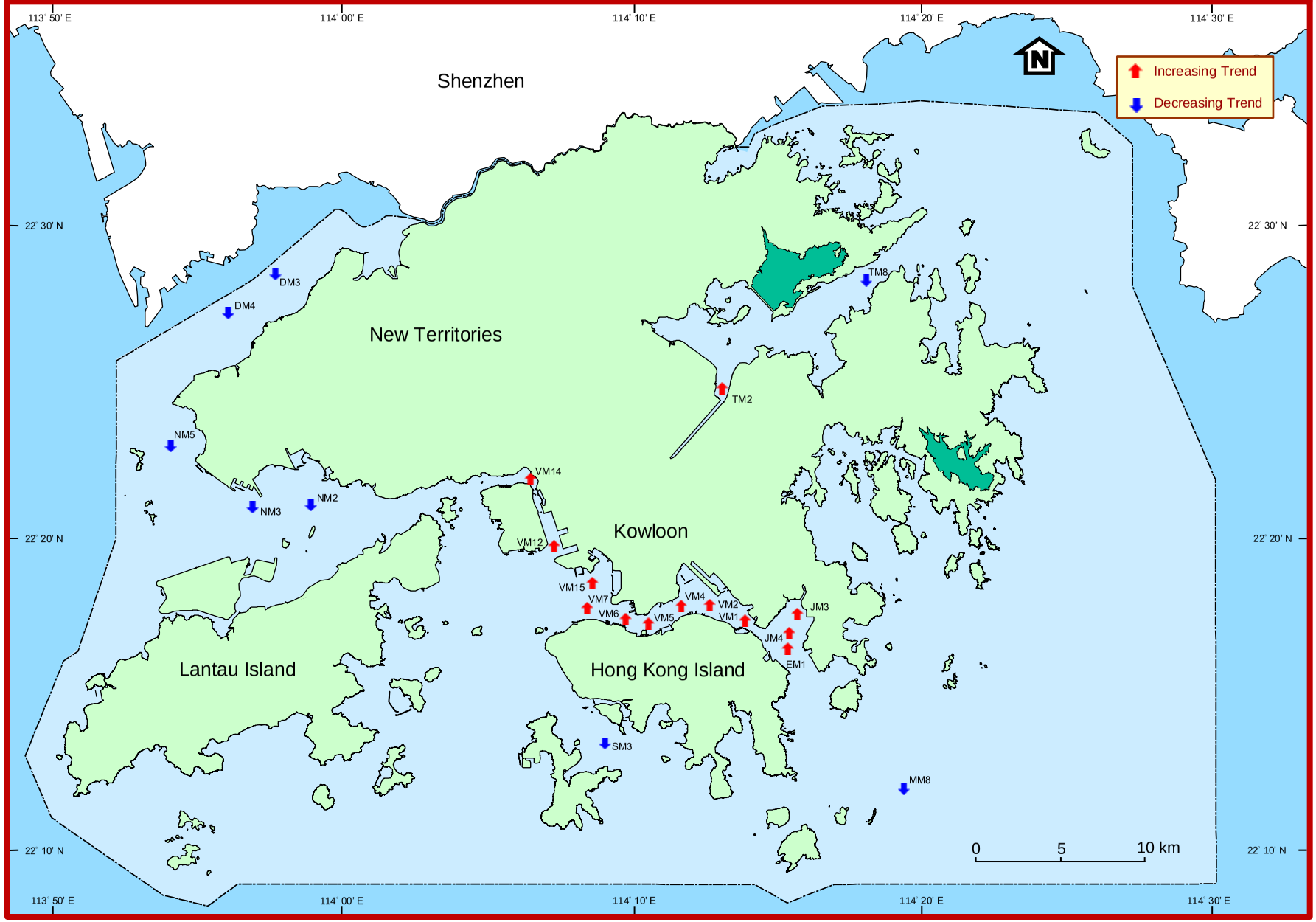
Level of compliance with key marine Water Quality Objectives in Hong Kong, 2009 - 2018



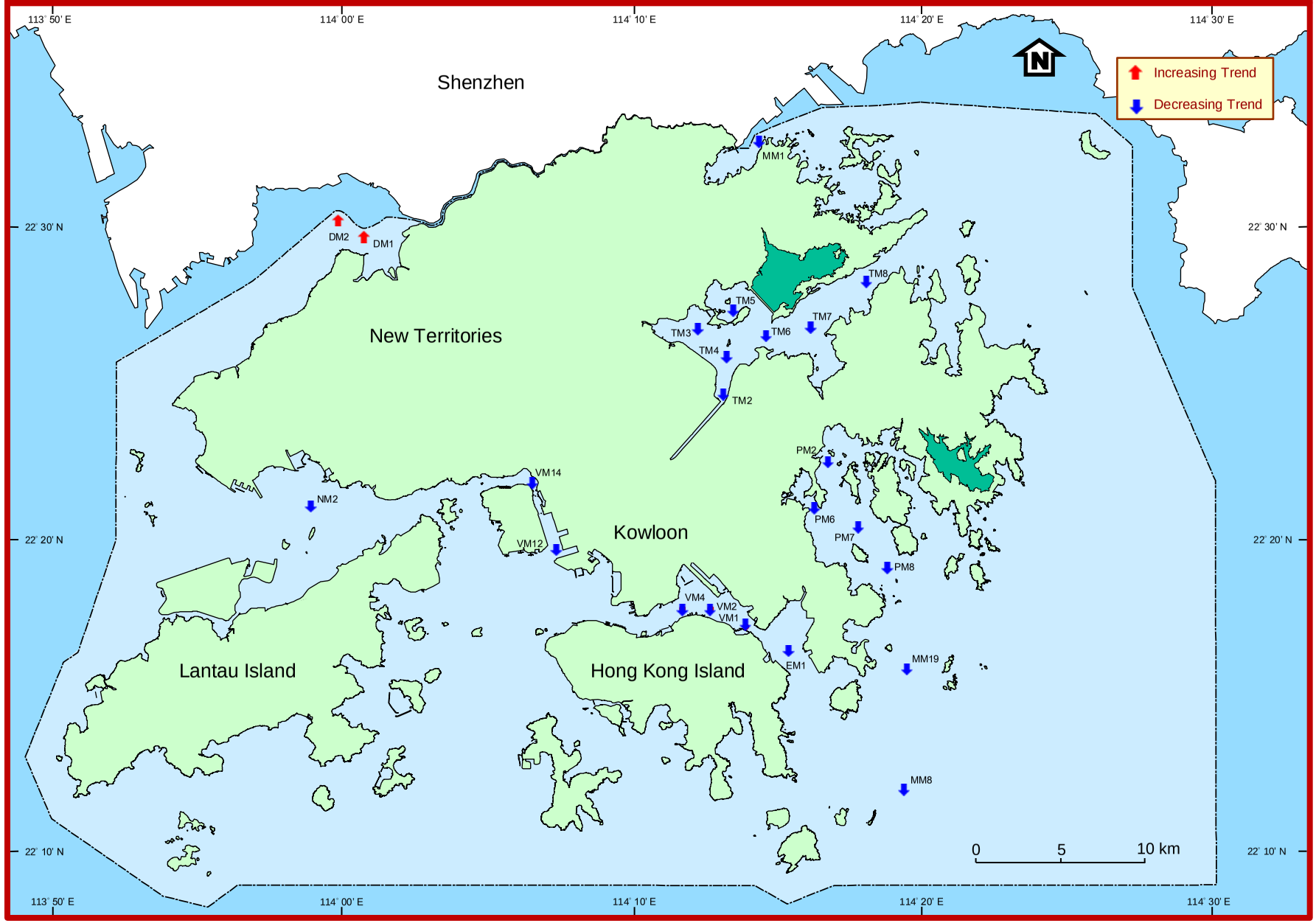
Overall level of compliance with key marine Water Quality Objectives in Hong Kong, 1986 - 2018



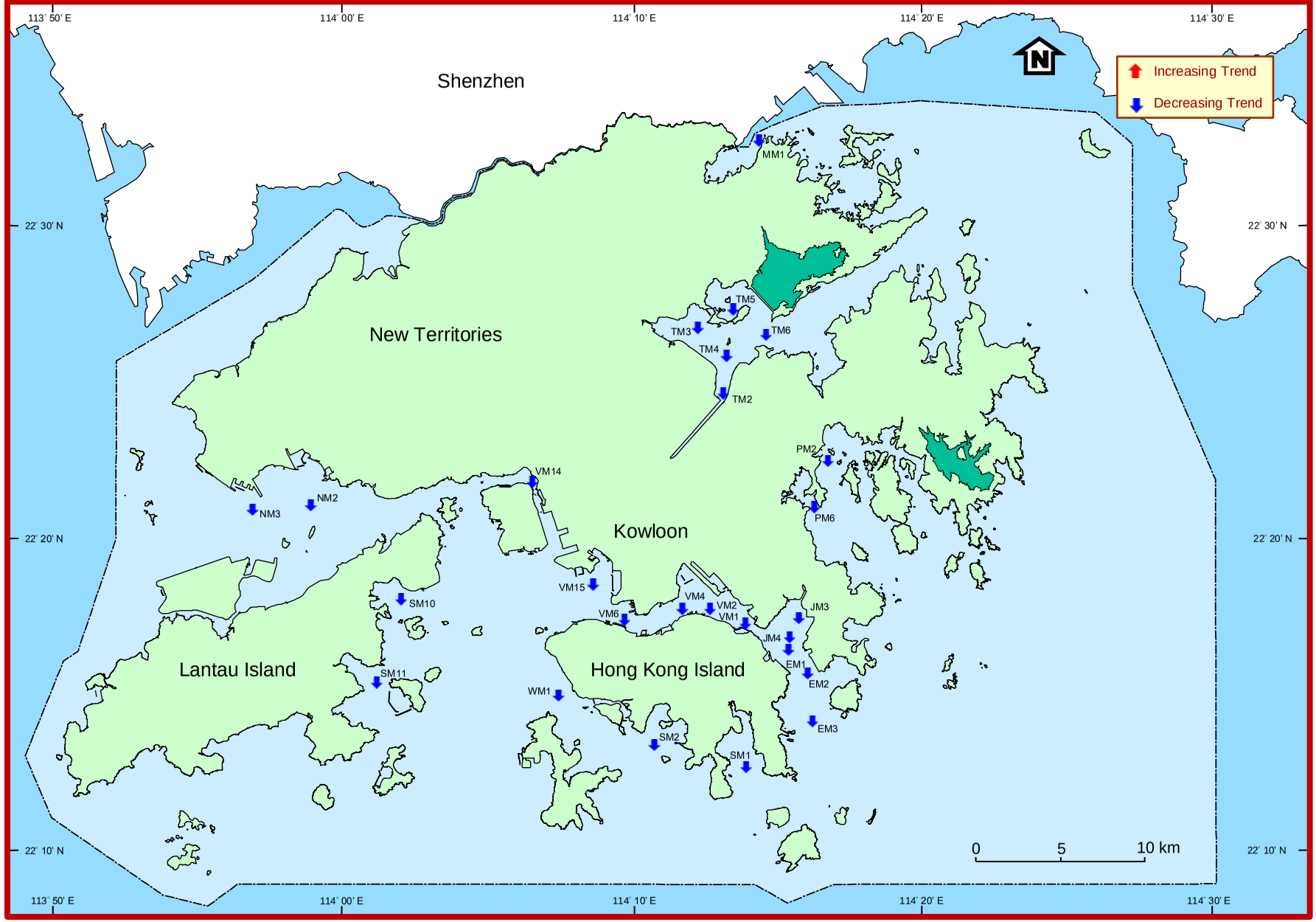
Long-term changes in dissolved oxygen in marine waters of Hong Kong, 1986-2018



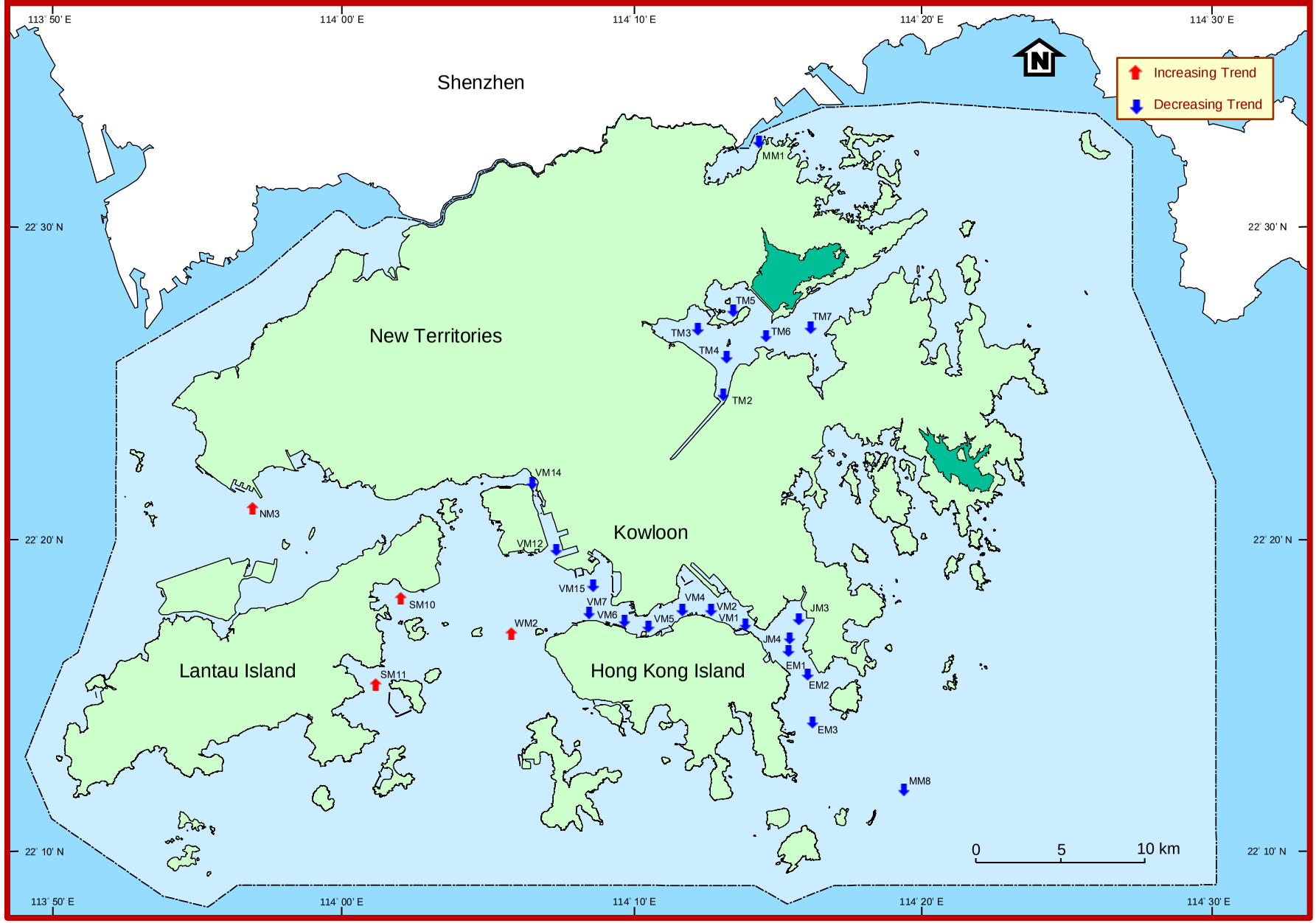
Long-term changes in 5-day biochemical oxygen demand in marine waters of Hong Kong, 1986-2018



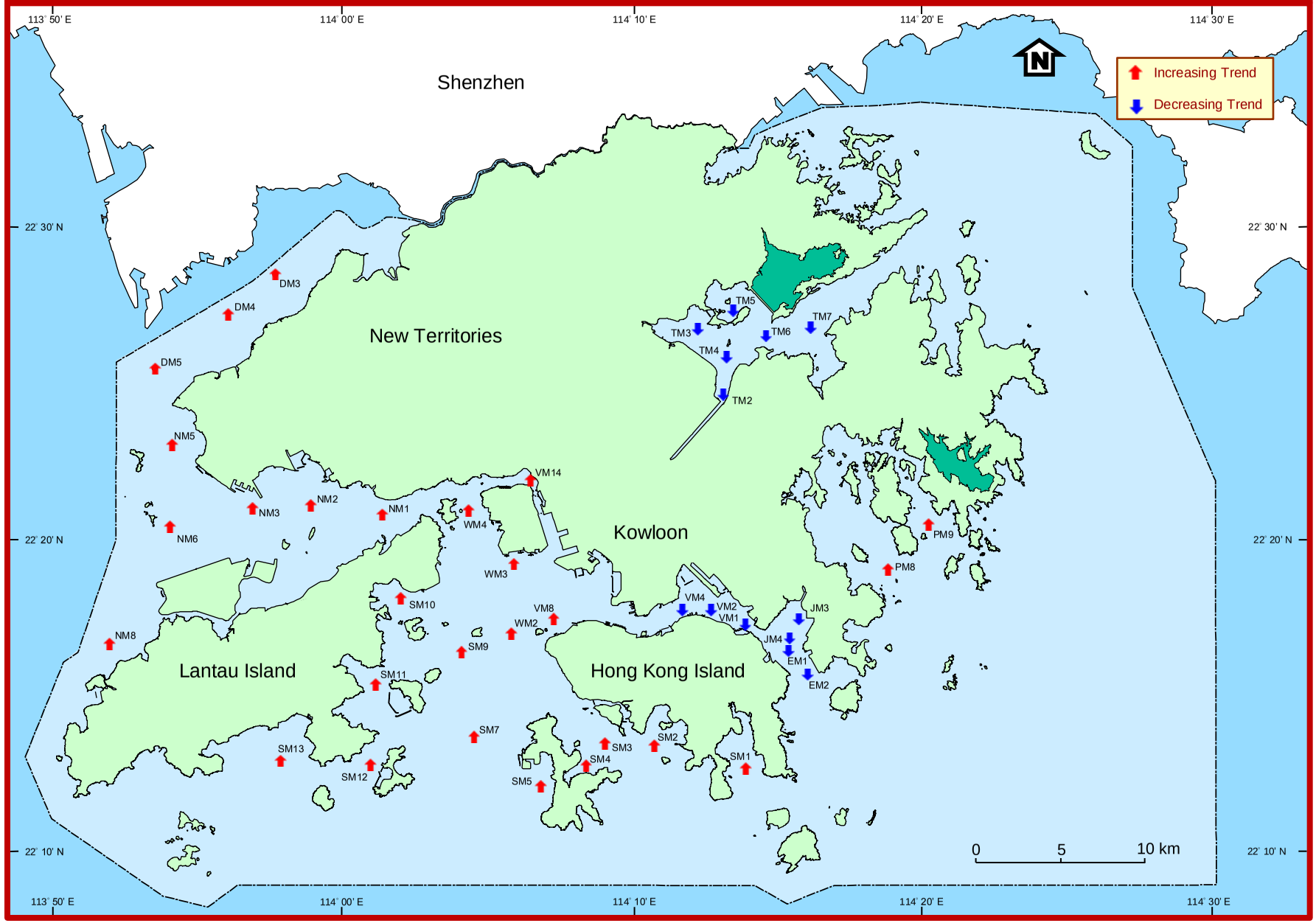
Long-term changes in *E.coli* in marine waters of Hong Kong, 1986-2018



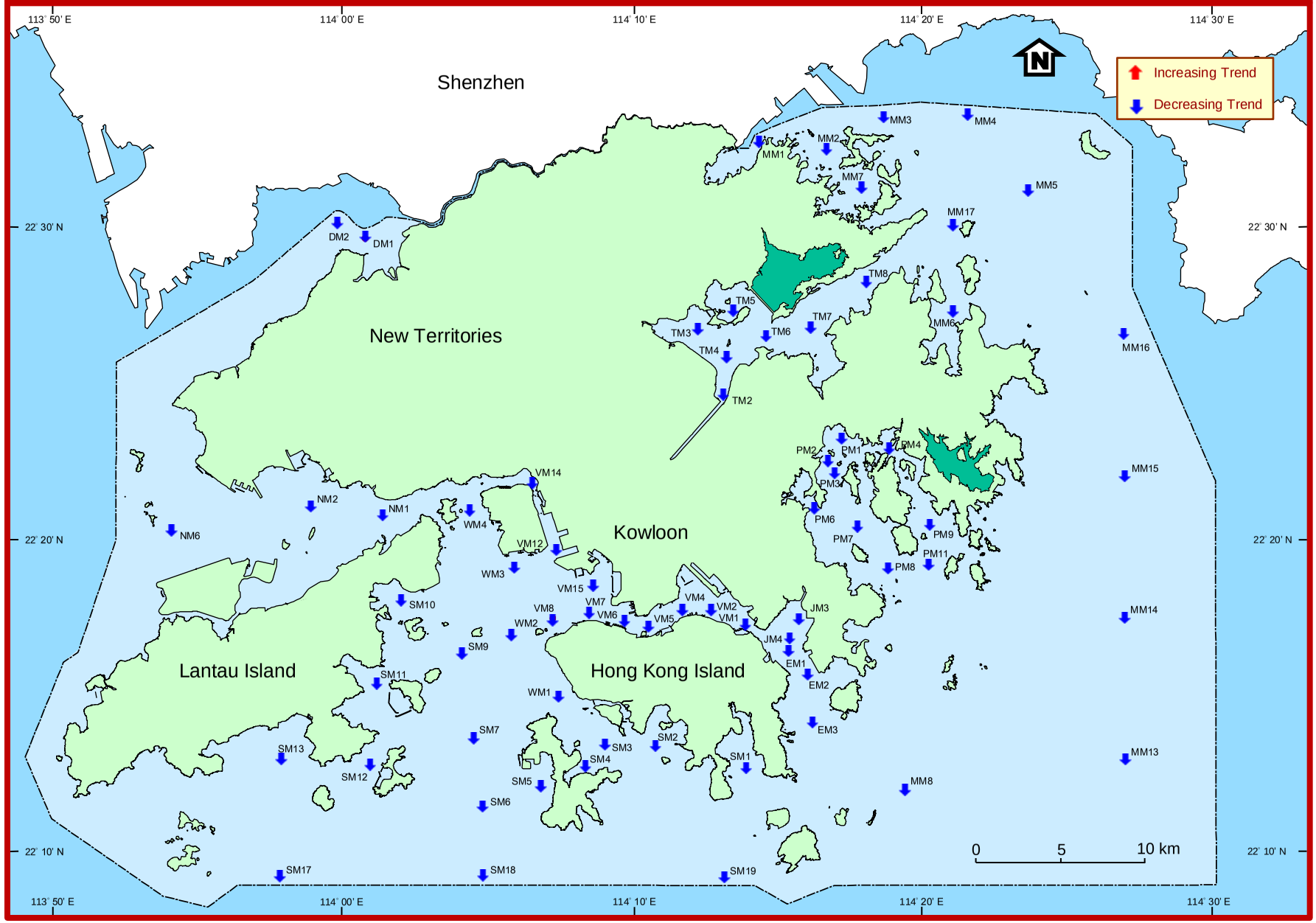
Long-term changes in ammonia nitrogen in marine waters of Hong Kong, 1986-2018



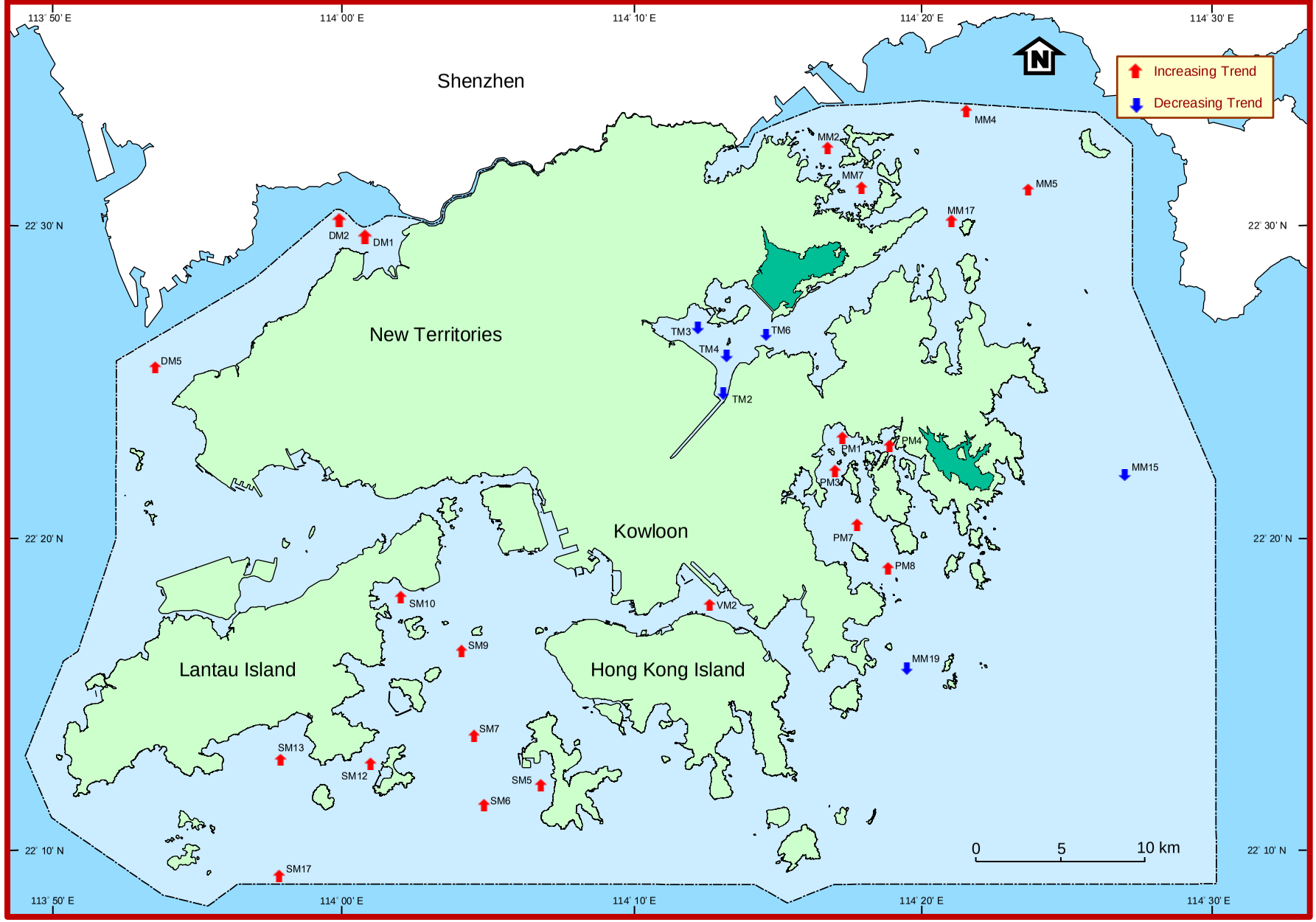
Long-term changes in total inorganic nitrogen in marine waters of Hong Kong, 1986-2018

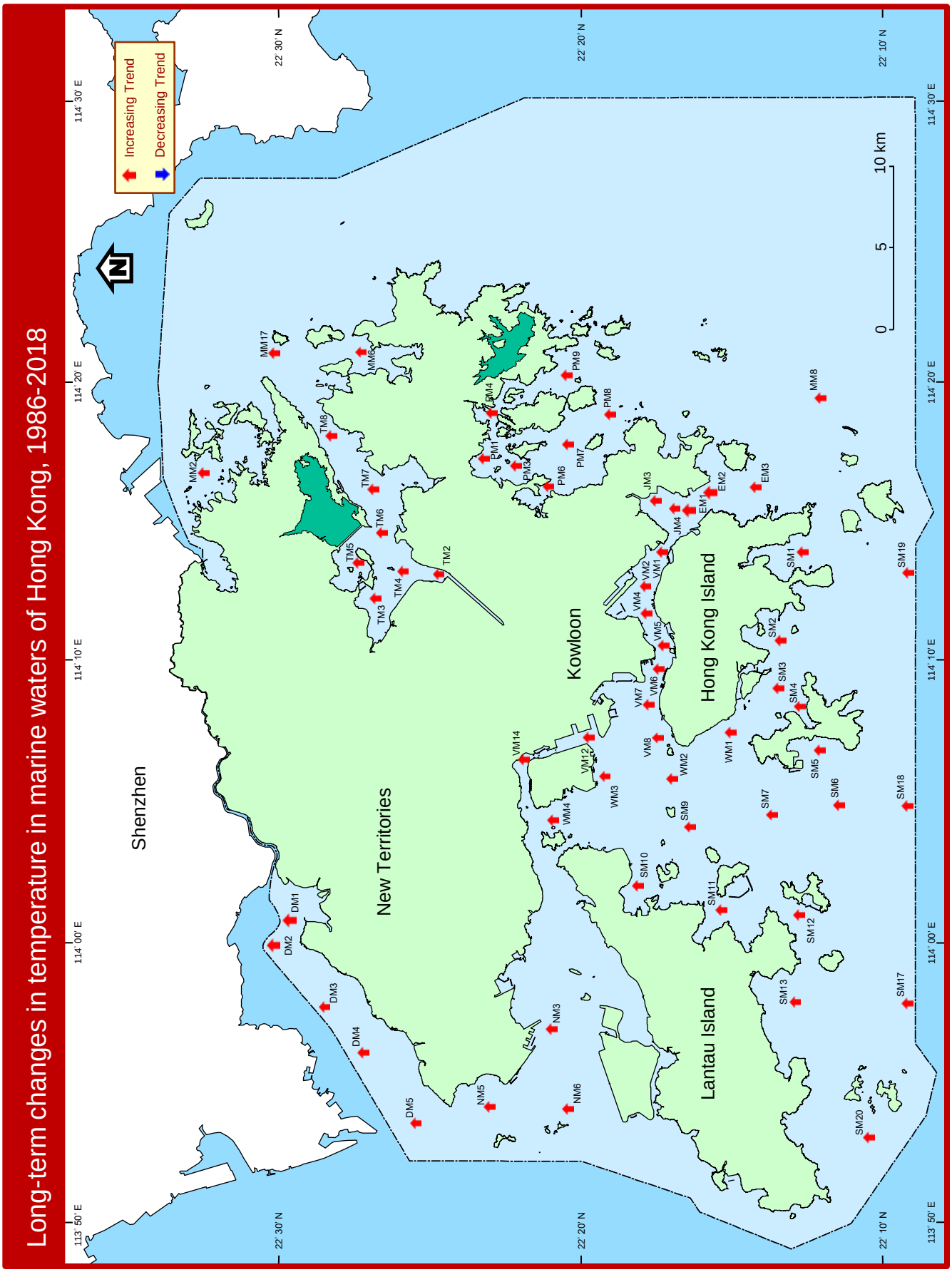


Long-term changes in orthophosphate phosphorus in marine waters of Hong Kong, 1986-2018



Long-term changes in chlorophyll-*a* in marine waters of Hong Kong, 1986-2018




Long-term changes in temperature in marine waters of Hong Kong, 1986-2018
Increasing Trend
Decreasing Trend
N
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N
DM1
DM2
DM3
DM4
DM5
NM3
NM5
NM6
MM2
MM17
MM6
TM8
TM7
TM6
TM5
TM4
TM3
TM2
PM1
PM3
PM4
PM6
PM7
PM8
PM9
MM8
JM3
JM4
EM1
EM2
EM3
VM1
VM2
VM4
VM5
VM6
VM7
VM8
VM12
VM14
WM1
WM2
WM3
WM4
SM1
SM2
SM3
SM4
SM5
SM6
SM7
SM9
SM10
SM11
SM12
SM13
SM17
SM18
SM19
SM20