

Marine Water Quality in Hong Kong in 2021



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.



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Abbreviations / 簡稱

Advance Disinfection Facilities	ADF	前期消毒設施
Ammonia Nitrogen	NH ₄ -N	氨氮
Chemically Enhanced Primary Treatment	CEPT	化學強化一級處理
Conductivity-temperature-depth	CTD / 溫鹽深	溫度、鹽度、深度
Dissolved Oxygen	DO	溶解氧
Environmental Protection Department	EPD / 環保署	環境保護署
<i>Escherichia coli</i>	<i>E. coli</i>	大腸桿菌
Harbour Area Treatment Scheme	HATS	淨化海港計劃
Orthophosphate phosphorus	PO ₄ -P	正磷酸鹽磷
Sewage Treatment Works	STW	污水處理廠
Stonecutters Island Sewage Treatment Works	SCISTW	昂船洲污水處理廠
Total Inorganic Nitrogen	TIN	總無機氮
Unionised Ammonia Nitrogen	NH ₃ -N	非離子化氨氮
Water Control Zone	WCZ	水質管制區
Water Quality Objective	WQO	水質指標
5-day Biochemical Oxygen Demand	BOD ₅	五天生化需氧量

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1. Introduction

To protect the marine environment of Hong Kong for various beneficial and sustainable 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:

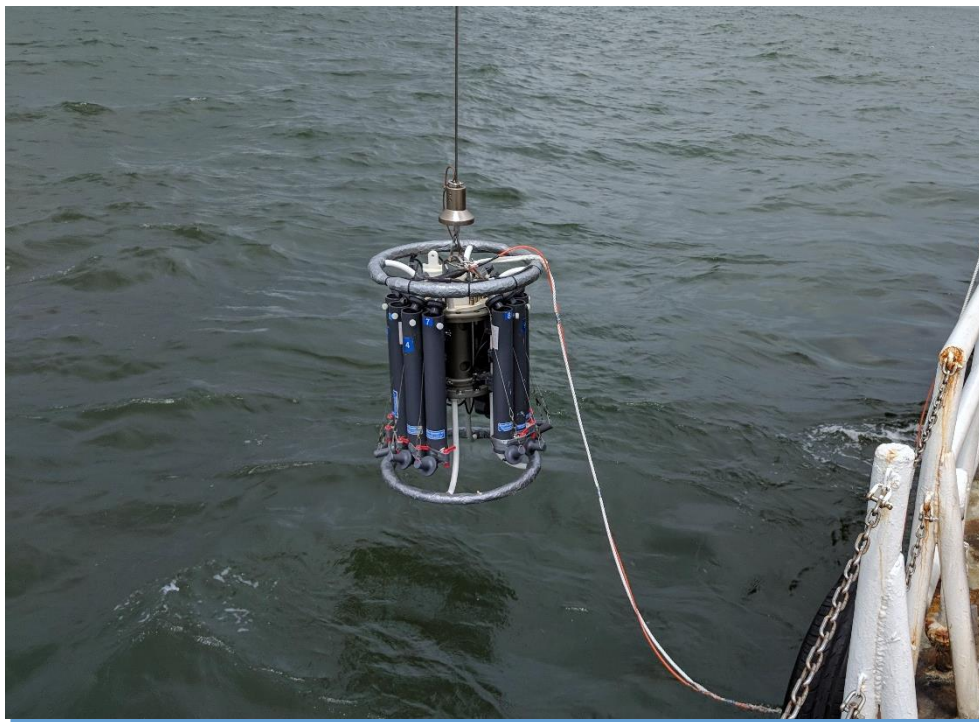
- evaluate the health state of marine waters;
- monitor long-term changes in water quality;
- provide a scientific basis for planning water pollution control strategies and evaluating their effectiveness; and
- assess the compliance with statutory Water Quality Objectives (WQOs).

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



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

Most of the field work at these monitoring stations is conducted on board of *MV Dr. Catherine Lam* – EPD’s marine monitoring vessel. An advanced conductivity-temperature-depth (CTD) profiler linked to a computer-controlled rosette water sampler is set up on the vessel to allow simultaneous depth profiling of *in situ* measurements and water sampling at specified depths. Marine sediments are collected by using a Van Veen sediment grab sampler. The water and sediment samples are analysed by the Government Laboratory and EPD’s in-house laboratory for over 80 physical, chemical and biological parameters. Details of the water quality and sediment parameters, their analytical methods as well as information of monitoring stations and WQOs are given in Appendix A.



The computer-controlled rosette water sampler

2. The State of Hong Kong Marine Waters in 2021

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

The overall marine WQO compliance rate¹ for Hong Kong was 90% in 2021 (see Figure 1). The compliance rates for the four key WQO parameters and the overall WQO compliance rates for the ten water control zones (WCZs) are shown in Figures 2 and 3. Notably, full compliance with the *Escherichia coli* (*E. coli*) and Unionised Ammonia Nitrogen (NH₃-N) WQOs in all applicable WCZs have been achieved for seven consecutive years since 2015. The compliance rates of the Dissolved Oxygen (DO) and Total Inorganic Nitrogen (TIN) WQOs were 95% and 72% respectively in 2021.

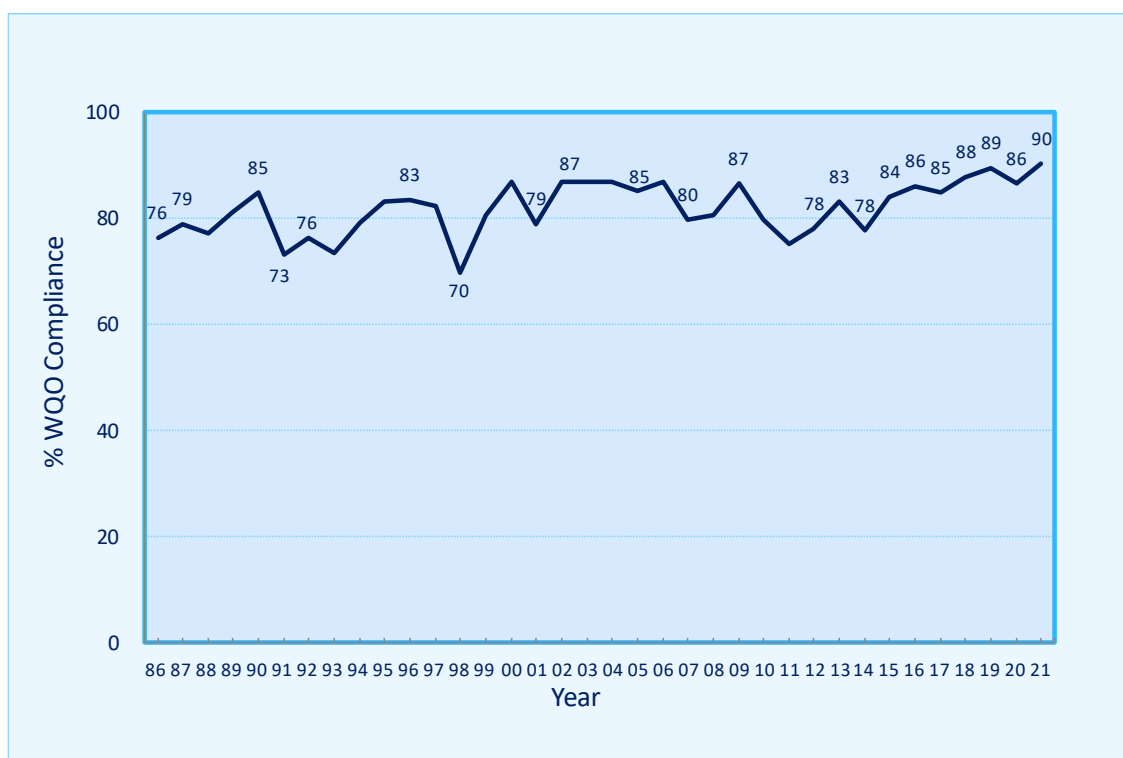


Figure 1. Overall marine WQO compliance rates, 1986-2021

For the DO WQO, localised non-compliance was observed in the Tolo Harbour and Channel WCZ and the Deep Bay WCZ. For the TIN WQO, non-compliance was observed in waters with a background level of TIN that has been consistently higher than other waters, covering the Deep Bay WCZ, North Western WCZ and Southern WCZ. The WQO compliance status of individual WCZs are presented in Chapter 3, with details of water quality monitoring data and compliance status of individual monitoring stations presented in Appendices B and C respectively.

¹ The overall marine WQO compliance rate for Hong Kong's marine waters is calculated based on the overall average of the compliance rates for all monitoring stations for the four key marine WQO parameters including DO, TIN, NH₃-N and *E. coli*.

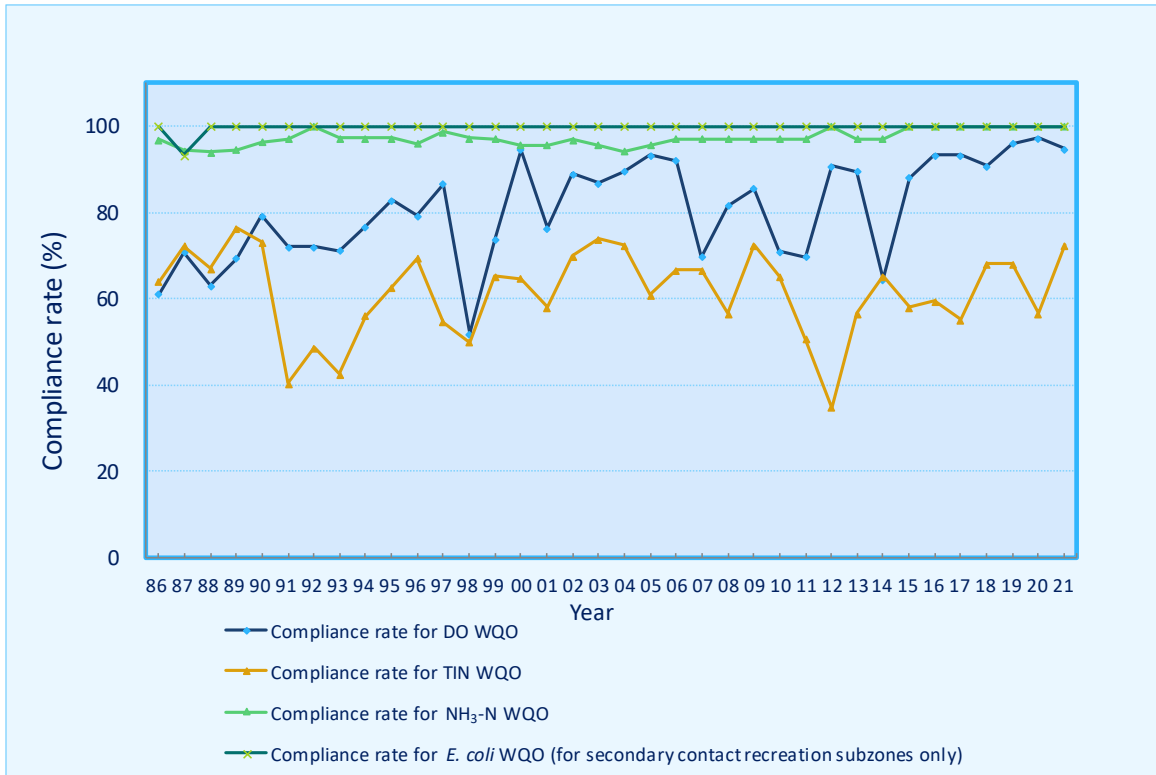


Figure 2. Compliance rates for four key marine WQOs, 1986-2021

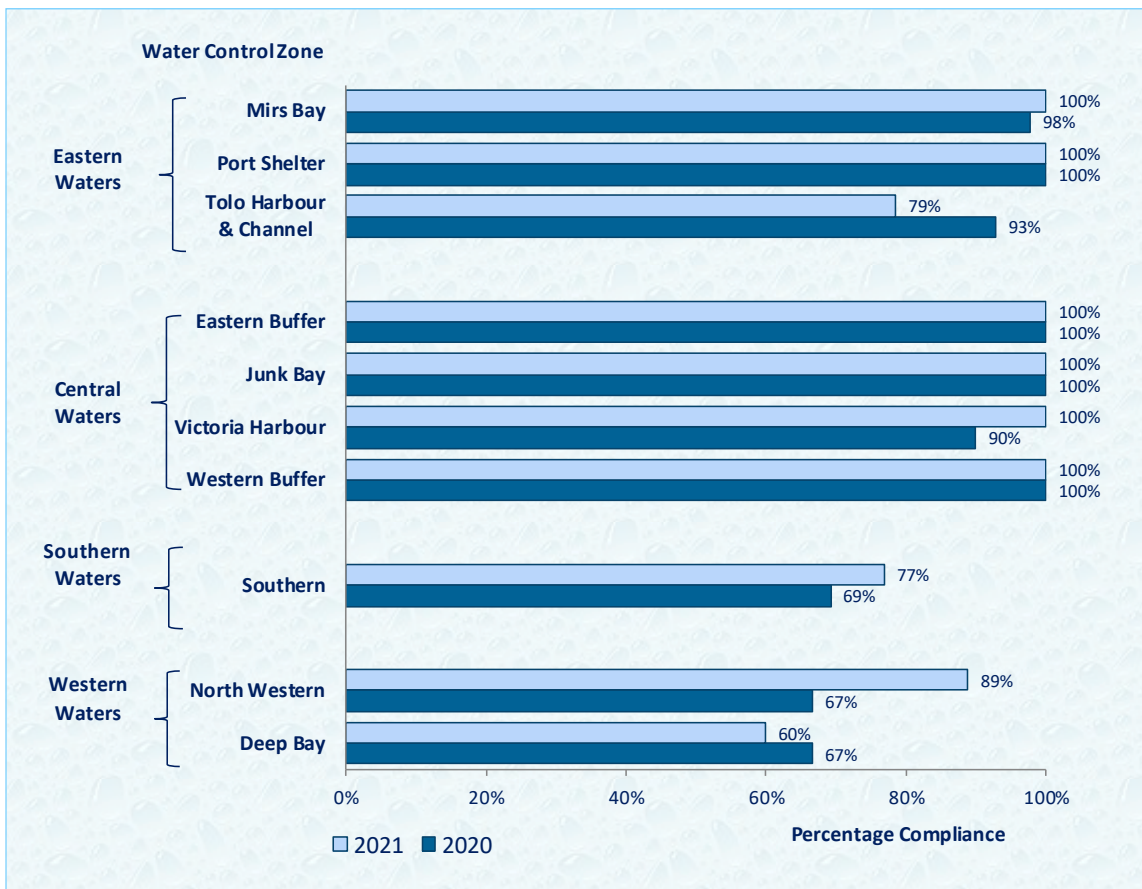


Figure 3. Marine WQO compliance rates for the ten WCZs, 2020-2021

2.2 Highlight in 2021 – Water Quality of Victoria Harbour

The vibrant Victoria Harbour, where more than half of Hong Kong's population reside, has seen significant improvement in its water quality upon staged implementation of the Harbour Area Treatment Scheme (HATS) in the last 20 years. As illustrated in Figure 4, over the recent six years, the average annual levels of *E. coli* and NH₃-N have significantly decreased to 361 counts per 100mL and 0.004 mg/L respectively, while that of DO has maintained at 5.5 mg/L.

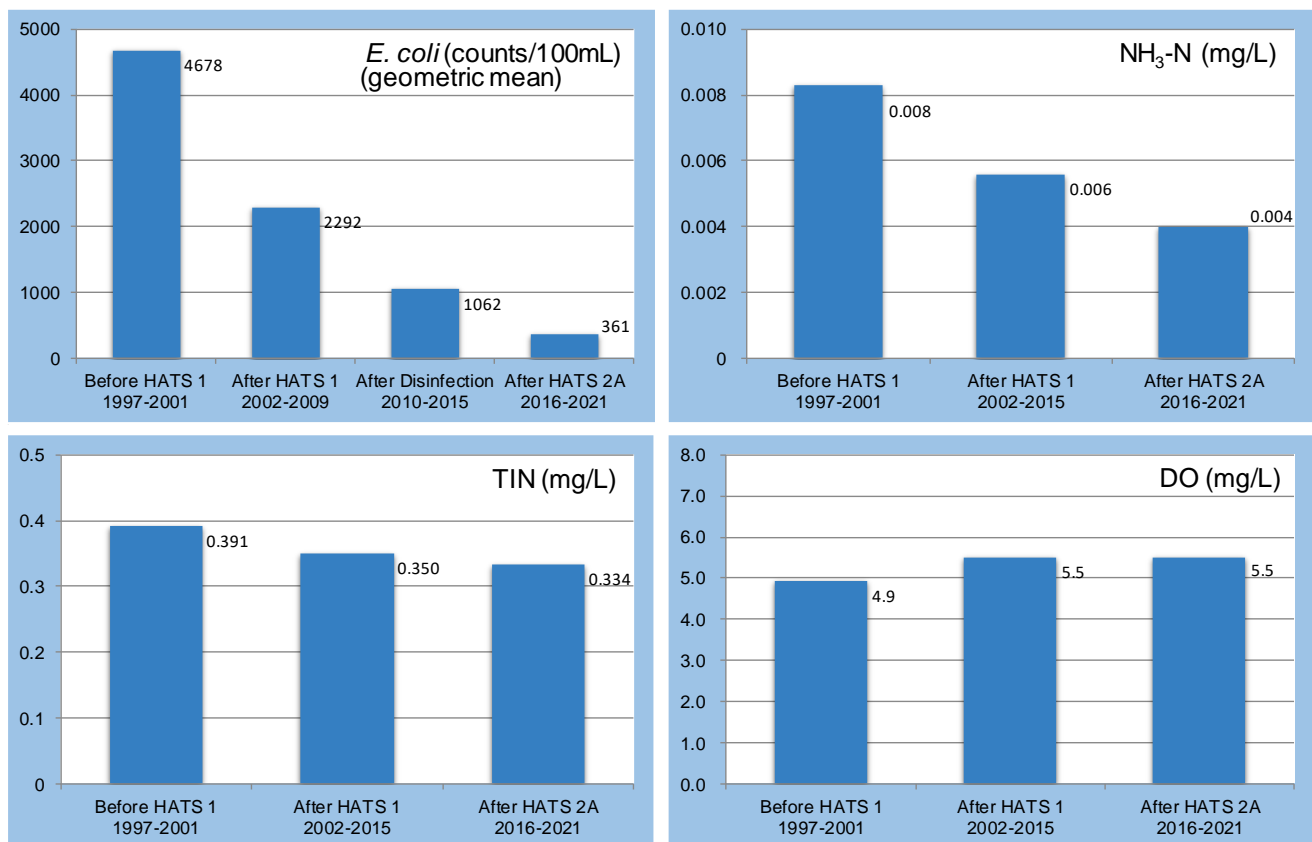
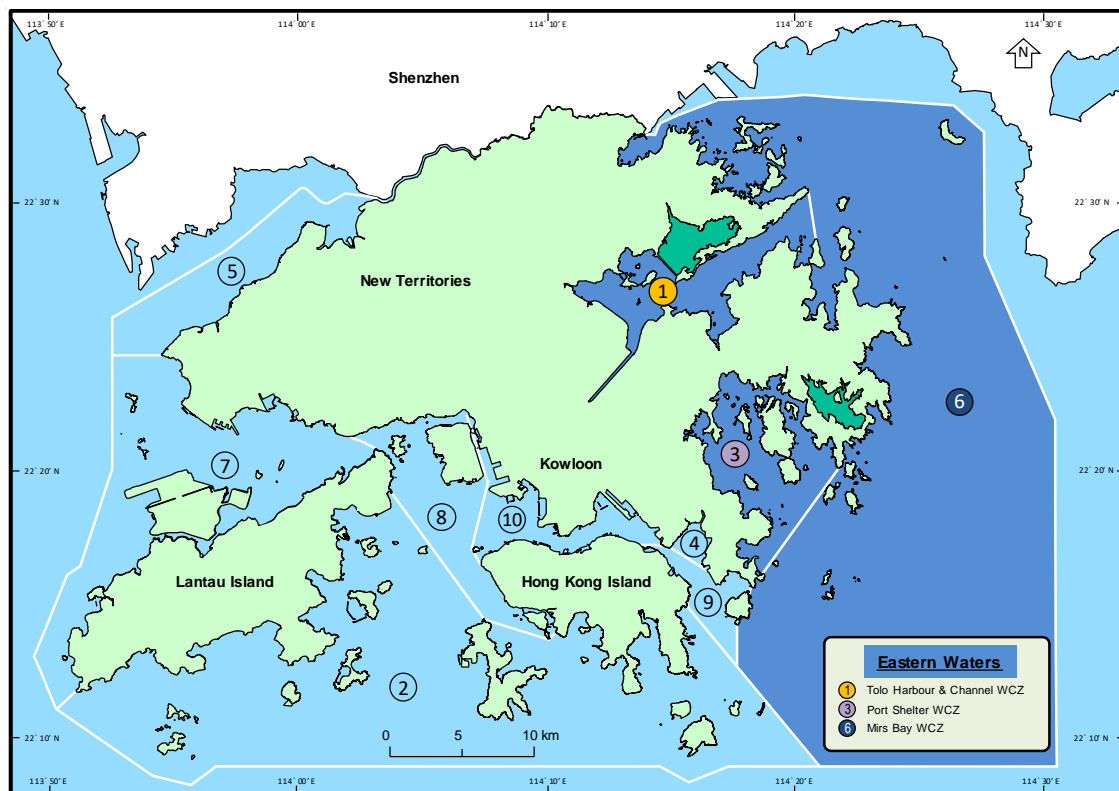


Figure 4. Water quality improvement in Victoria Harbour after the phased implementation of Harbour Area Treatment Scheme (HATS) since 2001

3. Water Quality of the Ten Water Control Zones (WCZs)

Based on the hydrographical conditions of Hong Kong waters and the proximity to the Pearl River Estuary, the ten WCZs are grouped into four main areas: namely Eastern, Central, Western and Southern Waters. Details of their respective water quality conditions 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 bathing beaches, three marine parks, the Hong Kong Geopark, 20 fish culture zones and beautiful natural coastlines with pristine water quality supporting a diversified array of marine life, fisheries and recreation activities.

Mirs Bay Water Control Zone

In 2021, the Mirs Bay WCZ fully achieved the marine WQOs. The water quality was very good with high DO, and low nutrient and *E. coli* levels, fitting secondary contact recreational uses. Figures 5 and 6 illustrate the WQO compliance rates and some long-term water quality trends for the Mirs Bay WCZ in the past three decades.

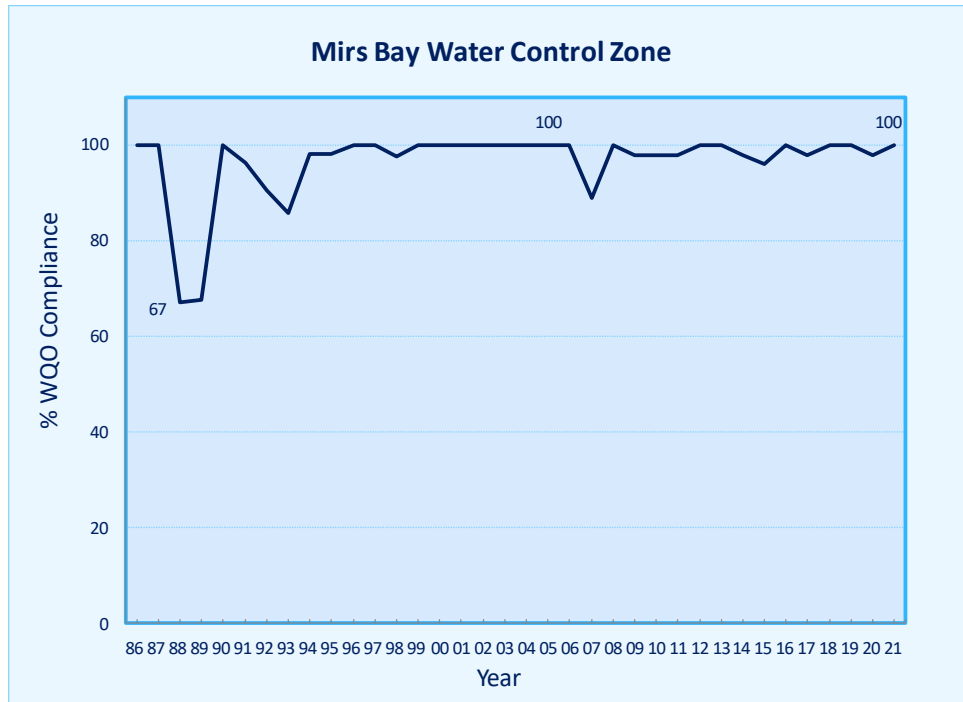


Figure 5. Overall WQO compliance rate for the Mirs Bay WCZ, 1986-2021

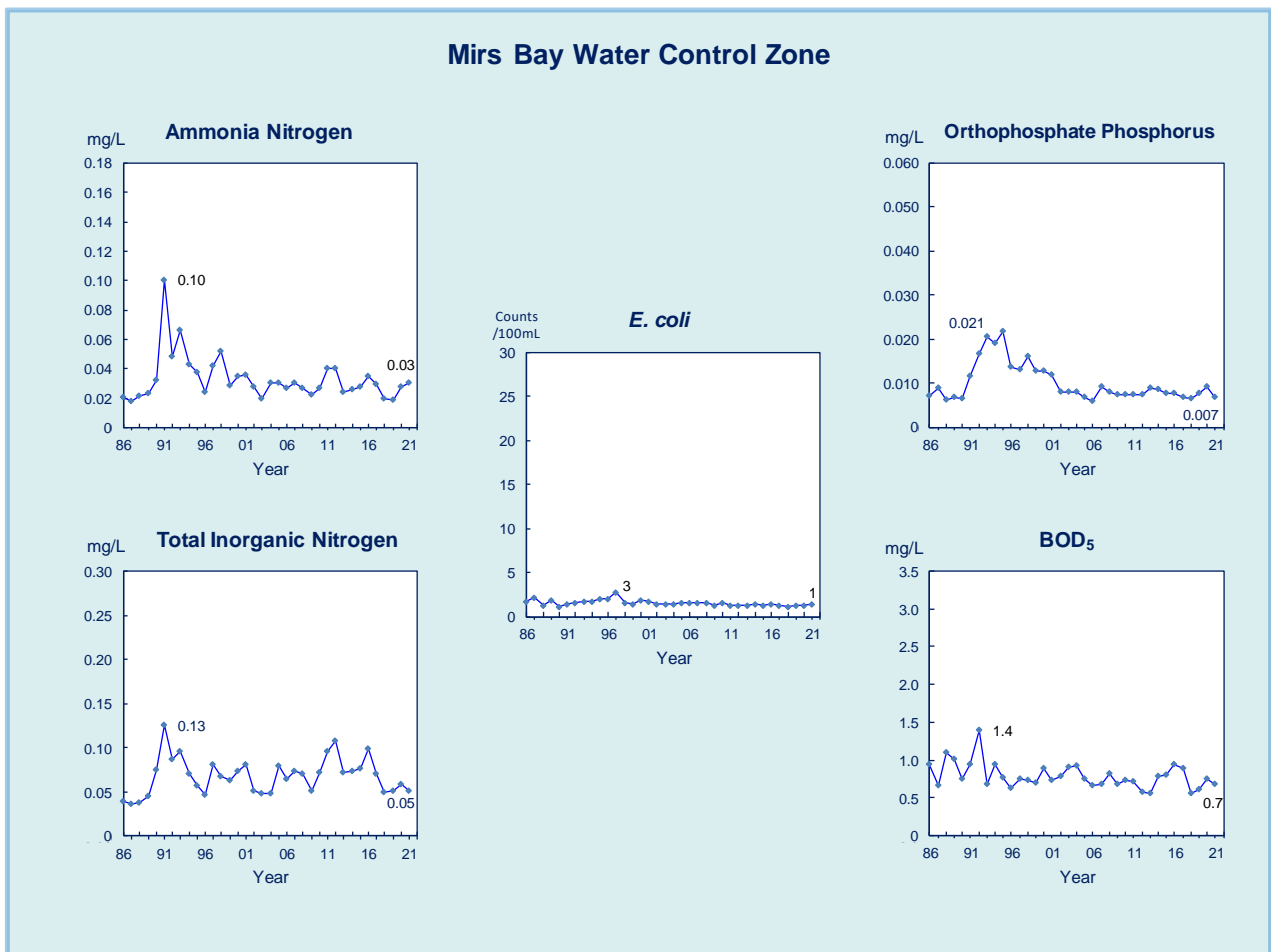


Figure 6. Long-term water quality trends in the Mirs Bay WCZ, 1986-2021

Port Shelter Water Control Zone

In 2021, the water quality of the Port Shelter WCZ remained excellent, fully achieving the WQOs for seven consecutive years since 2015.

The WQO compliance rates and long-term water quality trends for the Port Shelter WCZ since 1986 are illustrated in Figures 7 and 8. In addition to the generally low pollution levels, there was also a steady decrease in nutrients concentrations (including ammonia nitrogen ($\text{NH}_4\text{-N}$) and orthophosphate phosphorus ($\text{PO}_4\text{-P}$)).



Sai Kung in Port Shelter

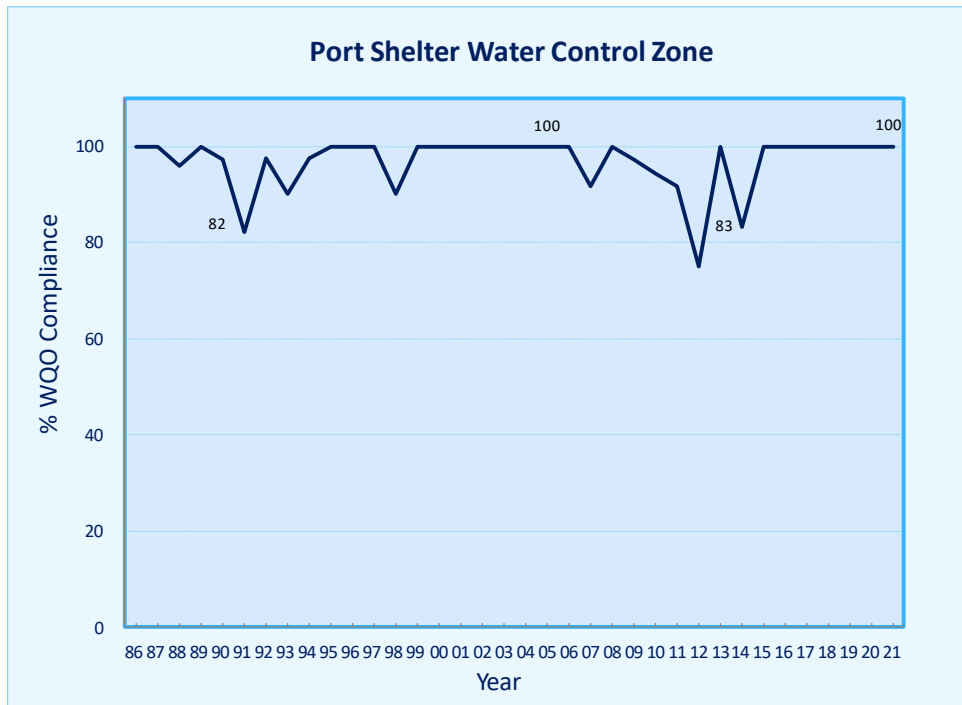


Figure 7. Overall WQO compliance rate for the Port Shelter WCZ, 1986-2021

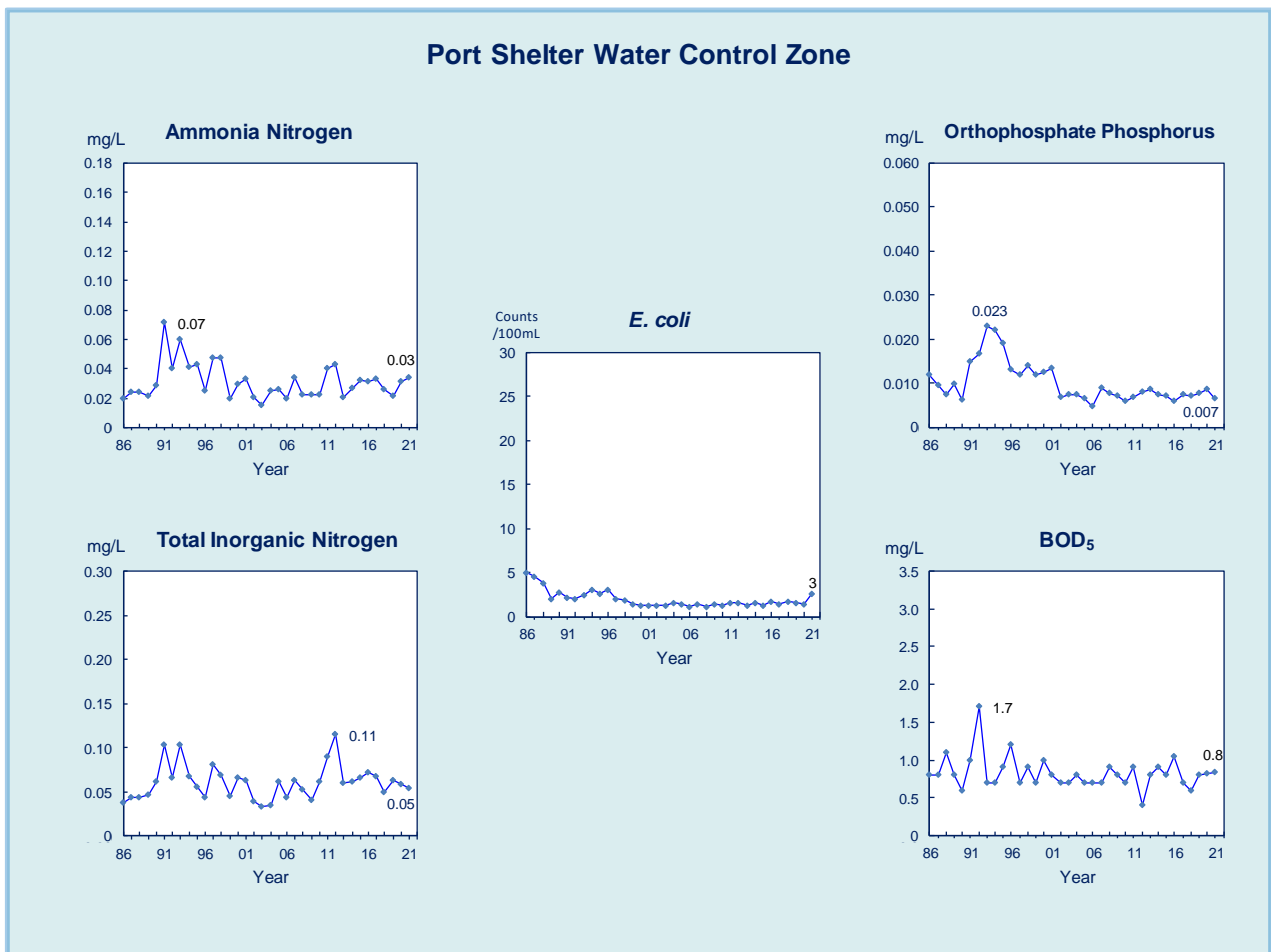


Figure 8. Long-term water quality trends in the Port Shelter WCZ, 1986-2021

Tolo Harbour and Channel Water Control Zone

The overall marine WQO compliance rate for the Tolo Harbour and Channel WCZ was 79% in 2021. The Tolo Harbour and Channel WCZ consistently complied with the bacteriological WQO for secondary contact recreational uses. This embayment of water is, however, subject to a natural hydrological phenomenon of water column stratification and associated formation of bottom layer water masses with low DO level in summer period due to restricted water exchange with the open waters.

Upon the implementation of the Tolo Harbour Action Plan since the mid-1980s, there has been a marked improvement in the water quality in Tolo Harbour in the past three decades, as shown in Figures 9 and 10.



Pak Shek Kok Promenade in Tolo Harbour

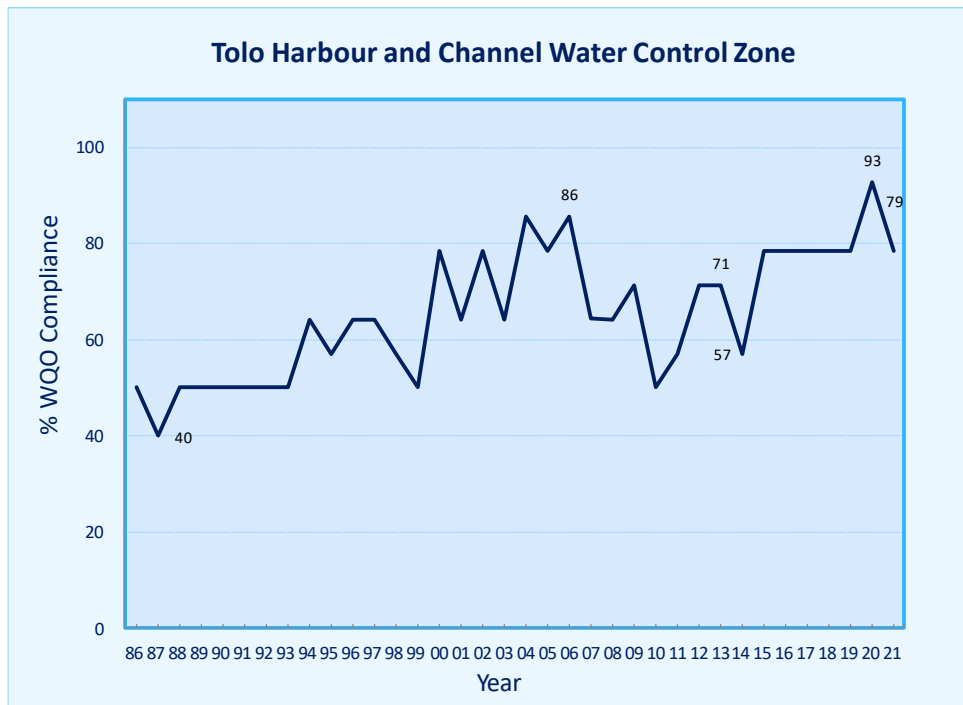


Figure 9. Overall WQO compliance rate for the Tolo Harbour and Channel WCZ, 1986-2021

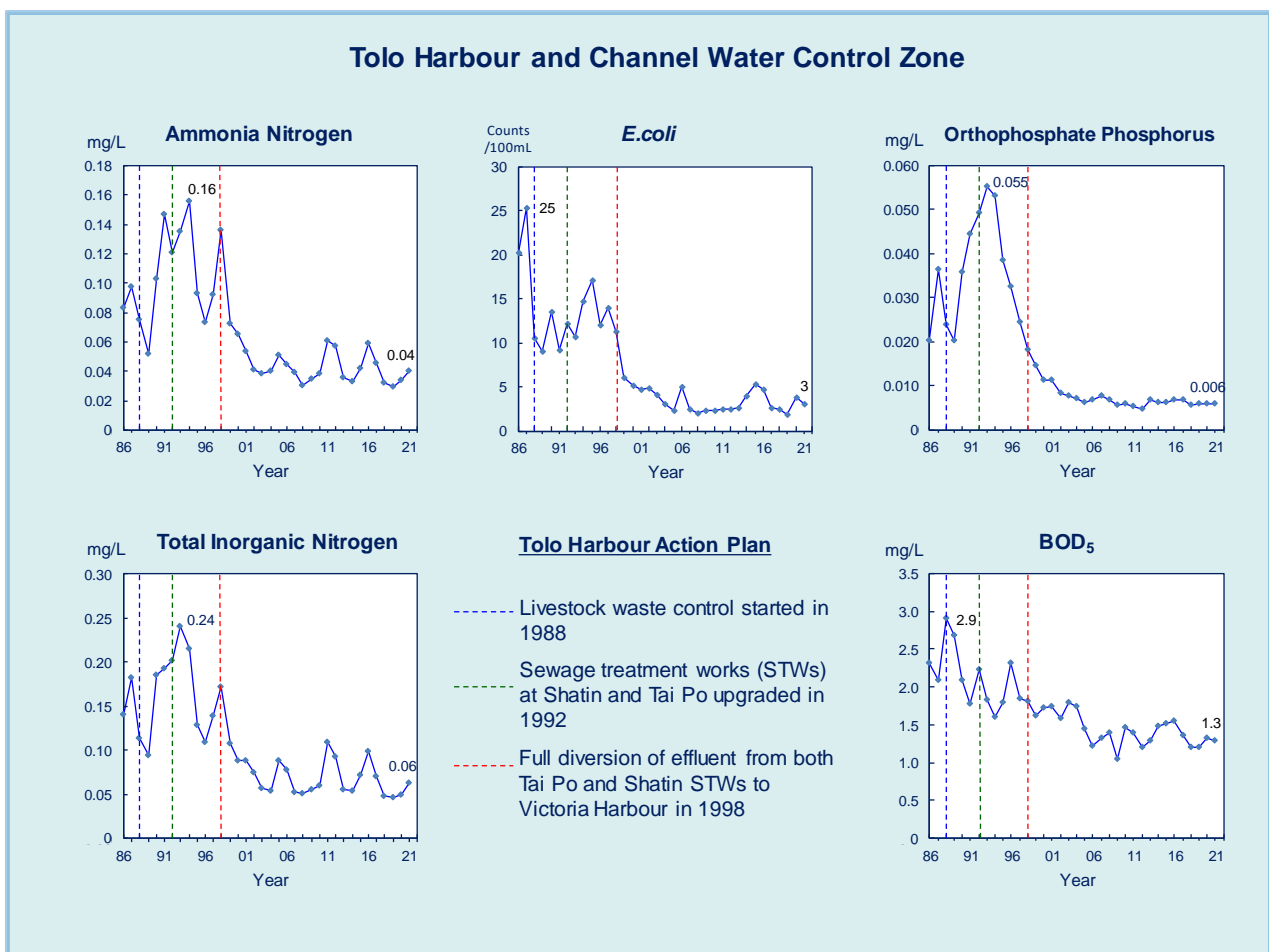
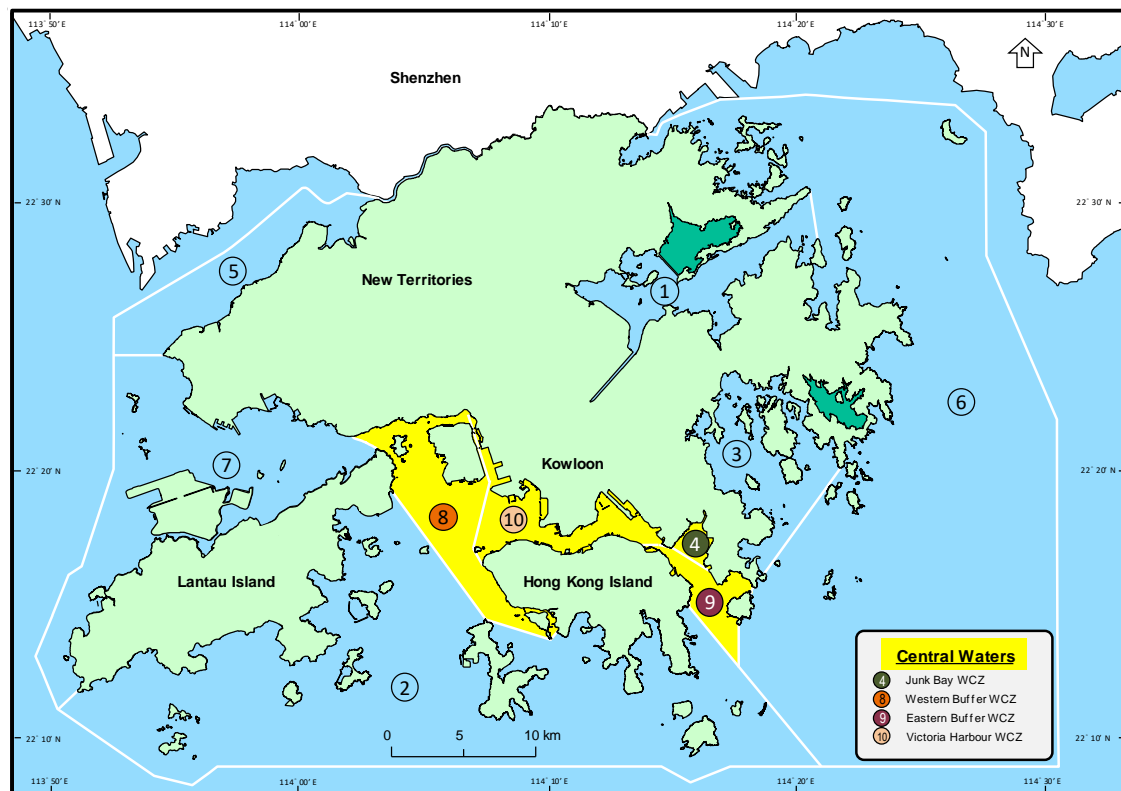


Figure 10. Long-term water quality trends in the Tolo Harbour and Channel WCZ, 1986-2021

3.2 Central Waters



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

Victoria Harbour Water Control Zone

The Victoria Harbour WCZ achieved an overall WQO compliance rate of 100% in 2021.

As shown in Figure 11, the *E. coli* level in the eastern side of Victoria Harbour has decreased markedly since the implementation of HATS Stage 1 in 2001. The annual Cross Harbour Swim, suspended since 1979 because of poor water quality, was resumed on the eastern side of the harbour in 2011 after implementation of the HATS ADF. With full commissioning of the HATS Stage 2A, the *E. coli* level of the central harbour area has been further reduced. Since 2017, the race route of the event has returned to the traditional route in the central harbour area.

Figures 12 and 13 show the WQO compliance rates and some long-term water quality trends for the Victoria Harbour WCZ in the period of 1986 to 2021.

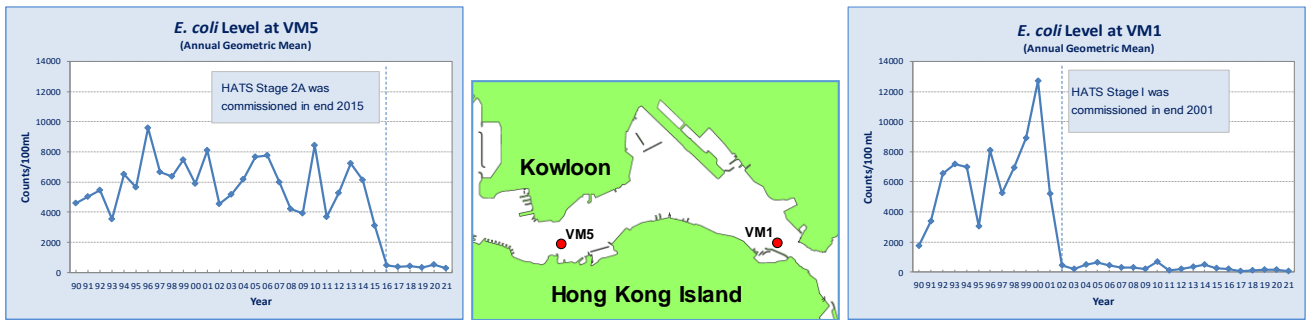


Figure 11. *E. coli* level at the central (VM5) and eastern (VM1) parts of the Victoria Harbour WCZ, 1990-2021



Cross Harbour Swim 2021 took place in central Victoria Harbour

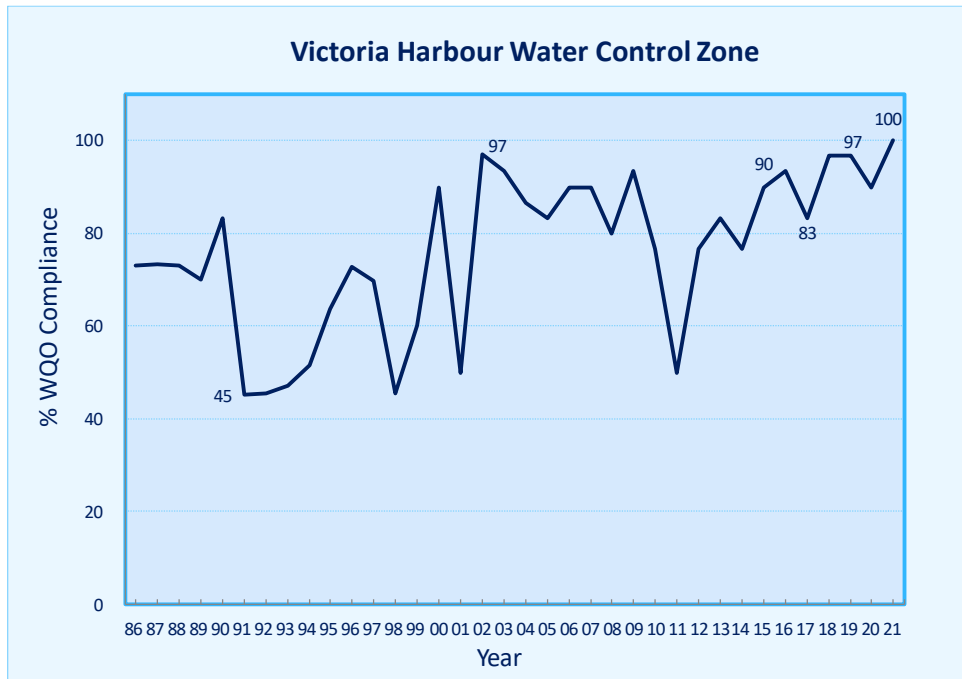


Figure 12. Overall WQO compliance rate for the Victoria Harbour WCZ, 1986-2021

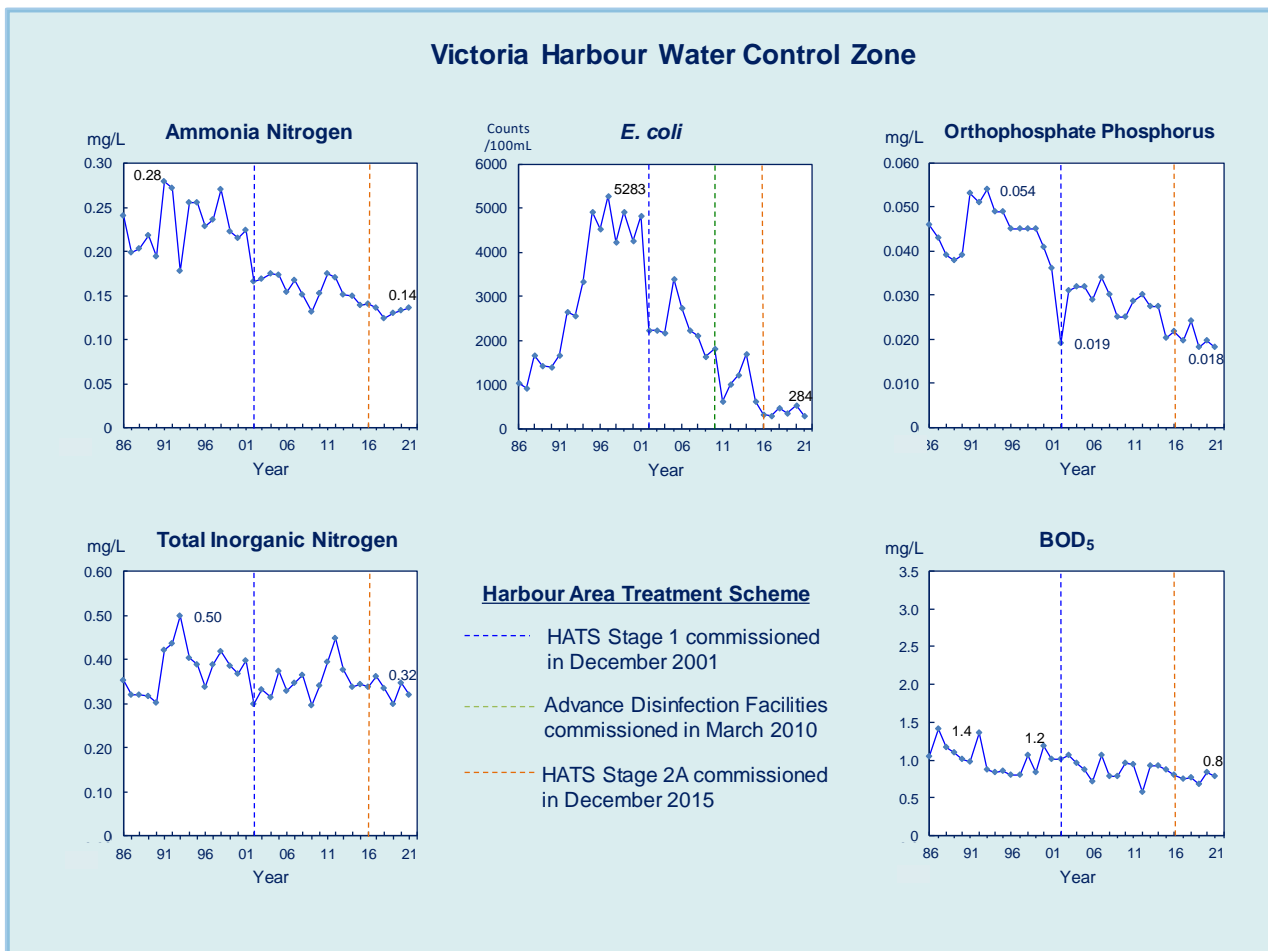


Figure 13. Long-term water quality trends in the Victoria Harbour WCZ, 1986-2021

Eastern Buffer Water Control Zone and Junk Bay Water Control Zone

Both the Eastern Buffer WCZ and the Junk Bay WCZ have fully achieved the marine WQOs for the past 22 years. Since the implementation of the HATS Stage 1 in 2001, the water quality of these two WCZs has improved noticeably with significant increase in DO level and decrease in nutrient and bacteria levels.



Tseung Kwan O Cross Bay Link under construction across Junk Bay

Figures 14 to 17 present the WQO compliance rates and long-term water quality improving trends for the Eastern Buffer WCZ and the Junk Bay WCZ over the past three decades.

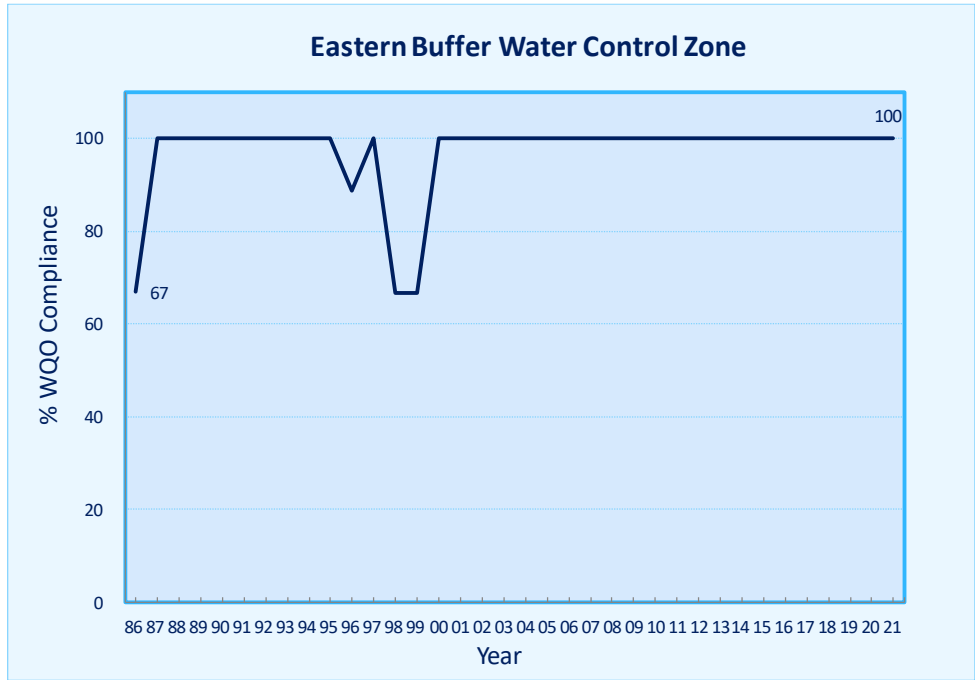


Figure 14. Overall WQO compliance rate for the Eastern Buffer WCZ, 1986-2021

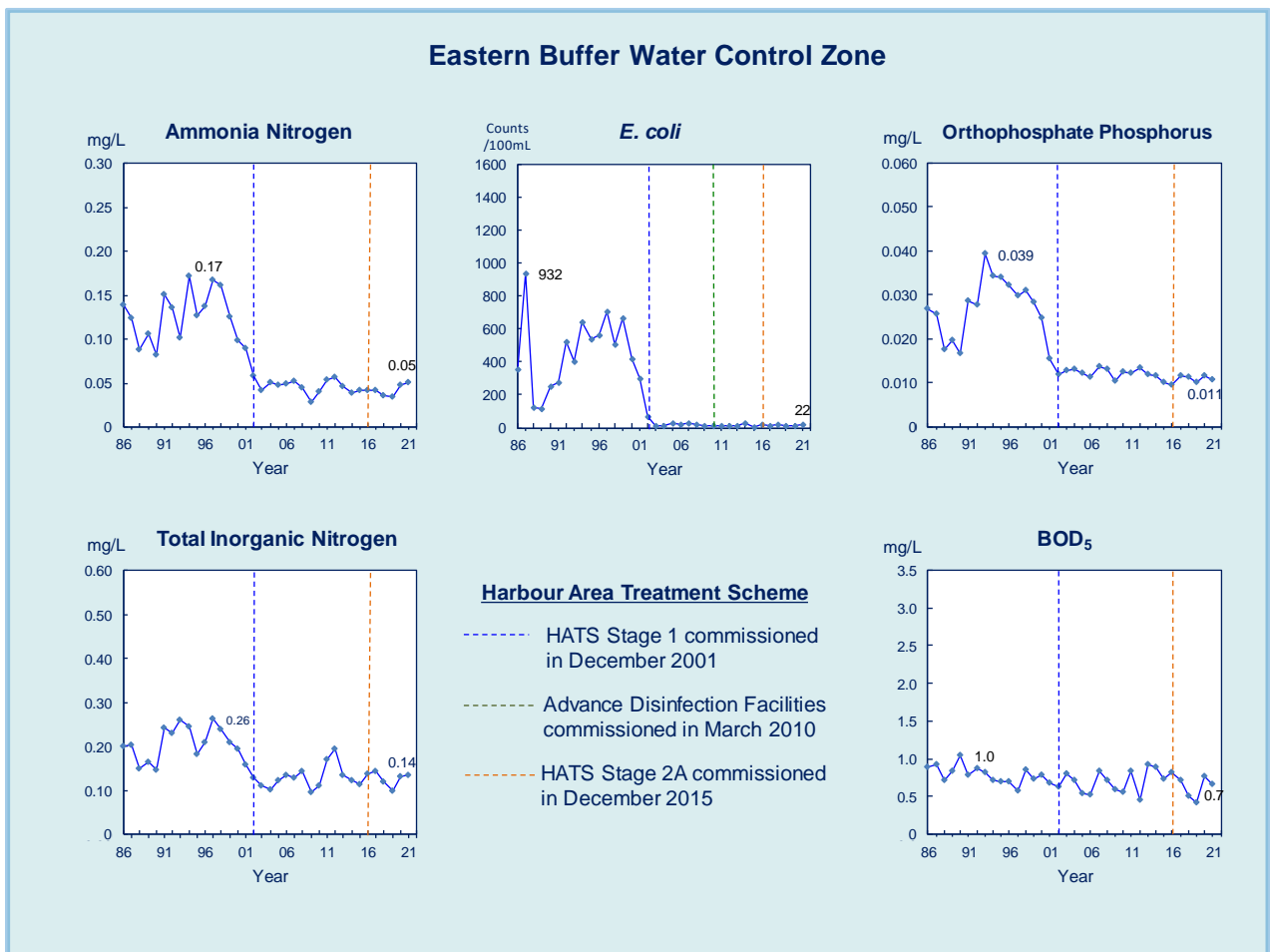


Figure 15. Long-term water quality trends in the Eastern Buffer WCZ, 1986-2021

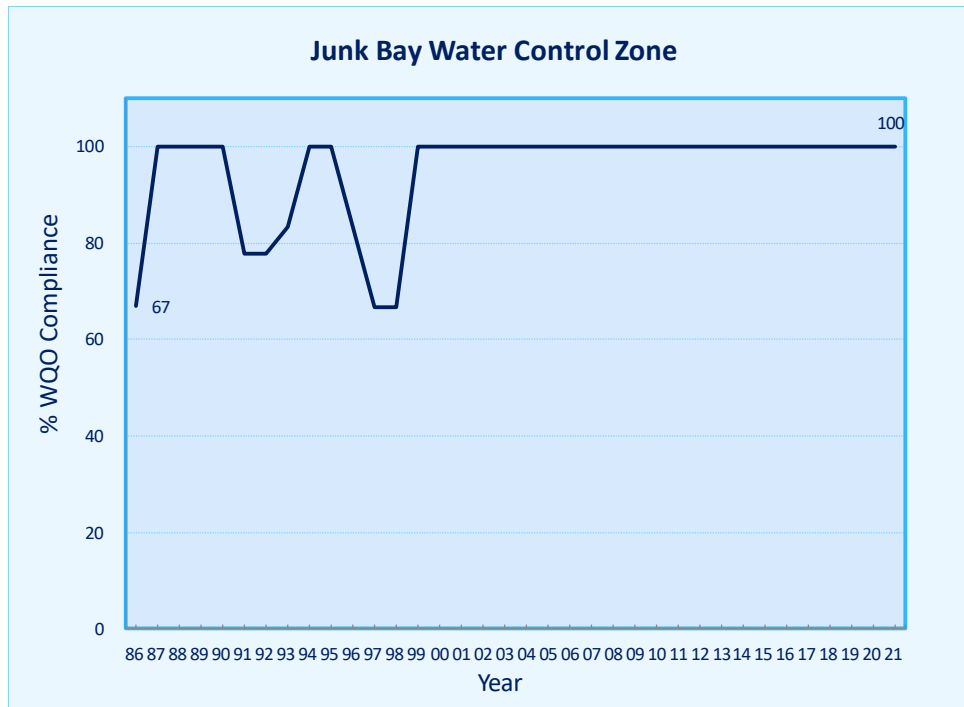


Figure 16. Overall WQO compliance rate for the Junk Bay WCZ, 1986-2021

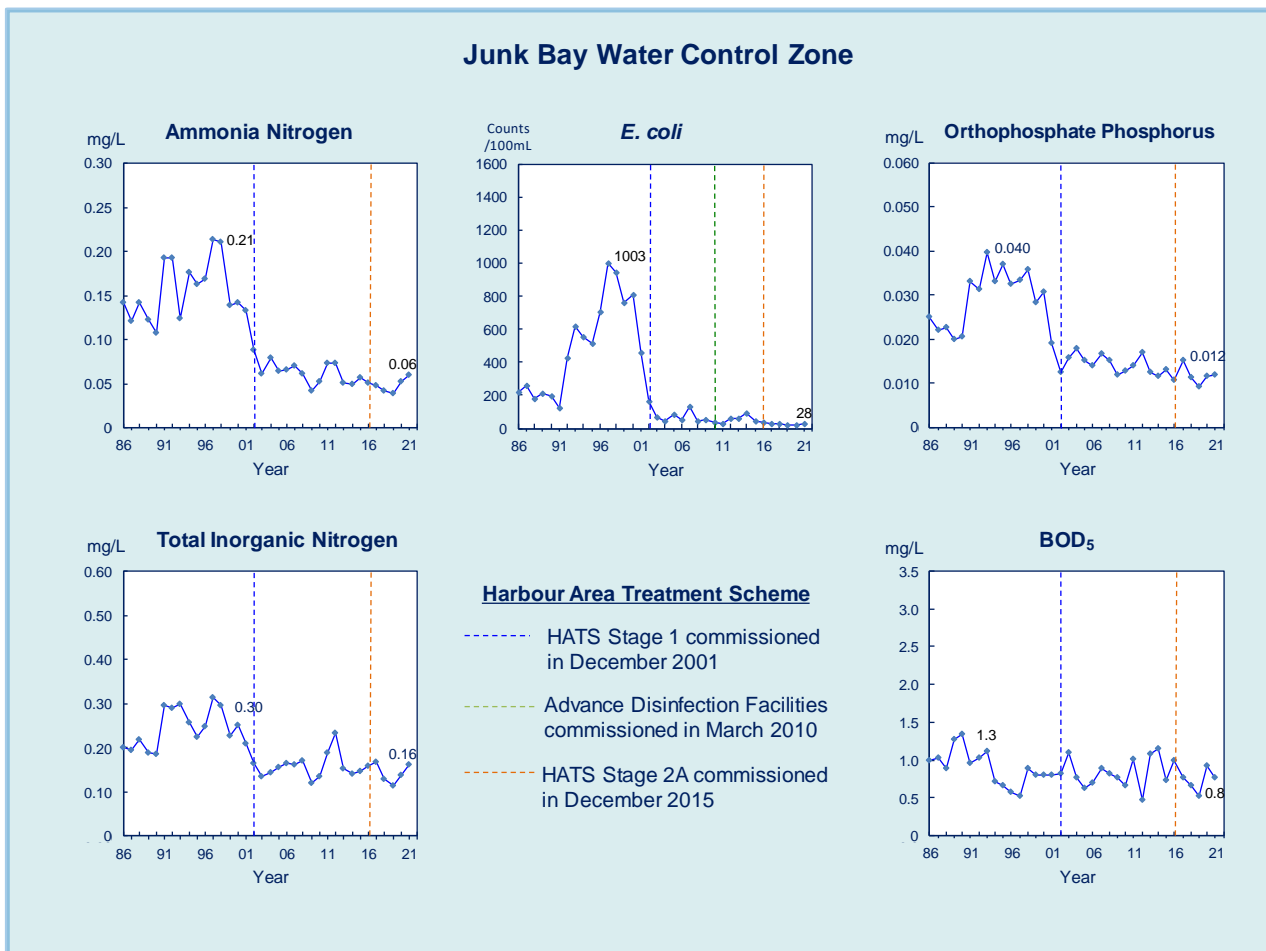


Figure 17. Long-term water quality trends in the Junk Bay WCZ, 1986-2021

Western Buffer Water Control Zone

The Western Buffer WCZ fully achieved the WQOs in 2021. Since the commissioning of the HATS ADF in 2010, the *E. coli* level in the WCZ decreased substantially.



Kap Shui Mun Bridge linking Ma Wan and Lantau Island

Figures 18 and 19 illustrate the WQO compliance rate and some long-term water quality trends for the Western Buffer WCZ since 1986. Similar to other WCZs in the central waters, significant improvement of water quality as reflected in reduction in levels of *E. coli* and $\text{PO}_4\text{-P}$ has been observed.

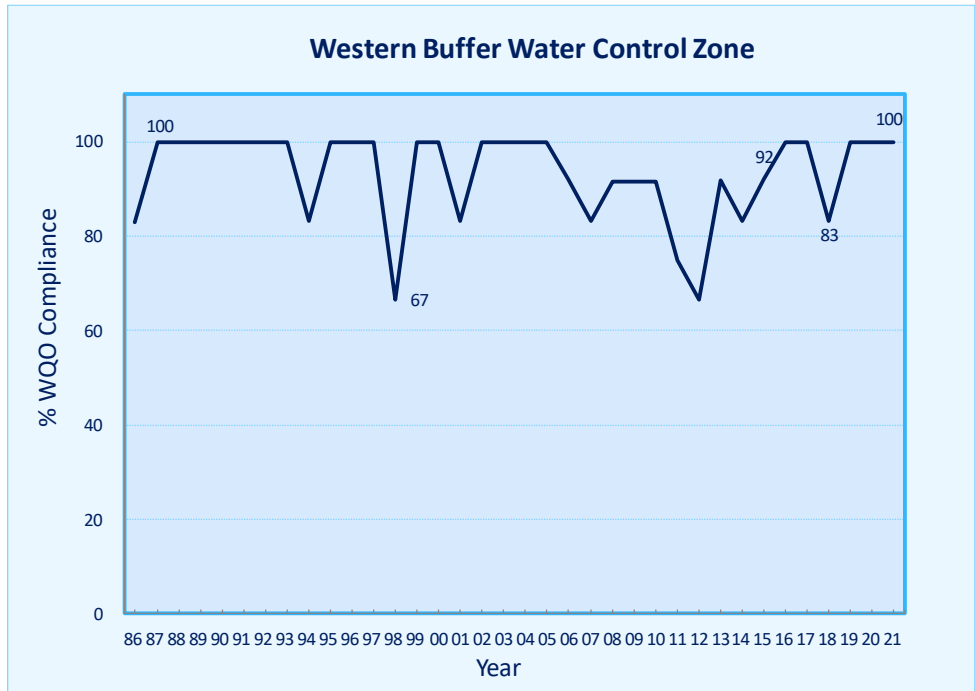


Figure 18. Overall WQO compliance rate for the Western Buffer WCZ, 1986-2021

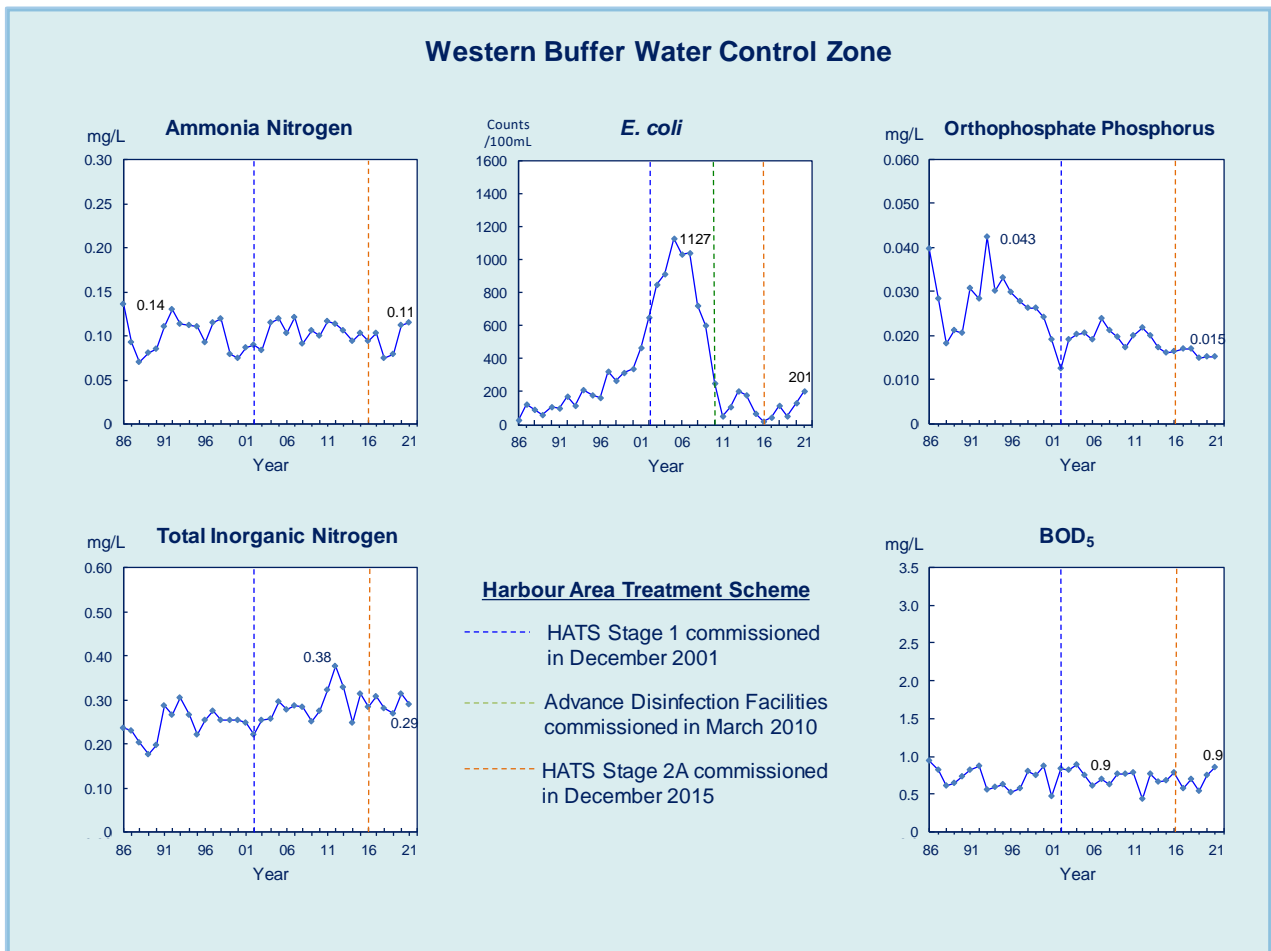
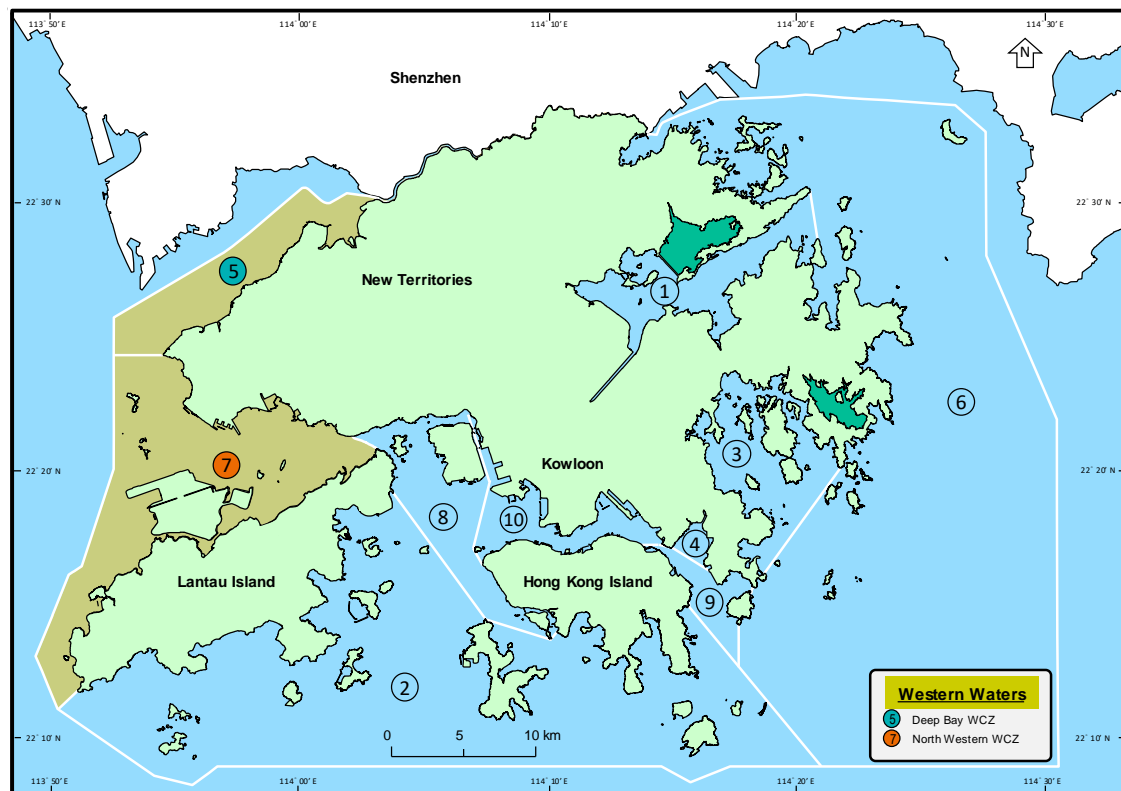


Figure 19. Long-term water quality trends in the Western Buffer WCZ, 1986-2021

3.3 Western Waters



The Deep Bay WCZ and the North Western WCZ are located in the western part of Hong Kong. The former includes the ecologically sensitive Mai Po Inner Deep Bay Ramsar Site and areas of oyster culture. The latter covers the waters around the North and Western side of Lantau Island, Tuen Mun, Sha Chau and Lung Kwu Chau.

Deep Bay Water Control Zone

In 2021, the overall WQO compliance rate for the Deep Bay WCZ was 60%, as compared with a ten-year average of 47% in 2009-2018. Overall, with the measures under the Deep Bay Water Pollution Control Joint Implementation Programme taken progressively by the governments of Hong Kong and Shenzhen, there have been significant water quality improvements in Deep Bay. In particular, there has been full compliance of the $\text{NH}_3\text{-N}$ WQOs in the past seven years. Although Deep Bay, as compared with other WCZs, shows higher nutrient levels with annual depth-averaged TIN levels exceeding the respective TIN WQOs, a noticeable long-term decrease in TIN levels since mid-2000s has been seen. The improvement in the WQO compliance rates and long-term water quality trends for Deep Bay since mid-2000s are illustrated in Figures 20 to 22.



T · PARK, overlooking Deep Bay

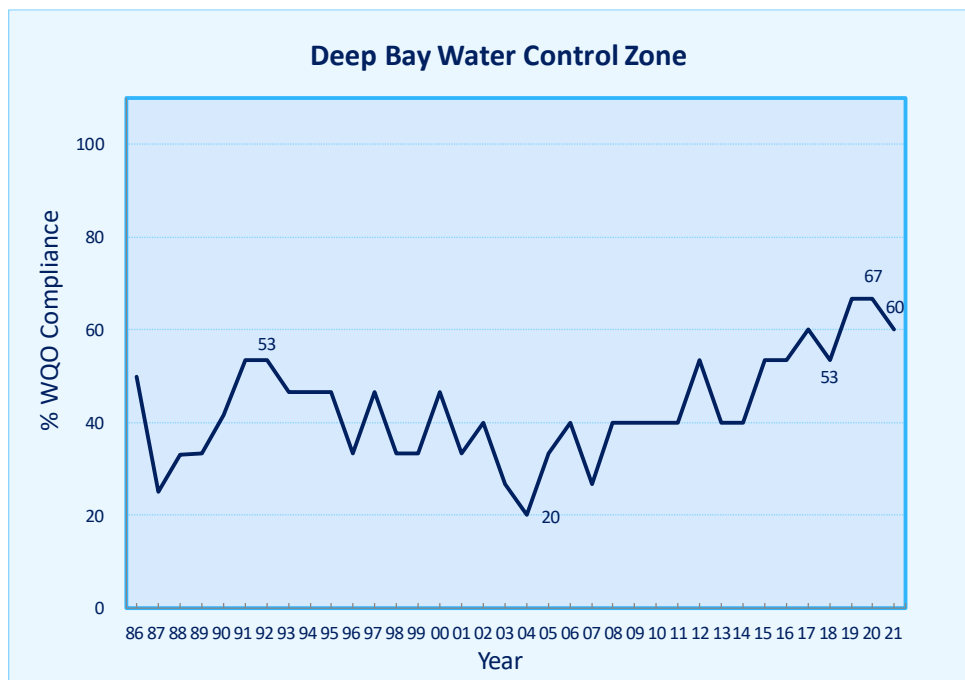


Figure 20. Overall WQO compliance rate for the Deep Bay WCZ, 1986-2021

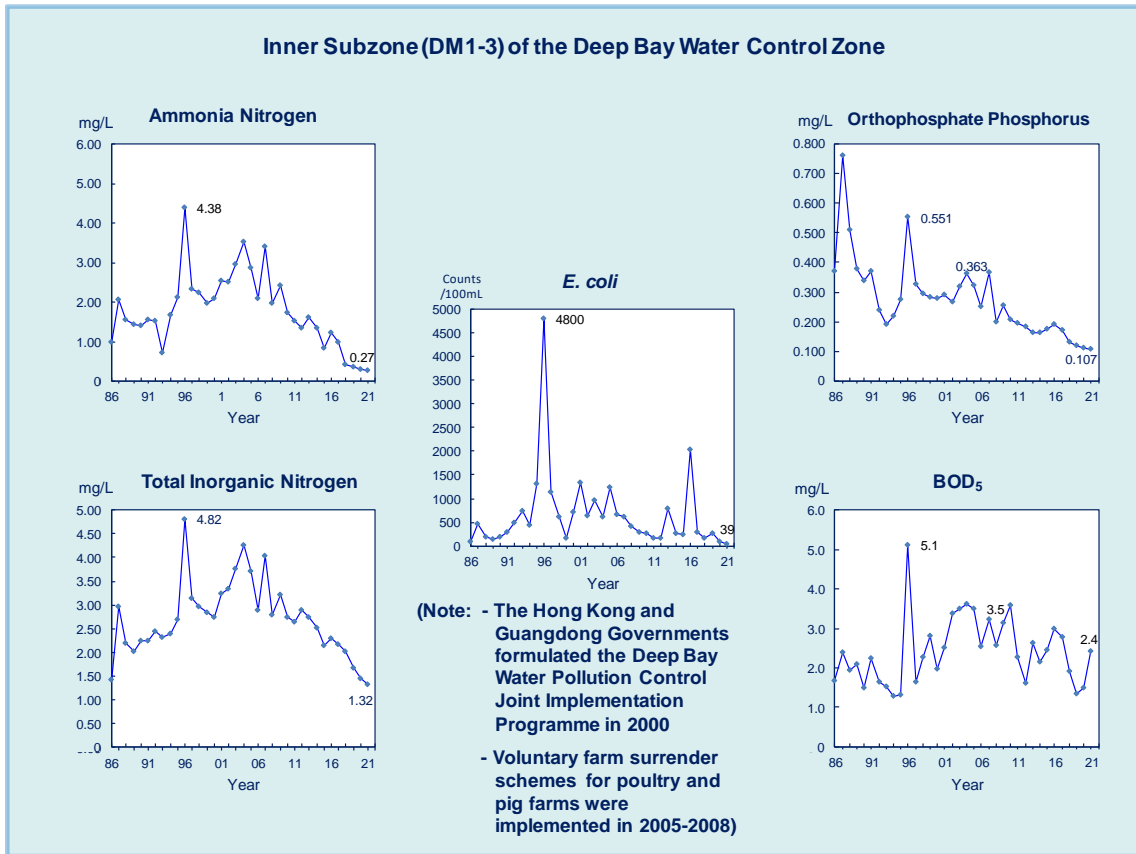


Figure 21. Long-term water quality trends in Inner Subzone of the Deep Bay WCZ, 1986-2021

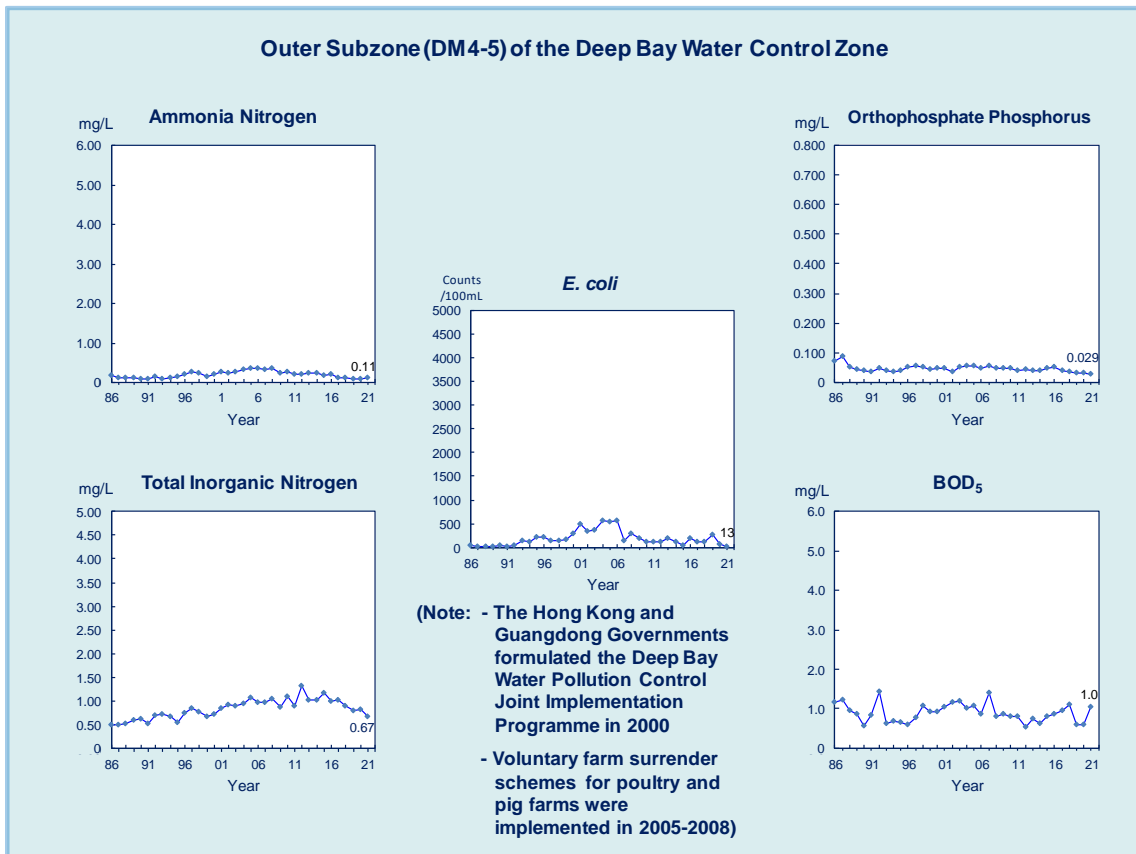


Figure 22. Long-term water quality trends in Outer Subzone of the Deep Bay WCZ, 1986-2021

North Western Water Control Zone

In 2021, the overall WQO compliance rate of the North Western WCZ was 89%, with the DO and NH₃-N WQOs fully met. Under the influence of high background level in the Pearl River Estuary, the compliance rate for TIN WQO was 67%. The WQO compliance rate and long-term water quality trends for the North Western Water WCZ are illustrated in Figures 23 and 24.



Tai O in the North Western WCZ

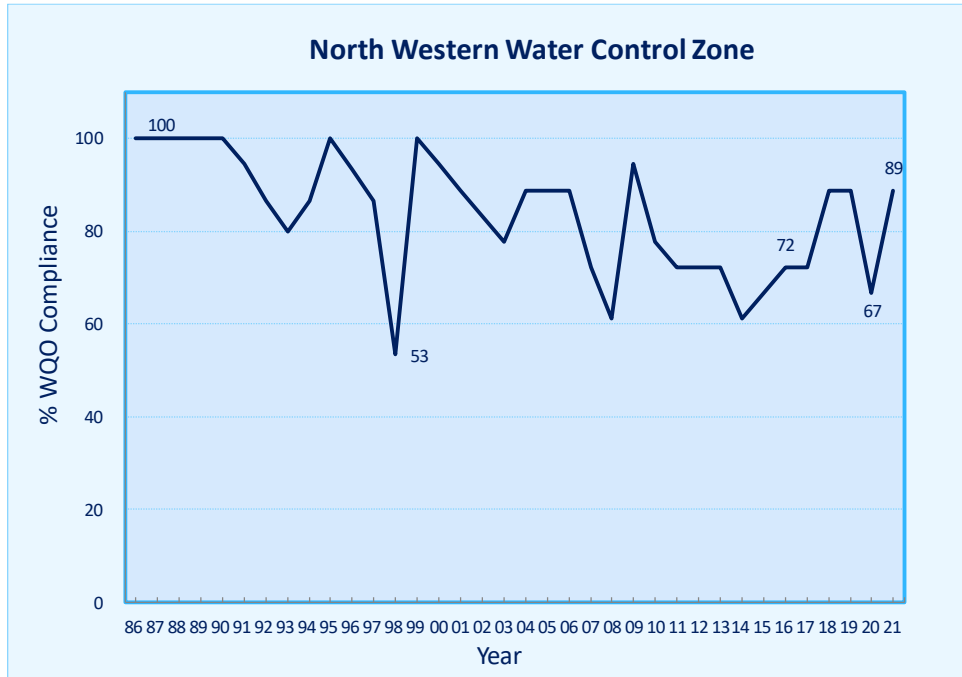


Figure 23. Overall WQO compliance rate for the North Western WCZ, 1986-2021

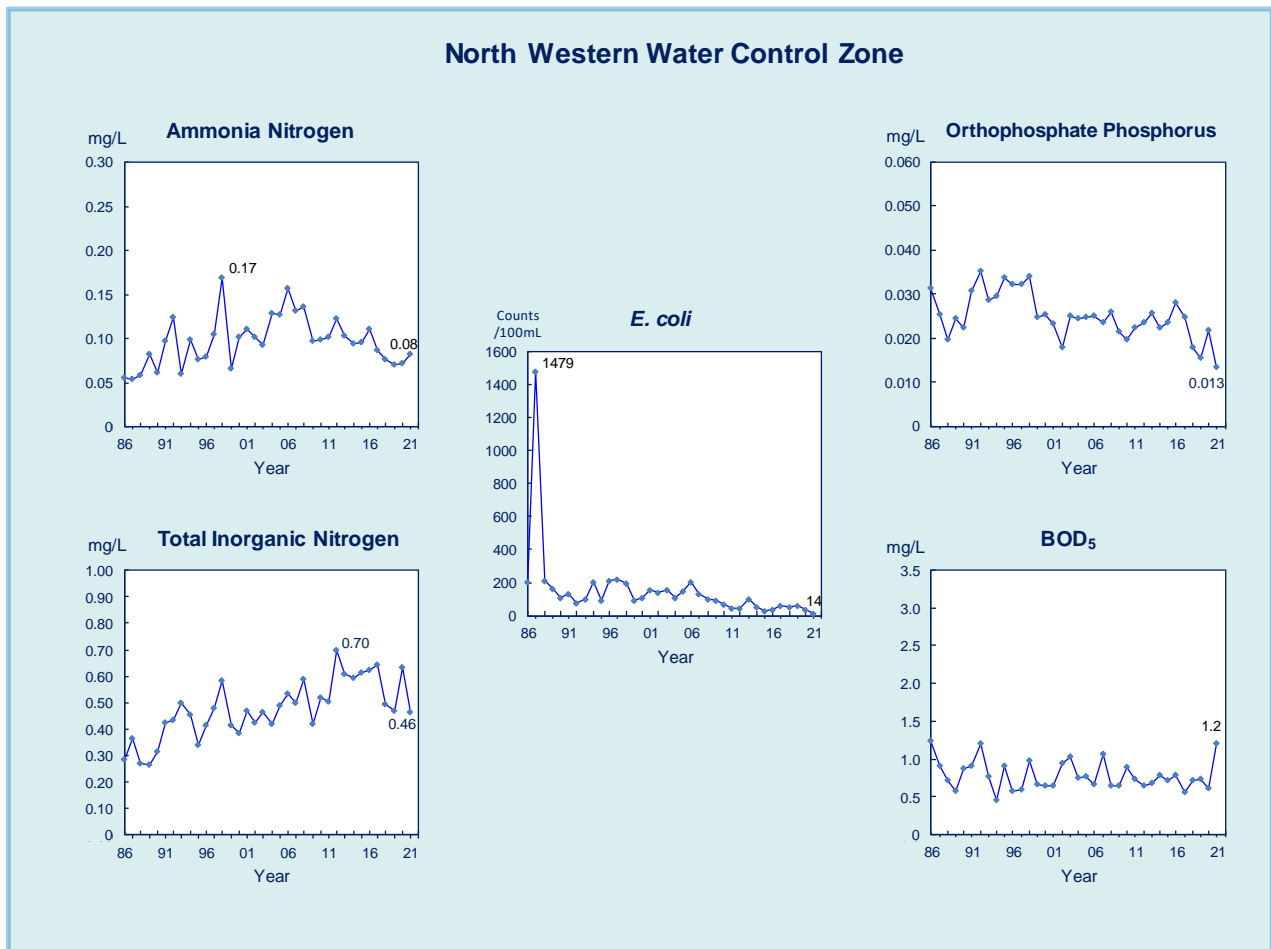
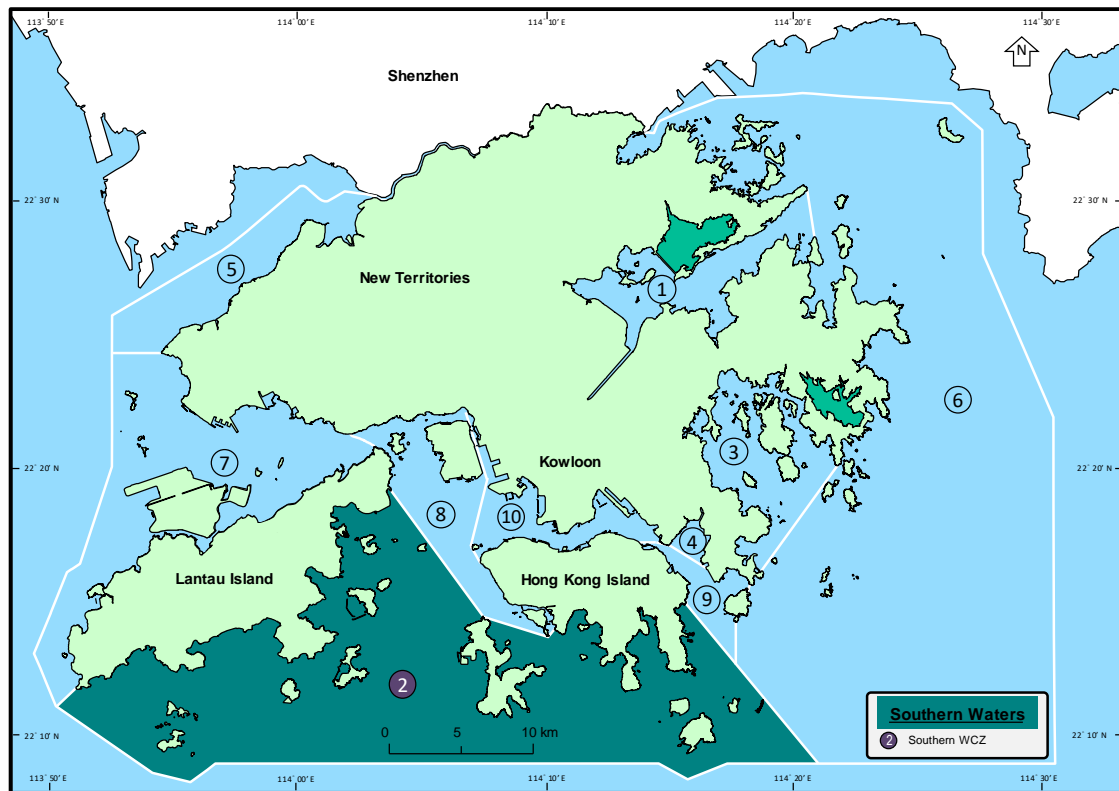


Figure 24. Long-term water quality trends in the North Western WCZ, 1986-2021

3.4 Southern Waters



The southern waters cover the Southern WCZ, stretching from south of Hong Kong Island to Lantau Island. This water body covers 21 gazetted beaches, one marine park, one marine reserve and four fish culture zones.

Southern Water Control Zone

In 2021, the Southern WCZ achieved an overall WQO compliance rate of 77%, with full attainment of the DO and NH₃-N WQOs. While the TIN level in the southern waters was generally lower than the adjacent western and central waters, it could not meet the more stringent TIN WQO of the WCZ.



Cape D'Aguilar Marine Reserve in the Southern WCZ

The Southern WCZ also covers a number of secondary contact recreation subzones mainly located along the southern coast of Hong Kong Island and the outlying islands. In 2021, full compliance with the bacteriological WQO on *E. coli* for all these secondary contact recreation subzones was achieved. The WQO compliance rates and long-term water quality trends for the Southern WCZ are plotted in Figures 25 and 26.

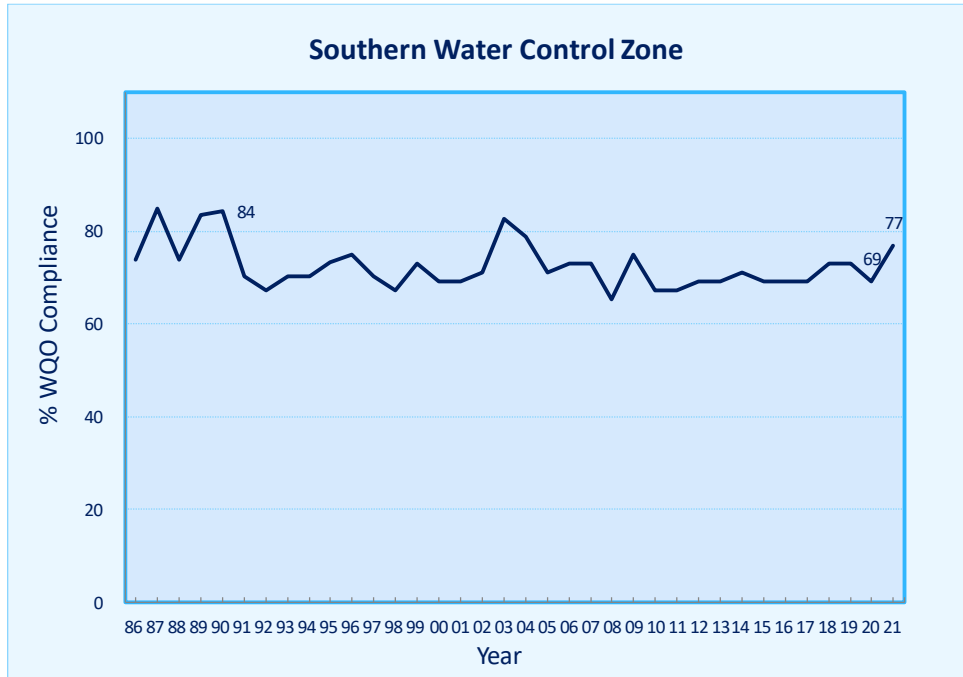


Figure 25. Overall WQO compliance rate for the Southern WCZ, 1986-2021

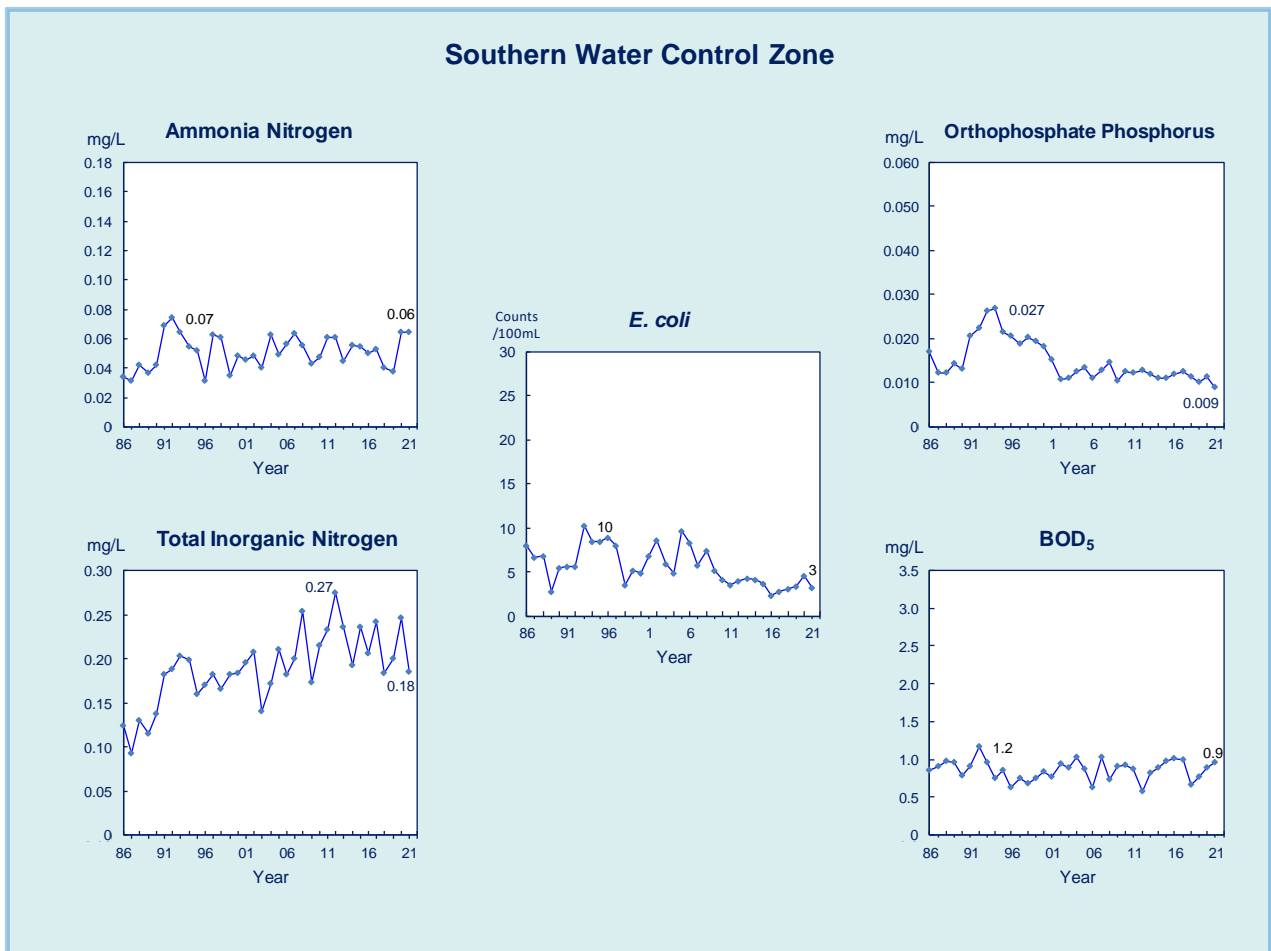


Figure 26. Long-term water quality trends in the Southern WCZ, 1986-2021

4. Marine Sediment Quality

Sediment samples taken in different parts of Hong Kong were analysed for over 60 physical, chemical and biological parameters. Details of sediment quality in all WCZs in the last five years (2017-2021) are summarised in Appendix E.

5. Typhoon Shelters

The EPD monitored the water quality of 14 typhoon shelters, three sheltered anchorages and the Government Dockyard. Some of these typhoon shelters (e.g. Causeway Bay Typhoon Shelter and Kwun Tong Typhoon Shelter) are located adjacent to densely populated residential, commercial and/or industrial areas. Others (e.g. Cheung Chau Typhoon Shelter and Shuen Wan Typhoon Shelter) are located in outlying islands or relatively away from urban areas. There is no bacteriological WQO set for typhoon shelters which are used only for vessel mooring. In 2021, the NH₃-N levels recorded in all typhoon shelters were generally low, and well within the NH₃-N WQOs set for respective WCZs.

Overall, the water quality of the typhoon shelters in Hong Kong has been improving over the last decade. Figure 27 shows the long-term improving trend in the depth-averaged DO level in the Kwun Tong Typhoon Shelter.

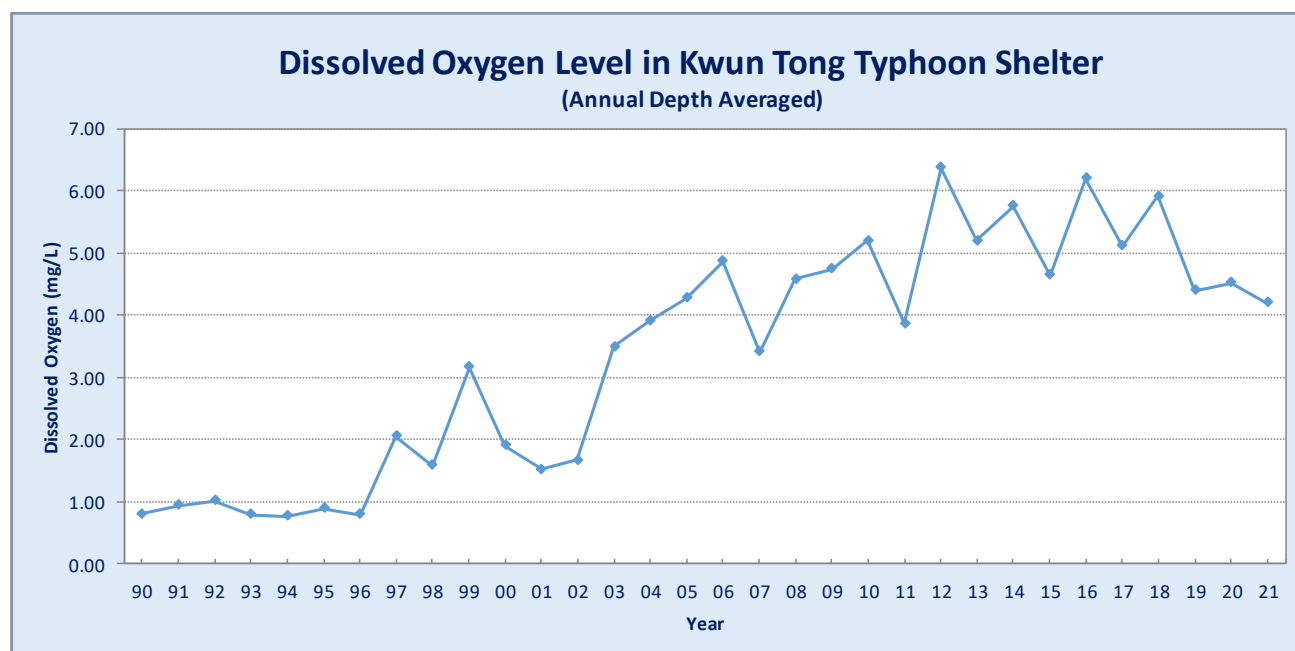


Figure 27. Long-term improvement in dissolved oxygen level in the Kwun Tong Typhoon Shelter, 1990-2021

6. Phytoplankton and Red Tides

The EPD conducts monthly sampling of phytoplankton at 26 marine water quality monitoring stations¹ to determine the long-term changes and trends in their composition and densities in Hong Kong marine waters. In 2021, a total of 96 phytoplankton species were recorded in Hong Kong waters, on par with a five-year average of 94 phytoplankton species in 2016-2020. Of these, 54 species were diatoms (56%), 30 were dinoflagellates (31%) and 12 were from other minor algal groups² (13%). This phytoplankton composition profile was generally similar to those observed in the past five years. Of the samples examined in 2021, diatoms were the dominant group found in our coastal waters in terms of species richness (number of species identified). Diatoms were also the dominant group in terms of cell density, except Deep Bay. The unusually high annual percentage of dinoflagellates recorded in Deep Bay in 2021 was due to a month-long red tide event that occurred in March to May 2021³.

The total phytoplankton densities were generally higher at the monitoring stations in the Tolo Harbour and Channel WCZ. The densities of diatoms, dinoflagellates and other minor phytoplankton groups followed a similar spatial pattern compared with the total phytoplankton density. The most abundant diatoms were *Thalassiosira spp.* which constituted 5% to 74% of the diatom population in various WCZs. The most abundant dinoflagellate was *Takayama tuberculata*, comprising up to 96% of the dinoflagellate populations in the Deep Bay WCZ.

In 2021, the total number of reported red tide incidents in Hong Kong waters was 11, slightly fewer than the average of 12 incidents in the past five years. Among them, three incidents involved only one WCZ; two incidents involved two WCZs; two incidents involved three WCZs; one incident involved four WCZs and three incidents involved five WCZs. The 11 red tide incidents were caused by eight red tide species, including six dinoflagellates, one diatom and one prymnesiophyte. Nevertheless, these species are non-toxic and no red tides related fish kill in Hong Kong waters was recorded in 2021. The details of red tide incidents in 2021 are shown in the following table.

¹ During the period of special work arrangement implemented under the COVID-19 pandemic in 2021, phytoplankton samples were collected from ten stations only in January 2021.

² 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.

³ Very high density (in excess of 10,000 cells/ml) of the dinoflagellate *Takayama tuberculata* was found in Deep Bay during the month of March to May 2021 due to a month-long red tide event.

Incident No.	Sighting Period	Red Tide Species
1	13/1/2021 – 18/1/2021	<i>Noctiluca scintillans</i> <i>Akashiwo sanguinea</i>
2	18/1/2021 – 8/2/2021	<i>Phaeocystis globosa</i>
3	23/1/2021 – 4/2/2021	<i>Noctiluca scintillans</i>
4	28/1/2021 – 9/2/2021	<i>Akashiwo sanguinea</i>
5	22/2/2021 – 30/3/2021	<i>Noctiluca scintillans</i>
6	1/3/2021 – 22/3/2021	<i>Gonyaulax polygramma</i>
7	26/3/2021 – 13/5/2021	<i>Takayama tuberculata</i>
8	23/4/2021 – 26/4/2021	<i>Karenia longicanalis</i> <i>Noctiluca scintillans</i>
9	9/5/2021 – 13/5/2021	<i>Guinardia delicatula</i>
10	30/7/2021 – 11/8/2021	<i>Polykrikos geminatum</i>
11	21/8/2021 – 31/8/2021	<i>Noctiluca scintillans</i>

Red tide incidents in Hong Kong marine waters in 2021

(Source: Agriculture, Fisheries and Conservation Department)

The number of red tide incidents in Tolo Harbour has dropped significantly from the record high of 43 in 1988 to an annual average of about only five incidents in the past five years. This is attributable to the significant improvement in water quality in the past decades following the successful implementation of the Tolo Harbour Action Plan, as clearly shown in Figure 28.

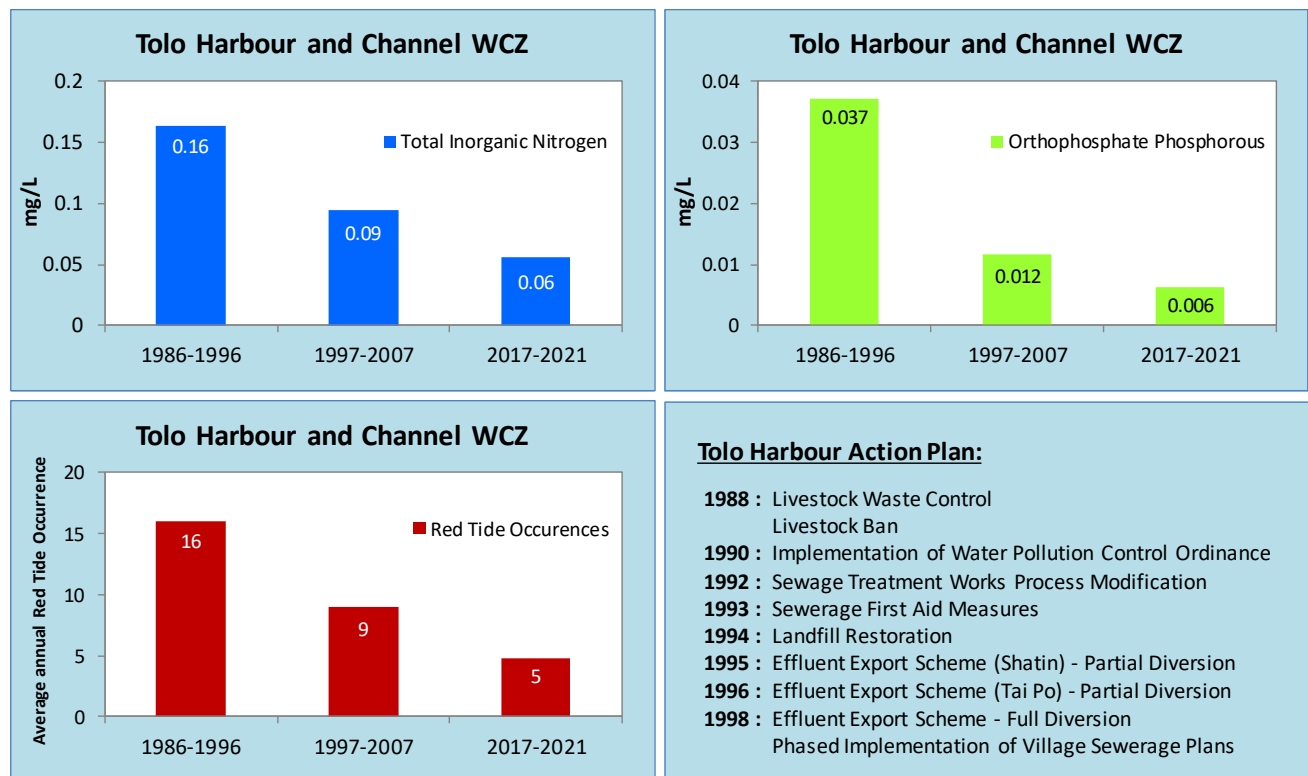
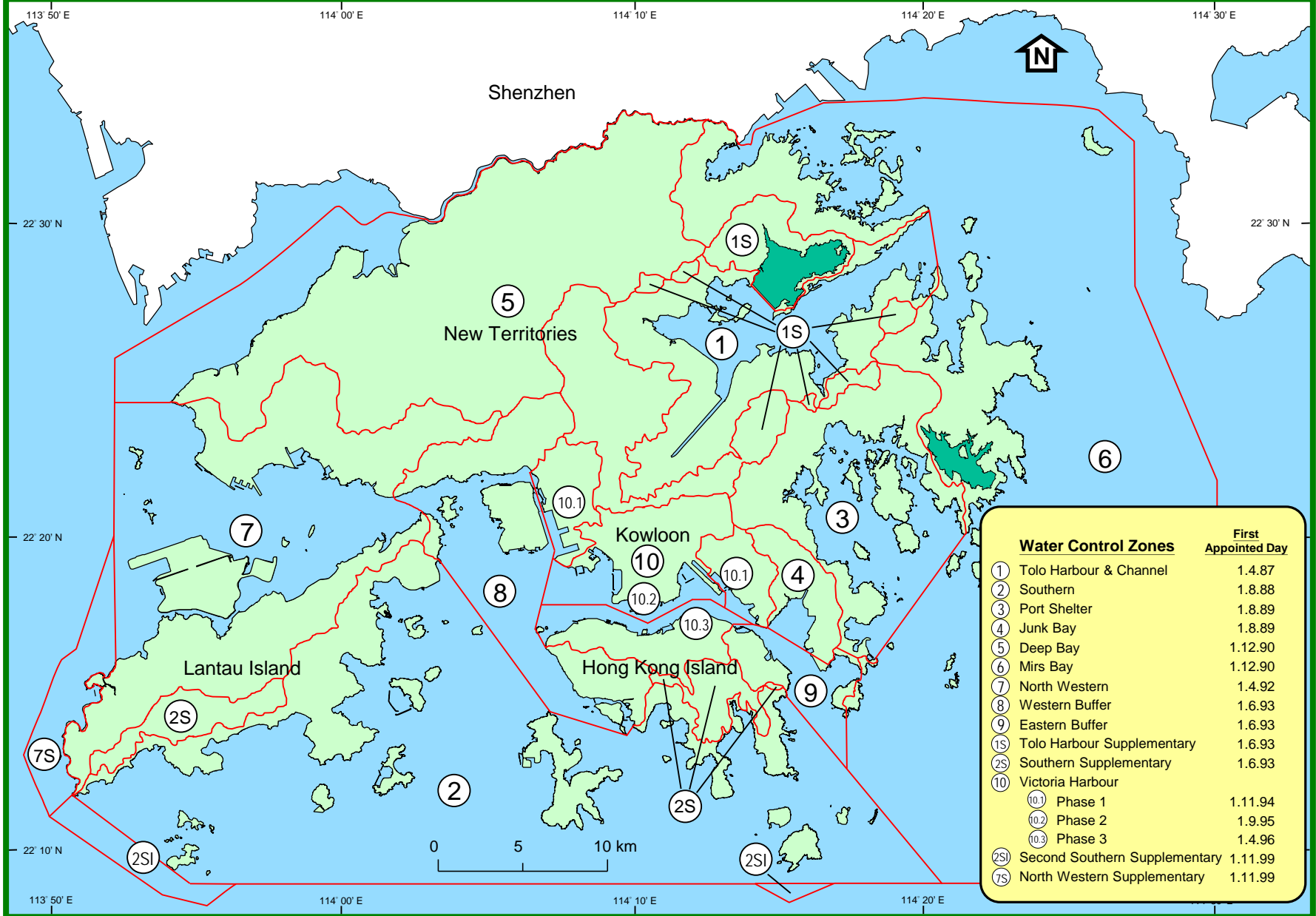


Figure 28. Reductions of nutrients levels with the average annual red tide occurrences in Tolo Harbour and Channel WCZ, 1986-2021

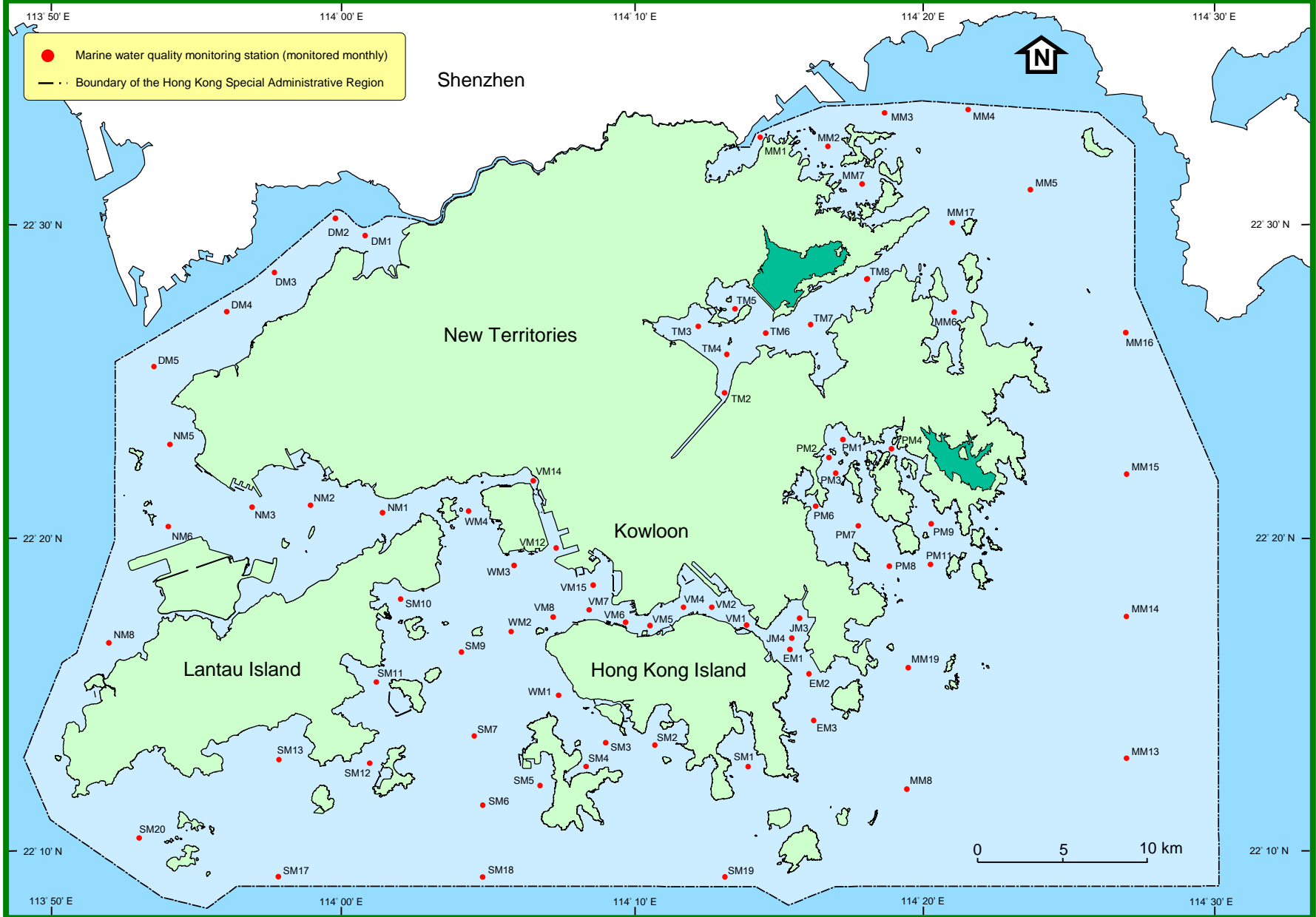
Appendices

The Water Control Zones in Hong Kong

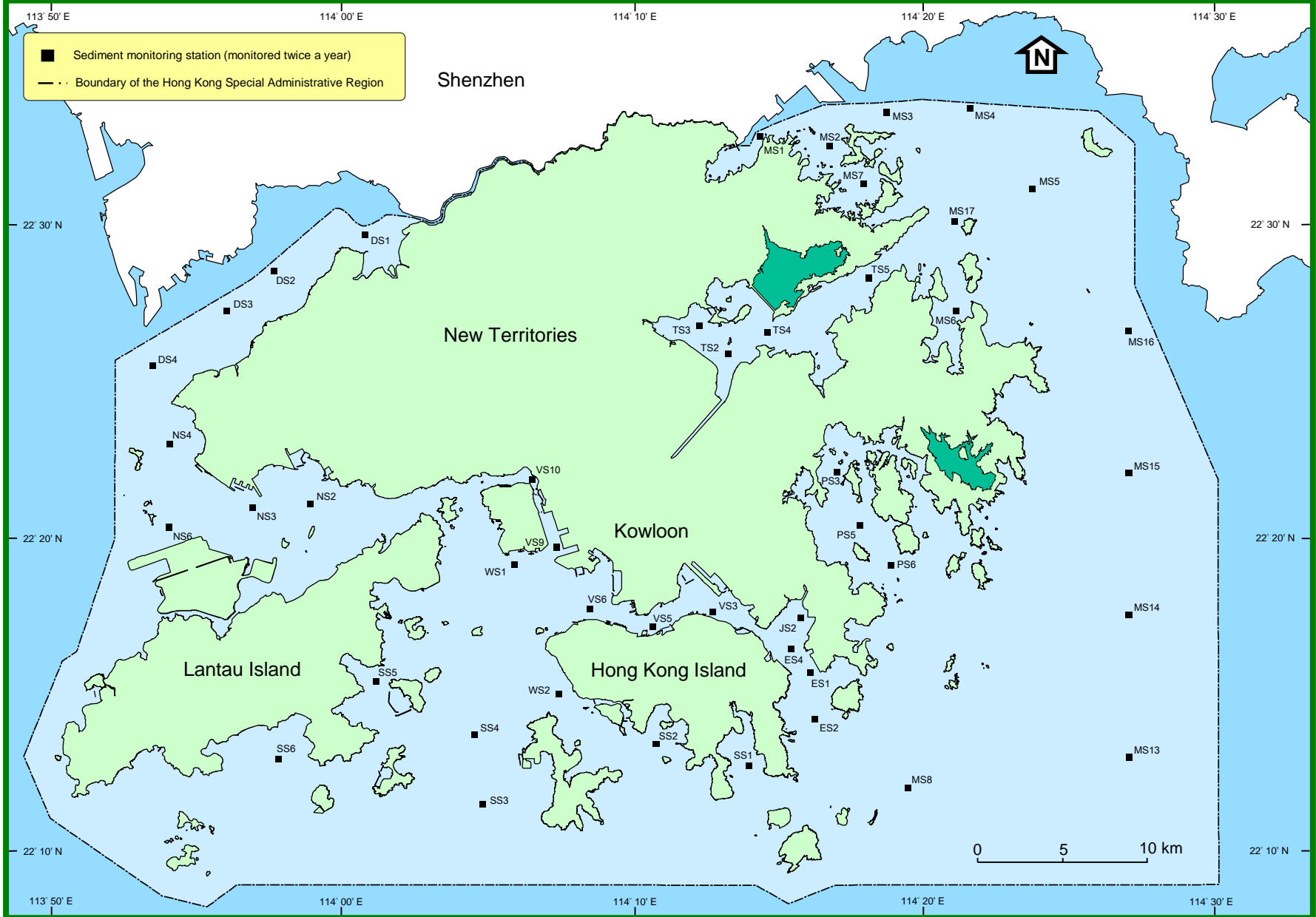
(Source: Environment Bureau— Plan No. WP/WP4/75, Oct 1999)



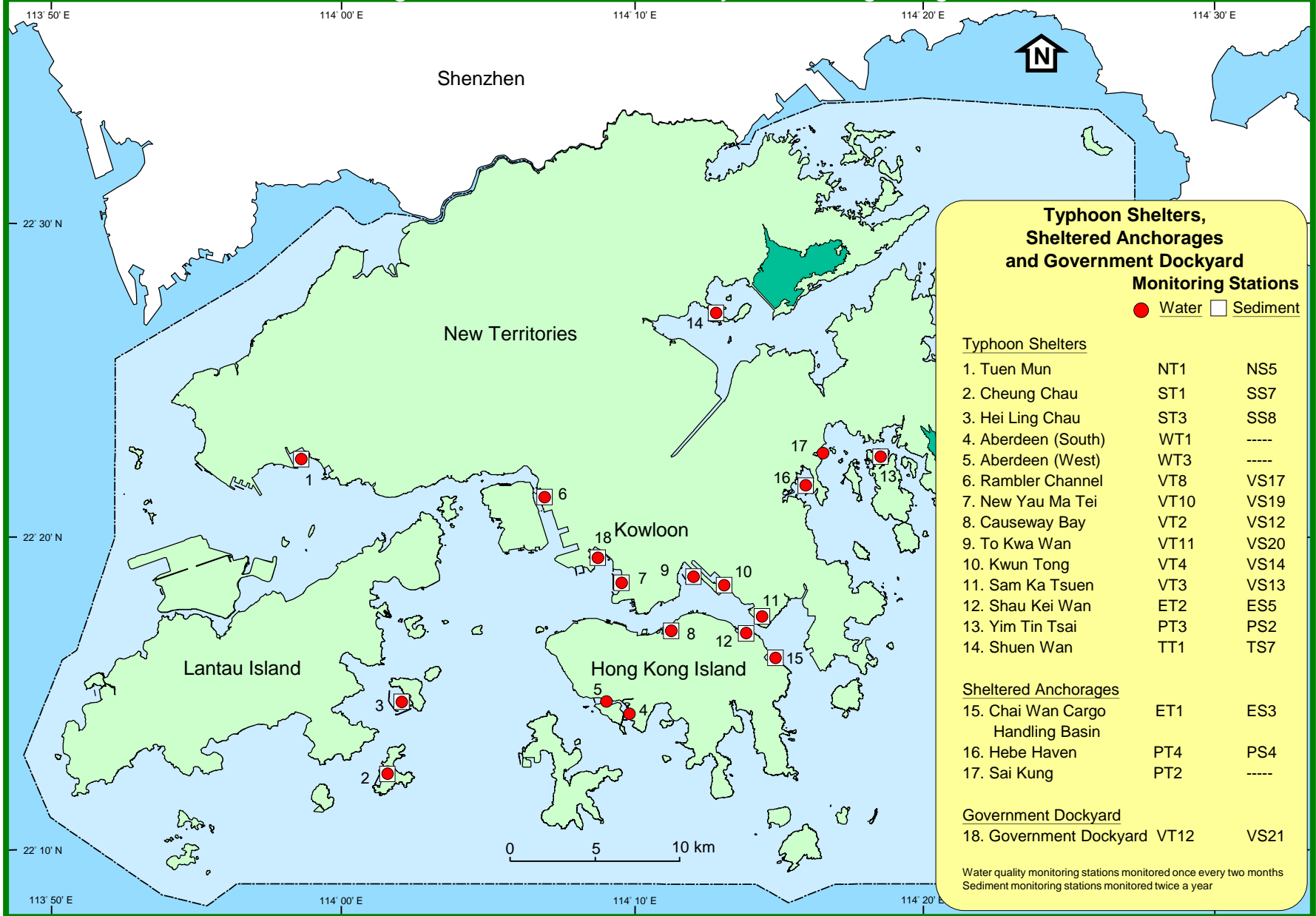
The 76 water quality monitoring stations in the open waters of Hong Kong in 2021



The 45 sediment monitoring stations in the open waters of Hong Kong in 2021



The 18 typhoon shelters, sheltered anchorages and Government Dockyard of Hong Kong in 2021



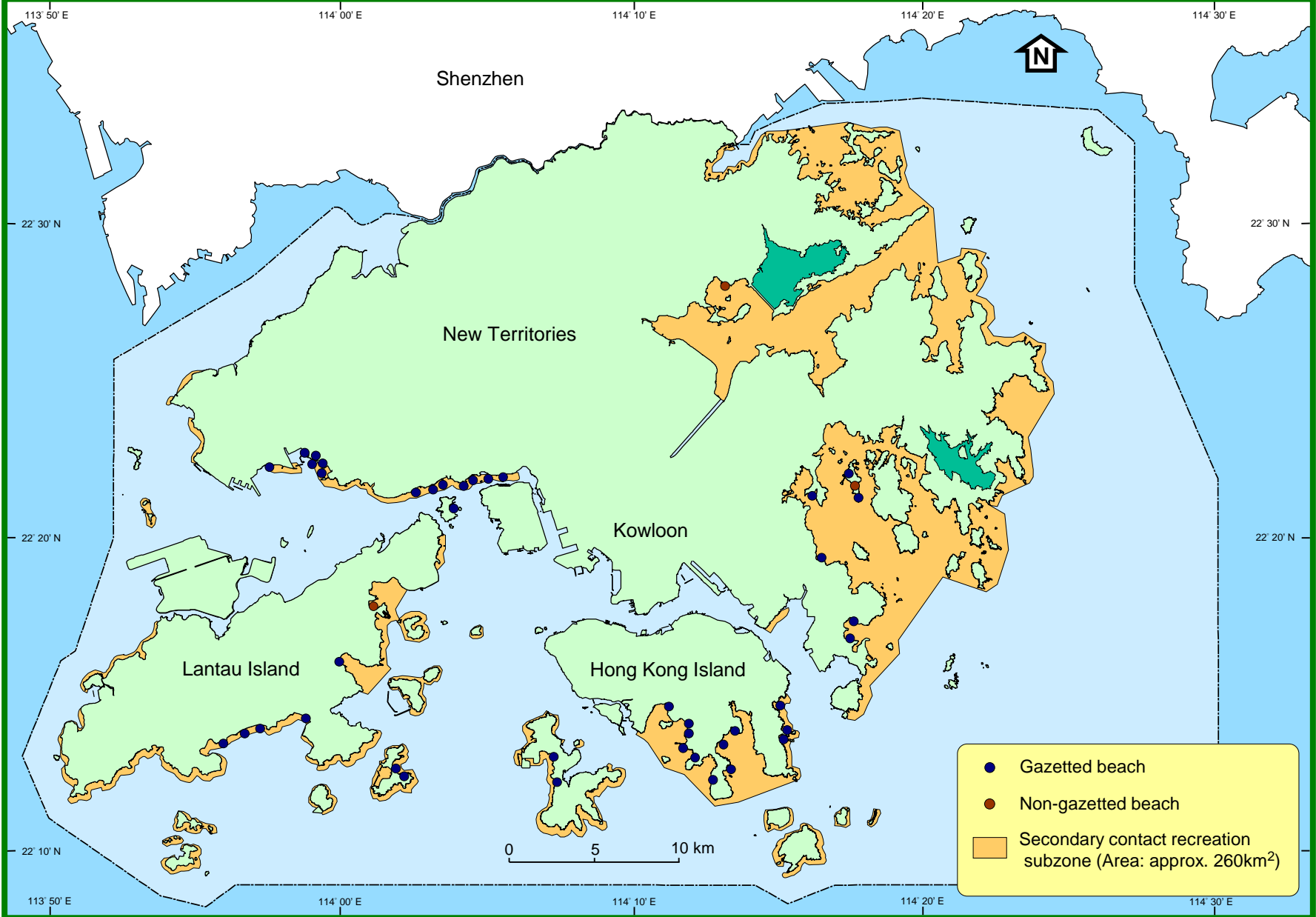
Locations of marine water and sediment quality monitoring stations

Water Control Zone	Station		Latitude	Location	Longitude	Depth (m) approx.	
	Water	Sediment					
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 6	
	* 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
	VM4	VS3	22° 17.631'	N	114° 12.526'	E 8	
			22° 17.860'	N	114° 11.654'	E 12	
			22° 17.266'	N	114° 10.510'	E 11	
	VM6	VS5	22° 17.077'	N	114° 10.600'	E 8	
	VM7		22° 17.371'	N	114° 9.665'	E 14	
	VM8	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

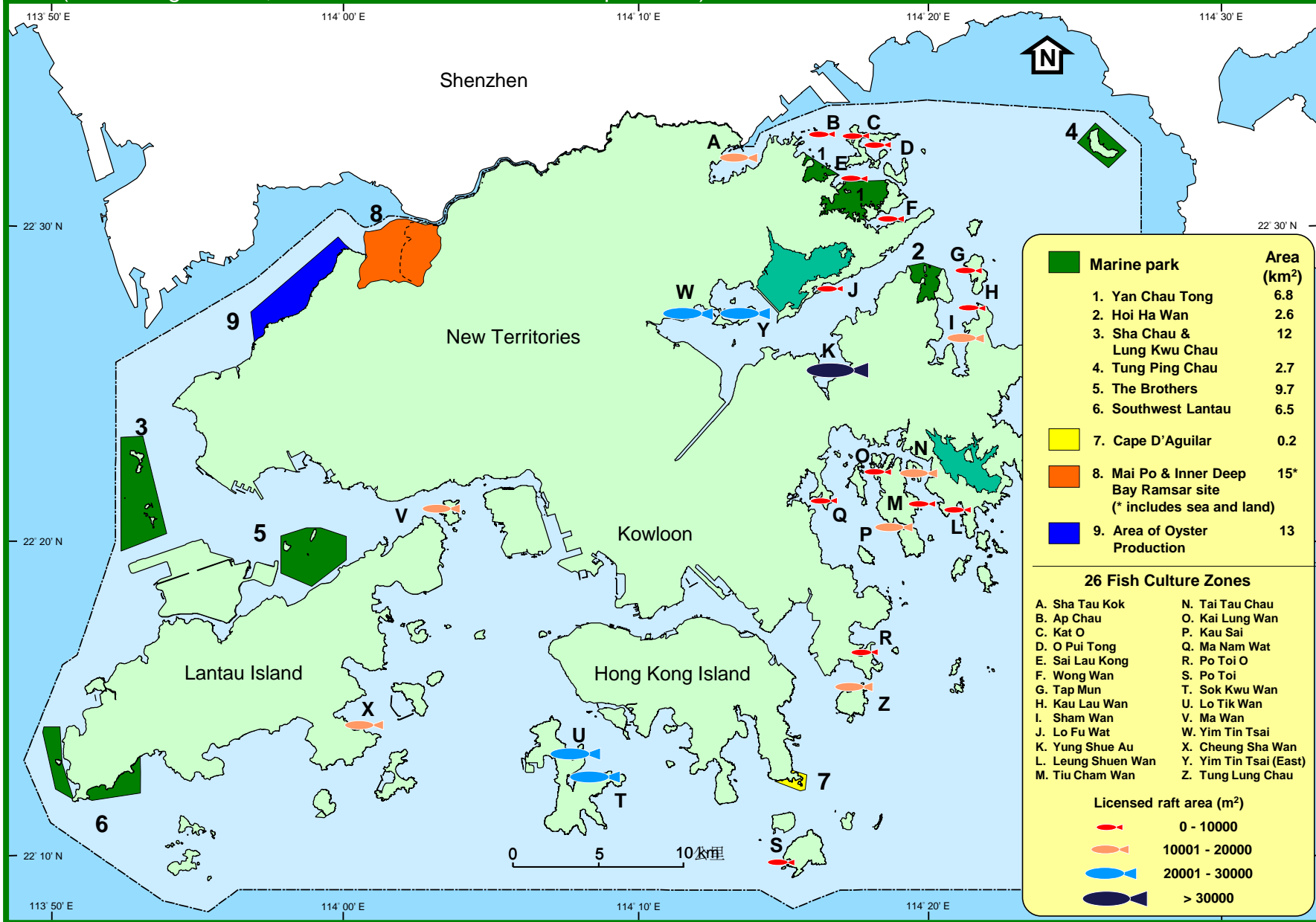
2. Water quality and sediment monitoring stations in typhoon shelters are marked with an asterisk *

Bathing beaches and secondary contact recreation subzones in Hong Kong in 2021

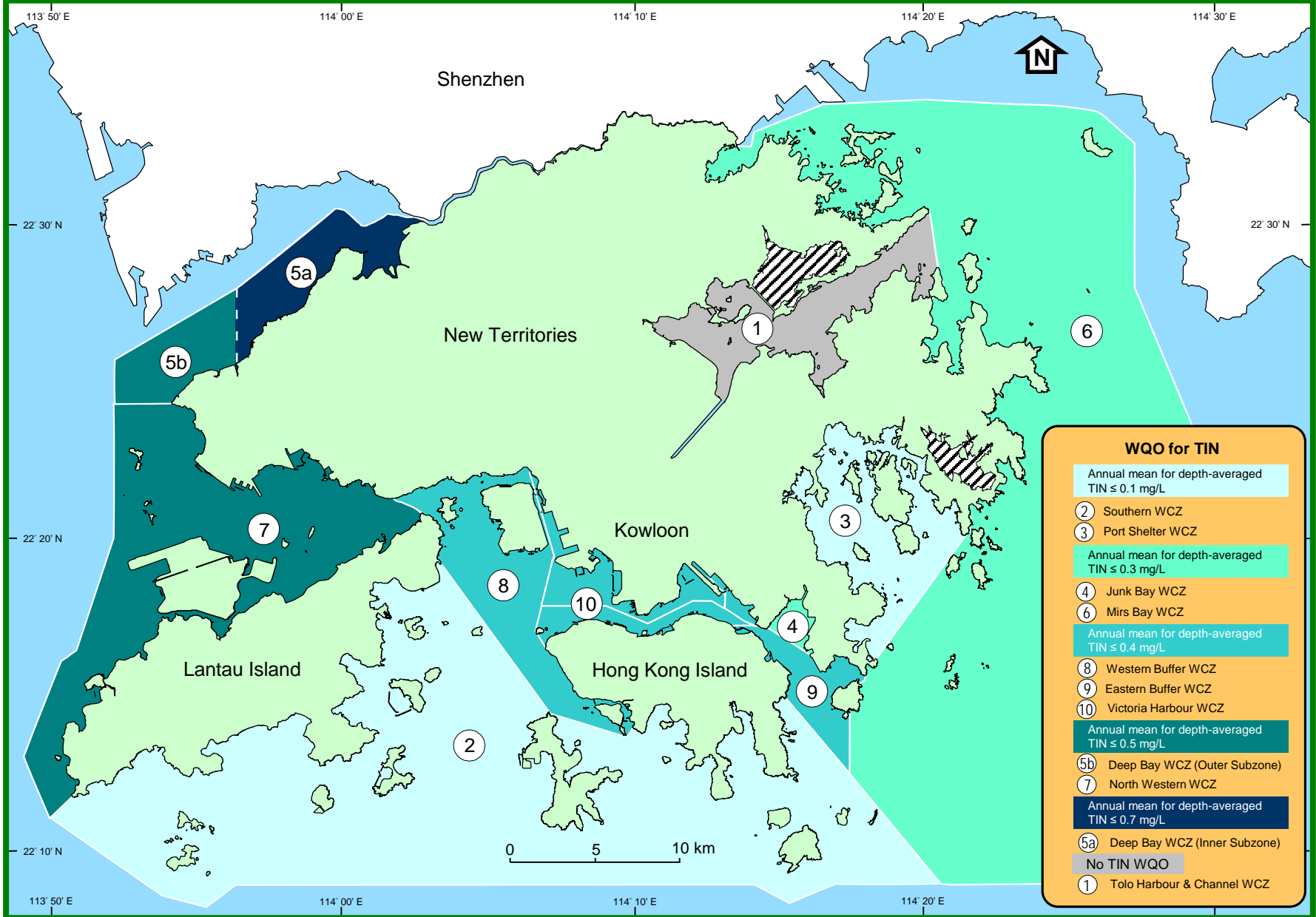


Fish and shellfish culture zones and marine conservation sites in Hong Kong in 2021

(source: Agriculture, Fisheries and Conservation Department)



Water Quality Objective (WQO) for Total Inorganic Nitrogen (TIN) in the 10 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
Dissolved 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
<i>E. coli</i>	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 ± 3 ppt	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 (μ g/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 (μ g/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 (μ g/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	Upper Chemical Exceedance Level
	(LCEL)	(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 electrode), 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 (electrode), 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 (w eighing)	GL ¹⁸
	Volatile Suspended Solids ³	mg/L	0.5	S,M,B	In-house method GL-PH-23 based on APHA 22ed 2540E (w eighing)	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 Test method 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 based on ASTM D3590-11 Test method 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 based on ASTM D515-88 Test method B and APHA 22ed 4500-P-G	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
	<i>Escherichia coli</i> (<i>E. coli</i>) ⁷	cfu/100mL	1	S,M,B	In-house method, membrane filtration with CHROMagar Liquid <i>E. coli</i> -coliform culture ¹⁴	EML/EPD
	Faecal Coliforms ⁷	cfu/100mL	1	S,M,B	In-house method, membrane filtration with CHROMagar Liquid <i>E. coli</i> -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) Bowler 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 Oren, 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 Vervollkommnung 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 sediment¹ quality 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 (electrodeometric)	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 Test method A (open reflux)	GL
	Total Carbon (TC)	% w/w	0.1	In-house method GL-OR-33 based on APHA 20ed 5310 B and BS EN 13137:2001	GL
Nutrients and Inorganic Constituents ³	Ammonia-Nitrogen	mg/kg	0.05	In-house method GL-IN-19 based on ASTM D3590-11 Test method B	GL
	Total Kjeldahl Nitrogen	mg/kg	0.5	In-house methods GL-IN-14 and GL-IN-15 based on ASTM D3590-11 Test method B	GL
	Total Phosphorus	mg/kg	0.2	In-house methods GL-IN-14 and GL-IN-16 based on ASTM D615-88 Test method B and APHA 22ed 4500-P-G	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/RW31, 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 2021

Parameter	Mirs Bay	Crooked Island	Port Island	Mirs Bay North			
	MM1	MM2	MM7	MM17	MM3	MM4	MM5
Number of samples	11	11	11	11	11	11	11
Temperature (°C)	25.4 (19.7 - 30.0)	25.1 (19.6 - 29.5)	25.0 (19.4 - 29.3)	24.5 (19.1 - 28.9)	24.6 (19.5 - 28.6)	24.5 (19.1 - 28.8)	24.3 (19.2 - 28.3)
Salinity	32.2 (29.0 - 33.6)	32.5 (30.0 - 33.8)	32.7 (30.4 - 33.7)	32.9 (30.6 - 33.8)	32.9 (30.7 - 33.8)	33.1 (31.0 - 33.8)	33.1 (31.4 - 33.8)
Dissolved Oxygen (mg/L)	5.3 (4.3 - 6.4)	5.1 (4.1 - 6.4)	5.2 (4.2 - 6.7)	5.2 (4.2 - 6.4)	5.1 (4.0 - 6.7)	5.0 (4.0 - 6.4)	5.2 (4.0 - 6.8)
	Bottom						
	5.1 (3.8 - 6.5)	4.8 (3.3 - 6.8)	4.9 (2.4 - 6.8)	5.0 (2.7 - 6.9)	4.7 (2.5 - 6.9)	4.6 (2.1 - 6.5)	4.7 (2.0 - 6.8)
Dissolved Oxygen (% Saturation)	78 (64 - 98)	74 (63 - 89)	75 (62 - 91)	75 (63 - 95)	74 (60 - 92)	72 (55 - 88)	74 (56 - 93)
	Bottom						
	75 (56 - 103)	69 (48 - 92)	70 (34 - 92)	70 (40 - 94)	66 (34 - 94)	66 (36 - 92)	66 (30 - 92)
pH	7.7 (7.4 - 8.2)	7.7 (7.3 - 8.1)	7.7 (7.3 - 8.1)	7.6 (7.3 - 8.0)	7.7 (7.3 - 8.1)	7.7 (7.4 - 8.0)	7.7 (7.3 - 8.0)
Secchi Disc Depth (m)	2.5 (2.0 - 3.3)	3.6 (2.4 - 5.6)	3.8 (2.5 - 6.1)	4.7 (1.6 - 9.0)	3.8 (2.5 - 7.5)	4.1 (1.8 - 10.0)	5.3 (2.3 - 10.0)
Turbidity (NTU)	25.5 (2.8 - 132.0)	14.7 (2.6 - 66.2)	15.6 (2.7 - 85.1)	4.5 (2.2 - 11.2)	5.1 (2.6 - 13.6)	10.5 (2.8 - 65.8)	13.0 (2.6 - 96.8)
Suspended Solids (mg/L)	4.5 (2.7 - 8.9)	3.6 (1.6 - 8.0)	3.4 (0.7 - 9.2)	3.1 (0.7 - 8.4)	3.0 (0.8 - 6.4)	3.5 (0.5 - 7.4)	3.3 (0.7 - 8.0)
5-day Biochemical Oxygen Demand (mg/L)	1.1 (0.4 - 2.4)	0.9 (0.2 - 1.8)	0.9 (0.2 - 1.8)	0.7 (<0.1 - 1.8)	0.8 (0.2 - 2.4)	0.8 (<0.1 - 1.7)	0.6 (<0.1 - 1.6)
Ammonia Nitrogen (mg/L)	0.046 (0.023 - 0.089)	0.035 (0.014 - 0.070)	0.032 (0.020 - 0.058)	0.030 (0.015 - 0.045)	0.032 (0.019 - 0.064)	0.031 (0.016 - 0.043)	0.030 (0.021 - 0.042)
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 - 0.001)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)	0.006 (<0.002 - 0.028)	0.004 (<0.002 - 0.016)	0.004 (<0.002 - 0.018)	0.003 (<0.002 - 0.013)	0.004 (<0.002 - 0.013)	0.006 (<0.002 - 0.018)	0.004 (<0.002 - 0.016)
Nitrate Nitrogen (mg/L)	0.020 (0.003 - 0.041)	0.012 (0.002 - 0.023)	0.010 (0.003 - 0.024)	0.007 (<0.002 - 0.020)	0.010 (<0.002 - 0.027)	0.011 (<0.002 - 0.030)	0.009 (<0.002 - 0.028)
Total Inorganic Nitrogen (mg/L)	0.07 (0.04 - 0.12)	0.05 (0.03 - 0.09)	0.05 (0.03 - 0.07)	0.04 (0.03 - 0.05)	0.05 (0.03 - 0.07)	0.05 (0.03 - 0.07)	0.04 (0.03 - 0.05)
Total Kjeldahl Nitrogen (mg/L)	0.73 (0.41 - 1.13)	0.73 (0.46 - 1.13)	0.77 (0.52 - 1.10)	0.70 (0.39 - 1.03)	0.72 (0.50 - 1.05)	0.68 (0.40 - 1.05)	0.82 (0.46 - 1.30)
Total Nitrogen (mg/L)	0.75 (0.42 - 1.14)	0.74 (0.46 - 1.14)	0.77 (0.53 - 1.11)	0.71 (0.39 - 1.04)	0.73 (0.50 - 1.06)	0.69 (0.40 - 1.06)	0.83 (0.47 - 1.31)
Orthophosphate Phosphorus (mg/L)	0.007 (<0.002 - 0.014)	0.006 (0.002 - 0.013)	0.007 (<0.002 - 0.011)	0.007 (<0.002 - 0.011)	0.007 (0.002 - 0.015)	0.008 (0.003 - 0.014)	0.007 (<0.002 - 0.014)
Total Phosphorus (mg/L)	0.06 (0.02 - 0.10)	0.06 (0.02 - 0.12)	0.05 (<0.02 - 0.10)	0.06 (<0.02 - 0.11)	0.06 (<0.02 - 0.10)	0.07 (0.02 - 0.11)	0.05 (0.02 - 0.10)
Silica (as SiO ₂) (mg/L)	0.70 (0.31 - 1.07)	0.55 (0.26 - 0.95)	0.59 (0.31 - 1.00)	0.51 (0.22 - 0.82)	0.51 (0.23 - 0.87)	0.57 (0.35 - 1.10)	0.49 (0.32 - 0.75)
Chlorophyll- <i>a</i> (µg/L)	5.2 (2.2 - 9.8)	3.0 (1.6 - 5.5)	3.1 (1.6 - 8.1)	2.0 (0.5 - 3.9)	2.4 (1.0 - 4.5)	2.0 (0.8 - 5.3)	1.6 (0.5 - 3.0)
<i>E. coli</i> (count/100mL)	26 (2 - 980)	1 (<1 - 5)	1 (<1 - 2)	1 (<1 - 3)	1 (<1 - 2)	1 (<1 - 4)	1 (<1 - 2)
Faecal Coliforms (count/100mL)	57 (9 - 1700)	2 (<1 - 5)	1 (<1 - 3)	2 (<1 - 6)	2 (<1 - 6)	1 (<1 - 8)	1 (<1 - 5)

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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained.

Full scale monitoring was conducted in the periods of February to December 2021

Summary of water quality statistics for the Mirs Bay WCZ in 2021 (continued)

Parameter	Ninepin	Waglan	Mirs Bay	Mirs Bay (Central)			Long Harbour
	Group MM19	Isalnd MM8	(South) MM13	MM14	MM15	MM16	MM6
Number of samples	11	11	11	11	12	12	11
Temperature (°C)	24.2 (19.2 - 29.9)	24.4 (20.1 - 29.7)	24.4 (19.5 - 29.4)	24.3 (19.0 - 30.0)	23.5 (17.1 - 29.7)	23.6 (17.1 - 29.6)	24.7 (19.3 - 29.0)
Salinity	33.4 (31.8 - 34.2)	33.3 (32.1 - 34.1)	33.4 (30.9 - 34.1)	33.4 (31.8 - 34.0)	33.3 (32.2 - 34.1)	33.1 (31.6 - 34.2)	32.7 (30.7 - 33.6)
Dissolved Oxygen (mg/L)	5.2 (4.0 - 6.7)	5.2 (4.0 - 6.3)	5.1 (4.0 - 6.4)	5.3 (4.0 - 6.4)	5.6 (4.0 - 7.7)	5.6 (4.0 - 7.5)	5.3 (4.3 - 7.1)
	Bottom						
	4.7 (2.7 - 6.8)	4.7 (2.7 - 6.9)	4.7 (2.9 - 6.6)	5.1 (3.0 - 6.7)	5.7 (2.8 - 10.2)	5.4 (3.2 - 9.6)	5.1 (3.6 - 6.8)
Dissolved Oxygen (% Saturation)	75 (52 - 91)	74 (54 - 91)	74 (58 - 90)	76 (57 - 90)	78 (53 - 98)	79 (58 - 94)	76 (66 - 97)
	Bottom						
	67 (37 - 93)	68 (38 - 101)	67 (42 - 92)	72 (42 - 91)	78 (39 - 129)	74 (45 - 121)	73 (53 - 93)
pH	7.7 (7.4 - 8.2)	7.7 (7.4 - 8.2)	7.7 (7.3 - 8.1)	7.7 (7.4 - 8.2)	7.7 (7.3 - 8.1)	7.7 (7.3 - 8.0)	7.6 (7.4 - 8.0)
Secchi Disc Depth (m)	3.6 (2.0 - 6.9)	3.7 (2.1 - 7.0)	4.5 (2.6 - 11.0)	4.3 (2.4 - 6.3)	5.3 (1.9 - 11.0)	5.0 (2.2 - 8.4)	3.8 (1.8 - 6.4)
Turbidity (NTU)	9.2 (2.7 - 51.9)	6.4 (3.0 - 12.5)	5.6 (3.0 - 10.5)	5.1 (2.2 - 11.8)	5.0 (2.2 - 8.9)	5.8 (2.7 - 15.8)	9.7 (2.5 - 65.6)
Suspended Solids (mg/L)	3.0 (<0.5 - 8.8)	3.3 (0.7 - 9.5)	3.3 (<0.5 - 8.8)	2.9 (0.7 - 7.6)	2.5 (0.8 - 7.2)	2.2 (0.7 - 5.8)	3.5 (0.7 - 8.3)
5-day Biochemical Oxygen Demand (mg/L)	0.5 (0.1 - 0.9)	0.5 (0.2 - 1.4)	0.5 (<0.1 - 1.3)	0.5 (<0.1 - 1.7)	0.5 (<0.1 - 0.8)	0.5 (0.1 - 1.3)	0.7 (0.1 - 1.7)
Ammonia Nitrogen (mg/L)	0.027 (0.019 - 0.037)	0.026 (0.018 - 0.032)	0.023 (0.018 - 0.039)	0.025 (0.017 - 0.036)	0.025 (0.018 - 0.035)	0.026 (0.014 - 0.035)	0.033 (0.018 - 0.047)
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 - 0.003)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.001)
Nitrite Nitrogen (mg/L)	0.009 (<0.002 - 0.025)	0.010 (<0.002 - 0.027)	0.008 (<0.002 - 0.028)	0.006 (<0.002 - 0.024)	0.007 (<0.002 - 0.028)	0.005 (<0.002 - 0.015)	0.006 (<0.002 - 0.031)
Nitrate Nitrogen (mg/L)	0.021 (<0.002 - 0.044)	0.028 (<0.002 - 0.141)	0.030 (<0.002 - 0.193)	0.017 (0.002 - 0.120)	0.014 (<0.002 - 0.039)	0.010 (<0.002 - 0.043)	0.009 (<0.002 - 0.023)
Total Inorganic Nitrogen (mg/L)	0.06 (0.03 - 0.09)	0.06 (0.03 - 0.18)	0.06 (0.02 - 0.23)	0.05 (0.02 - 0.16)	0.05 (0.03 - 0.07)	0.04 (0.02 - 0.08)	0.05 (0.03 - 0.09)
Total Kjeldahl Nitrogen (mg/L)	0.54 (0.09 - 0.92)	0.52 (0.10 - 1.30)	0.57 (0.09 - 1.12)	0.60 (0.08 - 1.15)	0.47 (0.10 - 0.60)	0.48 (0.09 - 0.70)	0.72 (0.48 - 1.13)
Total Nitrogen (mg/L)	0.55 (0.10 - 0.92)	0.53 (0.10 - 1.31)	0.57 (0.09 - 1.12)	0.61 (0.09 - 1.15)	0.48 (0.11 - 0.60)	0.49 (0.09 - 0.71)	0.73 (0.48 - 1.14)
Orthophosphate Phosphorus (mg/L)	0.008 (0.005 - 0.011)	0.007 (0.004 - 0.011)	0.007 (0.005 - 0.010)	0.007 (0.005 - 0.013)	0.006 (0.003 - 0.009)	0.006 (0.002 - 0.008)	0.007 (<0.002 - 0.012)
Total Phosphorus (mg/L)	0.07 (0.02 - 0.23)	0.04 (0.02 - 0.07)	0.04 (<0.02 - 0.08)	0.05 (0.02 - 0.10)	0.04 (0.02 - 0.05)	0.04 (0.02 - 0.05)	0.05 (0.02 - 0.11)
Silica (as SiO ₂) (mg/L)	0.49 (0.24 - 0.82)	0.38 (0.20 - 0.63)	0.33 (0.18 - 0.69)	0.32 (0.16 - 0.62)	0.42 (0.22 - 0.66)	0.48 (0.27 - 0.84)	0.61 (0.34 - 1.00)
Chlorophyll- <i>a</i> (µg/L)	1.9 (0.4 - 4.4)	2.0 (0.6 - 6.4)	1.9 (0.6 - 6.9)	1.9 (0.4 - 6.9)	1.6 (0.5 - 3.7)	1.6 (0.5 - 5.7)	2.3 (0.8 - 4.6)
<i>E. coli</i> (count/100mL)	1 (<1 - 3)	1 (<1 - 4)	1 (<1 - 4)	1 (<1 - 4)	1 (<1 - 5)	1 (<1 - 6)	1 (<1 - 3)
Faecal Coliforms (count/100mL)	1 (<1 - 3)	1 (<1 - 4)	1 (<1 - 4)	1 (<1 - 4)	1 (<1 - 5)	1 (<1 - 6)	2 (<1 - 19)

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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained.

Full scale monitoring was conducted in the periods of February to December 2021

Summary of water quality statistics for the Port Shelter WCZ in 2021

Parameter	Inner Port Shelter				Hebe Haven
	PM1	PM2	PM3	PM4	PM6
Number of samples	11	11	11	11	11
Temperature (°C)	25.7 (20.6 - 30.8)	25.3 (20.2 - 29.6)	24.7 (20.0 - 28.3)	25.6 (20.5 - 30.1)	24.7 (20.0 - 28.0)
Salinity	32.1 (24.3 - 33.8)	32.3 (25.4 - 33.7)	32.7 (27.4 - 33.9)	32.3 (25.5 - 33.7)	32.4 (25.6 - 33.8)
Dissolved Oxygen (mg/L)	5.1 (4.3 - 6.0)	5.2 (4.1 - 6.4)	5.1 (4.1 - 6.9)	5.0 (4.3 - 6.3)	5.0 (4.2 - 6.4)
	Bottom				
	5.0 (3.9 - 6.0)	5.2 (3.1 - 7.1)	4.8 (3.1 - 7.3)	4.9 (4.1 - 5.8)	4.7 (2.7 - 7.6)
Dissolved Oxygen (% Saturation)	75 (67 - 86)	75 (63 - 92)	75 (60 - 95)	74 (65 - 90)	72 (63 - 87)
	Bottom				
	73 (57 - 90)	75 (45 - 101)	70 (45 - 109)	71 (61 - 83)	66 (44 - 103)
pH	7.7 (7.3 - 8.1)	7.7 (7.3 - 8.1)	7.7 (7.3 - 8.1)	7.7 (7.3 - 8.0)	7.6 (7.0 - 7.9)
Secchi Disc Depth (m)	3.0 (1.5 - 5.0)	2.9 (1.5 - 4.9)	3.3 (1.7 - 5.2)	2.7 (1.6 - 4.5)	3.2 (1.0 - 5.2)
Turbidity (NTU)	4.4 (2.5 - 7.3)	4.5 (2.4 - 6.7)	4.6 (2.5 - 7.8)	4.7 (2.6 - 7.5)	4.8 (2.5 - 7.9)
Suspended Solids (mg/L)	3.7 (0.8 - 7.5)	3.6 (1.3 - 7.4)	4.0 (0.9 - 12.7)	4.2 (1.4 - 7.5)	4.2 (0.7 - 8.9)
5-day Biochemical Oxygen Demand (mg/L)	0.8 (0.5 - 1.1)	0.9 (0.4 - 2.3)	1.1 (0.4 - 3.9)	0.9 (0.5 - 2.4)	1.0 (0.3 - 2.7)
Ammonia Nitrogen (mg/L)	0.036 (0.020 - 0.072)	0.038 (0.023 - 0.063)	0.035 (0.022 - 0.071)	0.034 (0.017 - 0.055)	0.043 (0.026 - 0.090)
Unionised Ammonia (mg/L)	<0.001 (<0.001 - 0.003)	<0.001 (<0.001 - 0.003)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.003)	<0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)	0.002 (<0.002 - 0.005)	0.003 (<0.002 - 0.006)	0.003 (<0.002 - 0.007)	0.002 (<0.002 - 0.003)	0.004 (<0.002 - 0.009)
Nitrate Nitrogen (mg/L)	0.018 (<0.002 - 0.143)	0.017 (<0.002 - 0.090)	0.015 (<0.002 - 0.068)	0.012 (<0.002 - 0.064)	0.029 (<0.002 - 0.152)
Total Inorganic Nitrogen (mg/L)	0.06 (0.02 - 0.22)	0.06 (0.03 - 0.16)	0.05 (0.03 - 0.14)	0.05 (0.02 - 0.12)	0.08 (0.03 - 0.25)
Total Kjeldahl Nitrogen (mg/L)	0.39 (0.13 - 0.70)	0.56 (0.10 - 1.01)	0.44 (0.23 - 0.67)	0.41 (0.18 - 0.63)	0.43 (0.19 - 0.75)
Total Nitrogen (mg/L)	0.40 (0.13 - 0.70)	0.56 (0.10 - 1.01)	0.45 (0.23 - 0.68)	0.42 (0.18 - 0.64)	0.44 (0.20 - 0.76)
Orthophosphate Phosphorus (mg/L)	0.006 (<0.002 - 0.010)	0.006 (0.004 - 0.009)	0.006 (0.005 - 0.008)	0.006 (0.004 - 0.009)	0.007 (0.004 - 0.014)
Total Phosphorus (mg/L)	0.04 (0.02 - 0.06)	0.05 (0.03 - 0.08)	0.06 (0.04 - 0.08)	0.05 (0.03 - 0.08)	0.06 (0.03 - 0.09)
Silica (as SiO ₂) (mg/L)	0.74 (0.11 - 2.10)	0.65 (0.14 - 1.13)	0.63 (0.33 - 1.00)	0.82 (0.09 - 2.50)	0.85 (0.40 - 2.31)
Chlorophyll- <i>a</i> (µg/L)	2.3 (0.9 - 6.2)	3.2 (1.3 - 7.3)	2.7 (1.0 - 6.9)	2.5 (0.9 - 5.5)	3.0 (1.1 - 7.7)
<i>E. coli</i> (count/100mL)	3 (<1 - 670)	8 (<1 - 710)	4 (<1 - 230)	2 (<1 - 180)	5 (<1 - 990)
Faecal Coliforms (count/100mL)	6 (1 - 3700)	32 (1 - 3000)	10 (<1 - 1100)	4 (<1 - 2000)	16 (1 - 3000)

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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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained. Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the Port Shelter WCZ in 2021 (continued)

Parameter	Outer Port Shelter		Rocky Harbour	Bluff Island
	PM7	PM8	PM9	PM11
Number of samples	12	11	11	11
Temperature (°C)	23.7 (17.5 - 27.8)	24.2 (20.4 - 27.8)	24.4 (20.2 - 27.9)	24.1 (20.4 - 27.8)
Salinity	32.9 (30.4 - 33.9)	33.3 (31.3 - 33.9)	33.2 (30.5 - 33.9)	33.4 (31.4 - 34.0)
Dissolved Oxygen (mg/L)	5.3 (4.3 - 6.8)	5.1 (4.0 - 6.6)	5.1 (4.1 - 6.6)	5.1 (4.0 - 6.9)
	Bottom			
	5.1 (3.0 - 7.5)	4.7 (2.9 - 7.0)	5.1 (3.4 - 6.9)	4.7 (2.8 - 7.0)
Dissolved Oxygen (% Saturation)	76 (64 - 92)	73 (59 - 90)	74 (61 - 94)	74 (59 - 94)
	Bottom			
	72 (51 - 95)	68 (44 - 95)	73 (48 - 99)	67 (40 - 96)
pH	7.6 (7.3 - 8.0)	7.6 (7.3 - 8.0)	7.7 (7.3 - 8.0)	7.7 (7.3 - 8.0)
Secchi Disc Depth (m)	4.6 (2.4 - 7.2)	5.0 (2.2 - 7.1)	4.2 (2.4 - 6.9)	4.7 (2.5 - 6.9)
Turbidity (NTU)	4.5 (2.6 - 8.3)	5.7 (2.5 - 12.1)	5.6 (2.3 - 14.7)	5.1 (2.4 - 9.3)
Suspended Solids (mg/L)	3.3 (0.6 - 9.6)	3.2 (0.7 - 6.1)	3.5 (1.3 - 7.2)	3.1 (0.9 - 6.4)
5-day Biochemical Oxygen Demand (mg/L)	1.0 (0.2 - 3.0)	0.6 (0.3 - 0.9)	0.7 (0.3 - 1.2)	0.5 (0.3 - 0.8)
Ammonia Nitrogen (mg/L)	0.032 (0.018 - 0.050)	0.029 (0.017 - 0.043)	0.030 (0.017 - 0.057)	0.028 (0.017 - 0.041)
Unionised Ammonia (mg/L)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.001)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)	0.004 (<0.002 - 0.010)	0.005 (<0.002 - 0.016)	0.003 (<0.002 - 0.008)	0.005 (<0.002 - 0.011)
Nitrate Nitrogen (mg/L)	0.017 (<0.002 - 0.070)	0.016 (<0.002 - 0.095)	0.014 (<0.002 - 0.088)	0.016 (<0.002 - 0.104)
Total Inorganic Nitrogen (mg/L)	0.05 (0.03 - 0.11)	0.05 (0.02 - 0.14)	0.05 (0.02 - 0.13)	0.05 (0.02 - 0.14)
Total Kjeldahl Nitrogen (mg/L)	0.42 (0.12 - 0.72)	0.39 (0.18 - 0.73)	0.36 (0.13 - 0.61)	0.36 (0.11 - 0.74)
Total Nitrogen (mg/L)	0.44 (0.12 - 0.73)	0.40 (0.19 - 0.74)	0.37 (0.13 - 0.62)	0.37 (0.11 - 0.75)
Orthophosphate Phosphorus (mg/L)	0.007 (0.004 - 0.011)	0.008 (0.004 - 0.014)	0.007 (0.004 - 0.013)	0.007 (0.003 - 0.015)
Total Phosphorus (mg/L)	0.06 (0.02 - 0.08)	0.05 (0.02 - 0.09)	0.07 (0.03 - 0.14)	0.05 (0.03 - 0.06)
Silica (as SiO ₂) (mg/L)	0.58 (0.34 - 1.08)	0.55 (0.29 - 1.09)	0.55 (0.20 - 1.20)	0.54 (0.29 - 1.22)
Chlorophyll- <i>a</i> (µg/L)	2.0 (0.7 - 5.5)	1.5 (0.8 - 3.8)	1.5 (0.6 - 2.3)	1.6 (1.0 - 3.0)
<i>E. coli</i> (count/100mL)	2 (<1 - 30)	1 (<1 - 3)	1 (<1 - 5)	1 (<1 - 4)
Faecal Coliforms (count/100mL)	3 (1 - 88)	2 (<1 - 19)	2 (<1 - 56)	2 (<1 - 11)

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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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained. Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the Tolo Harbour and Channel WCZ in 2021

Parameter	Harbour Subzone			Buffer Subzone		Channel Subzone	
	TM2	TM3	TM4	TM5	TM6	TM7	TM8
Number of samples	11	12	11	11	11	11	11
Temperature (°C)	26.1 (21.4 - 31.5)	25.3 (18.5 - 31.2)	25.7 (20.8 - 31.1)	26.6 (21.3 - 32.3)	25.1 (20.3 - 28.9)	25.2 (20.0 - 29.5)	24.3 (19.6 - 27.2)
Salinity	30.5 (20.3 - 33.3)	31.7 (26.6 - 33.2)	31.7 (25.9 - 33.4)	31.3 (23.7 - 33.3)	32.2 (27.5 - 33.6)	32.2 (27.6 - 33.5)	32.8 (29.7 - 33.9)
Dissolved Oxygen (mg/L)	5.2 (4.4 - 6.6)	5.3 (4.3 - 6.9)	5.3 (4.4 - 6.6)	5.2 (4.3 - 6.5)	5.0 (4.1 - 6.2)	5.1 (3.9 - 5.8)	4.8 (3.2 - 6.1)
	Bottom						
	5.3 (4.3 - 6.9)	5.2 (3.3 - 7.3)	5.1 (3.8 - 6.4)	5.1 (4.0 - 6.9)	4.2 (2.6 - 5.8)	4.4 (2.8 - 5.8)	4.1 (1.9 - 6.0)
Dissolved Oxygen (% Saturation)	76 (65 - 92)	77 (67 - 95)	77 (67 - 95)	77 (68 - 93)	73 (61 - 85)	74 (59 - 87)	70 (47 - 85)
	Bottom						
	77 (65 - 100)	75 (48 - 101)	74 (56 - 96)	75 (63 - 98)	61 (38 - 76)	64 (40 - 76)	59 (26 - 87)
pH	7.6 (6.9 - 8.0)	7.7 (7.3 - 8.0)	7.6 (7.3 - 8.0)	7.7 (7.4 - 8.1)	7.7 (7.2 - 8.0)	7.7 (7.2 - 8.0)	7.7 (7.3 - 8.0)
Secchi Disc Depth (m)	2.3 (1.7 - 3.1)	2.7 (1.9 - 5.0)	2.5 (1.8 - 3.7)	2.8 (2.1 - 4.0)	2.9 (1.9 - 4.6)	3.0 (1.9 - 4.3)	3.6 (2.3 - 6.3)
Turbidity (NTU)	3.9 (1.4 - 6.4)	4.1 (2.7 - 6.4)	4.3 (2.8 - 7.0)	5.2 (2.5 - 16.3)	3.9 (2.5 - 6.4)	3.8 (2.4 - 6.9)	4.1 (2.7 - 6.8)
Suspended Solids (mg/L)	2.6 (1.1 - 5.0)	3.6 (0.5 - 9.0)	2.9 (0.9 - 7.9)	3.9 (1.3 - 10.6)	3.1 (0.7 - 7.7)	2.3 (0.8 - 5.0)	2.3 (0.9 - 5.2)
5-day Biochemical Oxygen Demand (mg/L)	1.6 (0.8 - 2.1)	1.5 (1.1 - 2.4)	1.5 (1.0 - 2.1)	1.2 (0.8 - 1.9)	1.2 (0.8 - 1.7)	1.2 (0.6 - 1.9)	0.9 (<0.1 - 1.3)
Ammonia Nitrogen (mg/L)	0.048 (0.027 - 0.075)	0.057 (0.026 - 0.125)	0.041 (0.024 - 0.076)	0.036 (0.026 - 0.066)	0.035 (0.022 - 0.055)	0.031 (0.020 - 0.046)	0.036 (0.019 - 0.065)
Unionised Ammonia (mg/L)	0.001 (<0.001 - 0.005)	0.001 (<0.001 - 0.004)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.003)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)	0.003 (<0.002 - 0.006)	0.004 (<0.002 - 0.010)	0.003 (<0.002 - 0.010)	0.003 (<0.002 - 0.008)	0.004 (<0.002 - 0.011)	0.003 (<0.002 - 0.010)	0.006 (<0.002 - 0.019)
Nitrate Nitrogen (mg/L)	0.031 (<0.002 - 0.230)	0.017 (<0.002 - 0.081)	0.021 (<0.002 - 0.140)	0.014 (<0.002 - 0.086)	0.017 (<0.002 - 0.103)	0.015 (<0.002 - 0.090)	0.017 (<0.002 - 0.047)
Total Inorganic Nitrogen (mg/L)	0.08 (0.04 - 0.26)	0.08 (0.03 - 0.16)	0.07 (0.03 - 0.17)	0.05 (0.03 - 0.13)	0.06 (0.03 - 0.15)	0.05 (0.03 - 0.12)	0.06 (0.04 - 0.12)
Total Kjeldahl Nitrogen (mg/L)	0.60 (0.23 - 0.86)	0.61 (0.30 - 0.77)	0.69 (0.27 - 1.01)	0.52 (0.16 - 0.74)	0.56 (0.17 - 0.82)	0.55 (0.20 - 0.80)	0.51 (0.28 - 0.67)
Total Nitrogen (mg/L)	0.62 (0.26 - 0.87)	0.63 (0.33 - 0.79)	0.70 (0.29 - 1.01)	0.52 (0.16 - 0.74)	0.56 (0.18 - 0.83)	0.56 (0.21 - 0.81)	0.51 (0.30 - 0.68)
Orthophosphate Phosphorus (mg/L)	0.003 (<0.002 - 0.006)	0.006 (<0.002 - 0.010)	0.006 (<0.002 - 0.010)	0.004 (<0.002 - 0.010)	0.007 (<0.002 - 0.016)	0.007 (<0.002 - 0.016)	0.009 (0.003 - 0.036)
Total Phosphorus (mg/L)	0.05 (<0.02 - 0.07)	0.05 (0.02 - 0.09)	0.05 (0.02 - 0.09)	0.05 (0.03 - 0.10)	0.05 (0.02 - 0.09)	0.04 (0.02 - 0.06)	0.04 (0.02 - 0.06)
Silica (as SiO ₂) (mg/L)	1.43 (0.24 - 5.85)	0.82 (0.11 - 1.53)	1.01 (0.27 - 2.20)	0.75 (0.28 - 1.30)	0.91 (0.20 - 1.83)	0.86 (0.28 - 1.53)	0.83 (0.37 - 1.79)
Chlorophyll- <i>a</i> (µg/L)	7.1 (2.1 - 14.5)	5.5 (2.6 - 8.7)	4.8 (1.8 - 7.8)	3.6 (1.1 - 6.4)	3.7 (1.6 - 6.7)	3.7 (1.4 - 6.7)	2.7 (0.8 - 5.8)
<i>E. coli</i> (count/100mL)	16 (2 - 82)	9 (<1 - 540)	4 (<1 - 28)	2 (<1 - 17)	2 (<1 - 380)	1 (<1 - 12)	1 (<1 - 2)
Faecal Coliforms (count/100mL)	84 (6 - 1300)	52 (3 - 960)	14 (1 - 200)	4 (<1 - 58)	3 (<1 - 650)	2 (<1 - 47)	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.

4. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained.

Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the Southern WCZ in 2021

Parameter	Hong Kong Island (South)			East Lamma Channel	
	SM1	SM2	SM19	SM3	SM4
Number of samples	11	11	11	11	11
Temperature (°C)	24.7 (20.2 - 27.4)	24.9 (19.8 - 28.1)	24.8 (20.6 - 27.6)	24.1 (19.1 - 28.4)	25.2 (19.9 - 27.9)
Salinity	33.0 (32.0 - 34.0)	32.7 (30.5 - 33.9)	33.0 (31.5 - 34.0)	32.8 (31.7 - 33.8)	32.2 (30.3 - 33.6)
Dissolved Oxygen (mg/L)	5.1 (4.2 - 6.5)	5.1 (4.3 - 6.6)	5.0 (4.0 - 6.6)	4.8 (3.4 - 5.9)	5.1 (4.3 - 6.6)
Bottom	4.9 (3.3 - 6.7)	5.1 (3.6 - 6.7)	4.5 (2.8 - 6.8)	4.3 (1.9 - 6.3)	5.2 (4.0 - 6.9)
Dissolved Oxygen (% Saturation)	73 (64 - 89)	74 (64 - 90)	73 (59 - 90)	69 (50 - 88)	74 (66 - 91)
Bottom	71 (47 - 91)	74 (52 - 92)	65 (39 - 93)	62 (27 - 92)	75 (59 - 95)
pH	7.6 (7.3 - 8.0)	7.6 (7.3 - 7.9)	7.7 (7.4 - 8.0)	7.5 (7.3 - 7.8)	7.6 (7.3 - 7.9)
Secchi Disc Depth (m)	3.3 (2.3 - 6.0)	3.2 (2.3 - 4.2)	3.3 (2.3 - 6.0)	2.7 (1.7 - 3.7)	2.8 (1.6 - 4.2)
Turbidity (NTU)	4.9 (2.5 - 9.7)	5.2 (2.9 - 8.8)	8.3 (3.4 - 26.0)	5.3 (2.8 - 8.5)	5.1 (2.8 - 11.2)
Suspended Solids (mg/L)	2.4 (0.7 - 5.2)	3.1 (1.1 - 6.5)	3.0 (0.9 - 7.3)	6.0 (2.6 - 10.8)	3.3 (0.8 - 8.1)
5-day Biochemical Oxygen Demand (mg/L)	0.7 (0.3 - 1.2)	0.7 (0.3 - 1.4)	0.6 (0.2 - 1.5)	0.7 (0.3 - 1.3)	0.9 (0.5 - 1.6)
Ammonia Nitrogen (mg/L)	0.035 (0.022 - 0.056)	0.038 (0.022 - 0.060)	0.029 (0.021 - 0.038)	0.061 (0.037 - 0.100)	0.065 (0.029 - 0.133)
Unionised Ammonia (mg/L)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.001)	<0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.004)	0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)	0.011 (0.002 - 0.030)	0.019 (0.002 - 0.051)	0.013 (<0.002 - 0.030)	0.027 (<0.002 - 0.055)	0.024 (0.003 - 0.060)
Nitrate Nitrogen (mg/L)	0.029 (<0.002 - 0.076)	0.041 (<0.002 - 0.105)	0.031 (<0.002 - 0.105)	0.060 (0.012 - 0.132)	0.070 (0.033 - 0.153)
Total Inorganic Nitrogen (mg/L)	0.08 (0.03 - 0.13)	0.10 (0.04 - 0.16)	0.07 (0.03 - 0.15)	0.15 (0.07 - 0.22)	0.16 (0.10 - 0.24)
Total Kjeldahl Nitrogen (mg/L)	0.53 (0.12 - 0.77)	0.61 (0.34 - 0.75)	0.52 (0.11 - 0.78)	0.68 (0.31 - 1.27)	0.62 (0.26 - 0.80)
Total Nitrogen (mg/L)	0.54 (0.14 - 0.78)	0.62 (0.36 - 0.77)	0.53 (0.11 - 0.79)	0.73 (0.41 - 1.37)	0.67 (0.32 - 0.87)
Orthophosphate Phosphorus (mg/L)	0.007 (0.003 - 0.012)	0.007 (0.002 - 0.013)	0.007 (0.003 - 0.012)	0.010 (0.006 - 0.015)	0.008 (0.002 - 0.017)
Total Phosphorus (mg/L)	0.04 (0.03 - 0.05)	0.04 (0.03 - 0.05)	0.04 (0.04 - 0.05)	0.05 (0.03 - 0.10)	0.05 (0.04 - 0.06)
Silica (as SiO ₂) (mg/L)	0.52 (0.10 - 0.78)	0.52 (0.10 - 0.94)	0.46 (0.19 - 0.81)	0.69 (0.37 - 1.07)	0.53 (0.08 - 1.10)
Chlorophyll- <i>a</i> (µg/L)	2.7 (0.8 - 6.1)	3.5 (0.7 - 6.9)	2.7 (0.8 - 9.5)	3.3 (0.5 - 9.8)	6.3 (0.6 - 14.3)
<i>E. coli</i> (count/100mL)	1 (<1 - 3)	2 (<1 - 20)	1 (<1 - 2)	16 (<1 - 3700)	5 (<1 - 120)
Faecal Coliforms (count/100mL)	2 (<1 - 4)	4 (<1 - 30)	1 (<1 - 3)	33 (1 - 7800)	10 (1 - 160)

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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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained. Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the Southern WCZ in 2021 (continued)

Parameter	West Lamma Channel				
	SM5	SM6	SM7	SM9	SM18
Number of samples	11	12	11	11	11
Temperature (°C)	25.7 (19.9 - 29.0)	24.5 (17.8 - 28.4)	25.4 (20.2 - 28.9)	24.9 (19.1 - 28.3)	25.0 (19.9 - 27.7)
Salinity	32.0 (28.7 - 33.9)	32.2 (30.5 - 34.0)	31.3 (28.4 - 33.6)	30.6 (26.3 - 33.6)	32.8 (31.2 - 33.9)
Dissolved Oxygen (mg/L)	5.2 (4.3 - 6.7)	5.5 (4.6 - 7.3)	5.1 (4.1 - 7.5)	4.9 (4.2 - 5.7)	5.1 (4.0 - 6.7)
	Bottom				
	5.5 (4.1 - 7.3)	5.6 (3.9 - 9.6)	5.2 (3.7 - 7.9)	4.8 (3.7 - 5.9)	4.8 (2.7 - 6.7)
Dissolved Oxygen (% Saturation)	77 (66 - 93)	79 (67 - 95)	74 (60 - 103)	70 (60 - 81)	74 (58 - 92)
	Bottom				
	80 (62 - 100)	79 (57 - 122)	76 (54 - 110)	69 (55 - 83)	68 (39 - 92)
pH	7.7 (7.4 - 8.0)	7.7 (7.4 - 8.0)	7.7 (7.3 - 8.0)	7.6 (7.3 - 7.9)	7.7 (7.4 - 8.0)
Secchi Disc Depth (m)	2.7 (1.7 - 4.8)	3.0 (1.6 - 7.5)	2.5 (1.8 - 3.6)	2.4 (1.4 - 4.3)	3.4 (1.9 - 7.0)
Turbidity (NTU)	5.4 (2.8 - 11.7)	5.8 (2.4 - 13.6)	6.0 (3.2 - 10.0)	6.1 (3.2 - 11.2)	5.3 (2.7 - 8.8)
Suspended Solids (mg/L)	4.0 (1.2 - 7.3)	4.1 (0.7 - 9.5)	4.6 (1.0 - 9.7)	6.8 (3.1 - 9.8)	3.1 (1.0 - 7.1)
5-day Biochemical Oxygen Demand (mg/L)	0.9 (<0.1 - 2.3)	1.1 (0.3 - 1.8)	1.2 (0.6 - 2.4)	0.9 (0.3 - 2.5)	0.8 (0.4 - 1.9)
Ammonia Nitrogen (mg/L)	0.033 (0.020 - 0.049)	0.036 (0.023 - 0.058)	0.094 (0.022 - 0.200)	0.112 (0.054 - 0.233)	0.032 (0.017 - 0.055)
Unionised Ammonia (mg/L)	<0.001 (<0.001 - 0.001)	<0.001 (<0.001 - 0.002)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.006)	<0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)	0.020 (0.002 - 0.050)	0.022 (0.002 - 0.061)	0.039 (0.005 - 0.089)	0.045 (<0.002 - 0.097)	0.014 (<0.002 - 0.039)
Nitrate Nitrogen (mg/L)	0.053 (<0.002 - 0.183)	0.078 (<0.002 - 0.170)	0.119 (0.045 - 0.267)	0.176 (0.088 - 0.370)	0.042 (0.002 - 0.148)
Total Inorganic Nitrogen (mg/L)	0.11 (0.04 - 0.24)	0.14 (0.03 - 0.26)	0.25 (0.14 - 0.42)	0.33 (0.22 - 0.54)	0.09 (0.04 - 0.23)
Total Kjeldahl Nitrogen (mg/L)	0.52 (0.10 - 0.94)	0.53 (0.14 - 0.88)	0.62 (0.18 - 1.05)	0.71 (0.24 - 1.27)	0.47 (0.10 - 0.62)
Total Nitrogen (mg/L)	0.53 (0.13 - 0.96)	0.58 (0.15 - 0.89)	0.70 (0.28 - 1.13)	0.85 (0.38 - 1.53)	0.48 (0.11 - 0.63)
Orthophosphate Phosphorus (mg/L)	0.007 (<0.002 - 0.013)	0.007 (0.002 - 0.012)	0.011 (<0.002 - 0.022)	0.015 (0.004 - 0.024)	0.006 (0.003 - 0.012)
Total Phosphorus (mg/L)	0.04 (0.03 - 0.05)	0.05 (0.04 - 0.06)	0.05 (0.04 - 0.06)	0.07 (0.04 - 0.11)	0.04 (0.03 - 0.04)
Silica (as SiO ₂) (mg/L)	0.46 (0.06 - 1.10)	0.53 (0.08 - 0.92)	0.73 (0.05 - 1.33)	0.94 (0.18 - 2.10)	0.49 (0.10 - 0.85)
Chlorophyll- <i>a</i> (µg/L)	6.0 (0.9 - 15.7)	7.8 (1.0 - 14.7)	8.3 (1.3 - 20.3)	6.3 (0.9 - 25.3)	3.3 (1.0 - 9.9)
<i>E. coli</i> (count/100mL)	1 (<1 - 1)	1 (<1 - 2)	4 (<1 - 240)	41 (4 - 2300)	1 (<1 - 3)
Faecal Coliforms (count/100mL)	2 (<1 - 10)	1 (<1 - 5)	8 (1 - 310)	74 (6 - 3200)	2 (<1 - 7)

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3. Data in brackets indicate the ranges.

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Summary of water quality statistics for the Southern WCZ in 2021 (continued)

Parameter	Lantau Island (East)		Lantau Island (South)			Soko Islands
	SM10	SM11	SM12	SM13	SM17	SM20
Number of samples	11	11	11	11	11	11
Temperature (°C)	25.4 (19.3 - 29.4)	25.5 (19.7 - 29.4)	25.4 (19.4 - 29.4)	25.6 (19.5 - 29.5)	25.2 (19.1 - 29.3)	25.6 (19.5 - 30.2)
Salinity	30.5 (27.1 - 33.2)	30.9 (27.3 - 33.2)	31.2 (27.5 - 33.3)	31.1 (26.9 - 33.3)	31.9 (29.0 - 33.4)	30.9 (25.8 - 33.5)
Dissolved Oxygen (mg/L)	5.0 (4.3 - 6.0)	5.1 (4.1 - 6.3)	5.2 (4.1 - 6.7)	5.1 (4.1 - 6.1)	5.4 (4.1 - 6.3)	5.2 (4.1 - 6.3)
	Bottom					
	4.8 (4.1 - 5.6)	5.0 (3.5 - 7.0)	5.2 (3.6 - 7.2)	5.1 (3.8 - 6.4)	5.2 (3.1 - 6.5)	5.2 (3.7 - 6.6)
Dissolved Oxygen (% Saturation)	73 (61 - 83)	74 (60 - 93)	76 (61 - 100)	75 (62 - 88)	78 (57 - 93)	76 (61 - 92)
	Bottom					
	70 (61 - 84)	72 (53 - 104)	76 (54 - 107)	74 (57 - 96)	75 (46 - 94)	76 (55 - 98)
pH	7.6 (7.1 - 7.9)	7.6 (7.3 - 8.0)	7.7 (7.2 - 8.0)	7.7 (7.3 - 8.0)	7.7 (7.3 - 8.0)	7.7 (7.3 - 8.0)
Secchi Disc Depth (m)	2.2 (1.4 - 3.0)	2.4 (1.4 - 3.7)	2.2 (1.3 - 4.0)	2.3 (1.3 - 4.8)	2.6 (1.0 - 4.0)	2.4 (1.1 - 4.0)
Turbidity (NTU)	6.7 (3.2 - 14.5)	6.4 (3.0 - 13.1)	6.4 (2.6 - 12.7)	6.2 (3.4 - 11.6)	7.1 (3.1 - 23.2)	5.7 (2.7 - 10.2)
Suspended Solids (mg/L)	6.0 (1.4 - 14.0)	5.9 (2.3 - 10.7)	5.9 (2.6 - 12.5)	5.7 (2.4 - 11.6)	4.8 (1.5 - 12.0)	5.0 (1.8 - 12.1)
5-day Biochemical Oxygen Demand (mg/L)	1.1 (0.3 - 2.9)	1.3 (0.4 - 3.0)	1.2 (0.4 - 2.4)	1.3 (0.5 - 2.2)	0.9 (0.4 - 1.7)	1.0 (0.6 - 2.1)
Ammonia Nitrogen (mg/L)	0.115 (0.068 - 0.165)	0.101 (0.054 - 0.150)	0.087 (0.042 - 0.133)	0.077 (0.037 - 0.133)	0.051 (0.027 - 0.071)	0.061 (0.031 - 0.090)
Unionised Ammonia (mg/L)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.006)	0.002 (<0.001 - 0.007)	0.002 (<0.001 - 0.007)	0.001 (<0.001 - 0.004)	0.002 (<0.001 - 0.006)
Nitrite Nitrogen (mg/L)	0.033 (0.003 - 0.088)	0.029 (0.002 - 0.082)	0.026 (0.002 - 0.066)	0.026 (<0.002 - 0.063)	0.021 (<0.002 - 0.047)	0.027 (0.002 - 0.068)
Nitrate Nitrogen (mg/L)	0.186 (0.082 - 0.390)	0.155 (0.044 - 0.343)	0.131 (0.055 - 0.240)	0.125 (0.039 - 0.273)	0.103 (0.016 - 0.206)	0.139 (0.022 - 0.350)
Total Inorganic Nitrogen (mg/L)	0.33 (0.17 - 0.52)	0.29 (0.10 - 0.50)	0.24 (0.13 - 0.37)	0.23 (0.09 - 0.40)	0.18 (0.07 - 0.29)	0.23 (0.07 - 0.47)
Total Kjeldahl Nitrogen (mg/L)	0.71 (0.47 - 1.13)	0.69 (0.57 - 1.05)	0.76 (0.59 - 1.17)	0.80 (0.55 - 1.27)	0.74 (0.50 - 1.16)	0.75 (0.45 - 1.20)
Total Nitrogen (mg/L)	0.84 (0.56 - 1.30)	0.80 (0.63 - 1.19)	0.85 (0.66 - 1.27)	0.87 (0.59 - 1.38)	0.79 (0.55 - 1.21)	0.82 (0.54 - 1.29)
Orthophosphate Phosphorus (mg/L)	0.013 (0.006 - 0.022)	0.011 (0.003 - 0.020)	0.009 (0.002 - 0.017)	0.009 (<0.002 - 0.017)	0.007 (0.002 - 0.015)	0.008 (0.002 - 0.014)
Total Phosphorus (mg/L)	0.06 (0.04 - 0.10)	0.06 (0.04 - 0.10)	0.06 (0.04 - 0.09)	0.05 (0.03 - 0.10)	0.05 (0.03 - 0.08)	0.05 (0.03 - 0.10)
Silica (as SiO ₂) (mg/L)	0.94 (0.11 - 1.85)	0.88 (0.09 - 1.80)	0.75 (0.13 - 1.57)	0.80 (0.13 - 1.67)	0.62 (0.16 - 1.42)	0.75 (0.14 - 1.70)
Chlorophyll- <i>a</i> (µg/L)	7.5 (2.0 - 17.0)	8.5 (1.0 - 16.3)	8.1 (1.6 - 16.7)	7.8 (1.6 - 20.0)	5.5 (0.9 - 12.9)	7.3 (0.9 - 16.3)
<i>E. coli</i> (count/100mL)	12 (2 - 350)	3 (<1 - 32)	8 (1 - 40)	5 (<1 - 31)	1 (<1 - 18)	1 (<1 - 6)
Faecal Coliforms (count/100mL)	30 (3 - 880)	7 (<1 - 81)	16 (2 - 71)	9 (<1 - 46)	2 (<1 - 33)	2 (<1 - 9)

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3. Data in brackets indicate the ranges.

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Summary of water quality statistics for the Victoria Harbour WCZ in 2021

Parameter	Victoria Harbour (East)		Victoria Harbour (Central)		
	VM1	VM2	VM4	VM5	VM6
Number of samples	11	11	12	12	11
Temperature (°C)	23.7 (19.8 - 26.5)	24.1 (19.8 - 27.2)	23.7 (18.2 - 28.2)	23.8 (18.4 - 28.2)	24.4 (19.9 - 28.1)
Salinity	33.0 (32.2 - 33.6)	32.6 (30.8 - 33.6)	32.2 (29.6 - 33.6)	32.0 (29.2 - 33.4)	32.0 (29.4 - 33.4)
Dissolved Oxygen (mg/L)	4.9 (4.0 - 6.3)	4.9 (4.0 - 6.2)	4.9 (4.0 - 6.2)	4.8 (4.0 - 5.7)	4.8 (4.0 - 5.9)
Bottom	4.4 (2.4 - 6.4)	4.8 (3.5 - 6.3)	4.8 (3.3 - 6.3)	4.8 (3.3 - 5.8)	4.6 (3.3 - 5.8)
Dissolved Oxygen (% Saturation)	69 (52 - 89)	70 (60 - 84)	69 (57 - 84)	68 (57 - 79)	69 (57 - 83)
Bottom	63 (35 - 91)	69 (52 - 85)	68 (48 - 85)	67 (49 - 81)	65 (50 - 81)
pH	7.5 (7.1 - 7.9)	7.5 (7.2 - 7.9)	7.5 (7.2 - 7.9)	7.5 (7.2 - 7.9)	7.5 (7.2 - 7.9)
Secchi Disc Depth (m)	2.7 (2.0 - 3.8)	2.5 (1.9 - 2.9)	2.5 (1.7 - 3.6)	2.6 (2.0 - 3.2)	2.5 (1.9 - 3.5)
Turbidity (NTU)	5.2 (2.8 - 8.1)	5.5 (3.4 - 9.5)	5.5 (3.0 - 9.1)	5.9 (3.3 - 10.7)	5.2 (4.0 - 8.4)
Suspended Solids (mg/L)	3.8 (1.4 - 7.2)	3.7 (1.8 - 6.8)	3.8 (2.0 - 7.5)	3.8 (1.5 - 6.6)	4.1 (1.7 - 7.6)
5-day Biochemical Oxygen Demand (mg/L)	0.6 (0.2 - 1.4)	0.7 (0.2 - 1.2)	0.7 (<0.1 - 1.1)	0.7 (<0.1 - 1.1)	0.8 (0.1 - 1.9)
Ammonia Nitrogen (mg/L)	0.069 (0.032 - 0.096)	0.093 (0.037 - 0.187)	0.110 (0.035 - 0.237)	0.134 (0.069 - 0.203)	0.150 (0.071 - 0.223)
Unionised Ammonia (mg/L)	<0.001 (<0.001 - 0.001)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.003)	0.002 (<0.001 - 0.003)	0.002 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)	0.029 (0.005 - 0.076)	0.034 (0.005 - 0.099)	0.034 (0.006 - 0.117)	0.037 (0.006 - 0.120)	0.041 (0.007 - 0.120)
Nitrate Nitrogen (mg/L)	0.075 (0.028 - 0.163)	0.103 (0.032 - 0.250)	0.133 (0.036 - 0.330)	0.149 (0.039 - 0.343)	0.149 (0.056 - 0.367)
Total Inorganic Nitrogen (mg/L)	0.17 (0.10 - 0.27)	0.23 (0.14 - 0.43)	0.28 (0.13 - 0.52)	0.32 (0.16 - 0.57)	0.34 (0.22 - 0.62)
Total Kjeldahl Nitrogen (mg/L)	0.56 (0.34 - 0.73)	0.63 (0.40 - 0.96)	0.63 (0.35 - 0.90)	0.72 (0.37 - 1.04)	0.72 (0.53 - 1.01)
Total Nitrogen (mg/L)	0.63 (0.47 - 0.78)	0.70 (0.54 - 1.01)	0.74 (0.52 - 0.96)	0.83 (0.43 - 1.12)	0.82 (0.60 - 1.09)
Orthophosphate Phosphorus (mg/L)	0.014 (0.009 - 0.023)	0.016 (0.008 - 0.033)	0.017 (0.006 - 0.031)	0.019 (0.005 - 0.029)	0.020 (0.008 - 0.032)
Total Phosphorus (mg/L)	0.07 (0.03 - 0.15)	0.06 (0.04 - 0.11)	0.08 (0.03 - 0.18)	0.09 (0.05 - 0.21)	0.08 (0.04 - 0.18)
Silica (as SiO ₂) (mg/L)	0.76 (0.45 - 1.20)	0.84 (0.46 - 1.60)	0.91 (0.45 - 1.87)	0.96 (0.48 - 1.83)	1.01 (0.48 - 1.80)
Chlorophyll- <i>a</i> (µg/L)	2.1 (0.3 - 4.8)	2.5 (0.4 - 7.5)	2.7 (0.4 - 7.9)	2.6 (0.6 - 8.0)	2.5 (0.4 - 7.5)
<i>E. coli</i> (count/100mL)	90 (8 - 720)	140 (39 - 500)	130 (24 - 410)	280 (78 - 900)	360 (29 - 1100)
Faecal Coliforms (count/100mL)	200 (18 - 2300)	290 (56 - 1500)	300 (60 - 850)	590 (190 - 1500)	850 (56 - 2300)

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3. Data in brackets indicate the ranges.

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Summary of water quality statistics for the Victoria Harbour WCZ in 2021 (continued)

Parameter	Victoria Harbour (West)		Stonecutters Island	Rambler Channel	
	VM7	VM8	VM15	VM12	VM14
Number of samples	11	11	12	11	12
Temperature (°C)	24.5 (19.9 - 28.4)	24.6 (19.8 - 28.3)	24.3 (18.2 - 28.8)	24.8 (20.0 - 28.3)	24.5 (18.2 - 28.9)
Salinity	31.7 (28.6 - 33.4)	31.8 (28.1 - 33.6)	31.2 (27.4 - 33.3)	31.4 (28.8 - 33.4)	30.2 (25.2 - 33.3)
Dissolved Oxygen (mg/L)	4.6 (4.0 - 5.9)	4.8 (4.1 - 5.8)	4.9 (4.1 - 6.0)	4.7 (4.0 - 5.7)	4.9 (4.1 - 5.6)
Bottom	4.4 (3.2 - 5.7)	4.7 (3.2 - 6.0)	4.6 (2.3 - 6.9)	4.5 (3.2 - 7.0)	4.8 (3.9 - 5.9)
Dissolved Oxygen (% Saturation)	66 (58 - 80)	69 (59 - 84)	69 (61 - 77)	67 (59 - 82)	70 (58 - 79)
Bottom	62 (48 - 81)	67 (48 - 88)	65 (33 - 89)	64 (48 - 92)	69 (56 - 76)
pH	7.5 (7.2 - 7.9)	7.5 (7.2 - 7.9)	7.6 (7.4 - 7.9)	7.5 (7.2 - 7.9)	7.6 (7.4 - 7.9)
Secchi Disc Depth (m)	2.3 (2.0 - 2.9)	2.2 (1.3 - 2.9)	2.2 (1.7 - 3.0)	2.1 (1.8 - 2.8)	2.2 (1.7 - 3.0)
Turbidity (NTU)	7.5 (3.9 - 22.3)	16.5 (3.5 - 124.0)	10.9 (3.0 - 45.4)	7.6 (4.2 - 16.5)	5.4 (2.8 - 10.0)
Suspended Solids (mg/L)	3.8 (1.7 - 7.8)	4.4 (2.0 - 10.9)	6.2 (2.6 - 10.7)	6.3 (0.9 - 15.0)	6.1 (2.9 - 13.6)
5-day Biochemical Oxygen Demand (mg/L)	0.8 (0.2 - 1.8)	0.9 (0.3 - 1.3)	1.0 (<0.1 - 1.9)	0.7 (0.2 - 1.5)	0.9 (<0.1 - 2.6)
Ammonia Nitrogen (mg/L)	0.183 (0.064 - 0.347)	0.159 (0.080 - 0.330)	0.171 (0.099 - 0.273)	0.170 (0.059 - 0.243)	0.126 (0.041 - 0.223)
Unionised Ammonia (mg/L)	0.002 (<0.001 - 0.004)	0.003 (<0.001 - 0.006)	0.003 (0.002 - 0.007)	0.003 (<0.001 - 0.005)	0.002 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)	0.043 (0.005 - 0.127)	0.043 (0.005 - 0.127)	0.036 (0.008 - 0.078)	0.047 (0.006 - 0.127)	0.044 (0.007 - 0.084)
Nitrate Nitrogen (mg/L)	0.155 (0.068 - 0.373)	0.150 (0.035 - 0.387)	0.153 (0.049 - 0.303)	0.180 (0.066 - 0.477)	0.212 (0.068 - 0.467)
Total Inorganic Nitrogen (mg/L)	0.38 (0.26 - 0.63)	0.35 (0.22 - 0.62)	0.36 (0.21 - 0.55)	0.40 (0.27 - 0.67)	0.38 (0.21 - 0.65)
Total Kjeldahl Nitrogen (mg/L)	0.80 (0.52 - 1.07)	0.71 (0.42 - 1.04)	0.62 (0.41 - 0.89)	0.74 (0.36 - 1.12)	0.59 (0.40 - 0.76)
Total Nitrogen (mg/L)	0.90 (0.68 - 1.15)	0.80 (0.55 - 1.12)	0.76 (0.57 - 1.15)	0.88 (0.54 - 1.23)	0.75 (0.52 - 0.96)
Orthophosphate Phosphorus (mg/L)	0.021 (0.011 - 0.028)	0.018 (0.007 - 0.026)	0.020 (0.006 - 0.031)	0.021 (0.013 - 0.030)	0.016 (0.004 - 0.027)
Total Phosphorus (mg/L)	0.08 (0.04 - 0.14)	0.08 (0.05 - 0.17)	0.07 (0.05 - 0.09)	0.08 (0.04 - 0.15)	0.07 (0.04 - 0.08)
Silica (as SiO ₂) (mg/L)	1.05 (0.56 - 1.97)	1.01 (0.45 - 2.10)	0.95 (0.29 - 2.13)	1.10 (0.45 - 2.17)	1.28 (0.22 - 2.80)
Chlorophyll- <i>a</i> (µg/L)	2.4 (0.4 - 7.2)	3.0 (0.3 - 9.6)	6.2 (0.4 - 19.3)	2.7 (0.8 - 8.0)	7.8 (0.4 - 29.7)
<i>E. coli</i> (count/100mL)	480 (44 - 5200)	580 (5 - 11000)	540 (72 - 3700)	690 (100 - 6600)	200 (18 - 580)
Faecal Coliforms (count/100mL)	1200 (120 - 9300)	1200 (15 - 21000)	1100 (130 - 9000)	1500 (210 - 17000)	530 (52 - 2300)

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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained. Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the Eastern Buffer WCZ in 2021

Parameter	Chai Wan		Tathong Channel	
	EM1	EM2	EM2	EM3
Number of samples	11	12		11
Temperature (°C)	23.9 (19.3 - 29.1)	23.6 (18.1 - 29.1)		23.8 (19.2 - 29.2)
Salinity	33.0 (31.9 - 33.7)	33.0 (31.3 - 33.8)		33.3 (32.6 - 33.8)
Dissolved Oxygen (mg/L)	5.0 (4.0 - 6.4)	5.2 (3.5 - 6.5)		5.2 (4.0 - 6.5)
	Bottom			
	4.9 (3.3 - 6.5)	5.1 (2.6 - 6.6)		4.9 (2.6 - 6.8)
Dissolved Oxygen (% Saturation)	71 (58 - 88)	74 (51 - 90)		74 (59 - 91)
	Bottom			
	70 (49 - 90)	72 (37 - 94)		69 (37 - 96)
pH	7.6 (7.3 - 7.9)	7.7 (7.3 - 8.0)		7.6 (7.3 - 8.0)
Secchi Disc Depth (m)	2.9 (1.9 - 4.6)	2.9 (1.8 - 4.4)		2.8 (1.8 - 5.3)
Turbidity (NTU)	5.5 (2.9 - 11.0)	5.4 (3.0 - 9.0)		8.0 (2.9 - 37.2)
Suspended Solids (mg/L)	5.7 (1.5 - 10.3)	5.4 (1.6 - 11.0)		5.5 (1.8 - 12.0)
5-day Biochemical Oxygen Demand (mg/L)	0.7 (0.2 - 1.0)	0.7 (0.2 - 1.6)		0.6 (0.1 - 1.0)
Ammonia Nitrogen (mg/L)	0.066 (0.027 - 0.173)	0.045 (0.024 - 0.058)		0.043 (0.018 - 0.126)
Unionised Ammonia (mg/L)	0.001 (<0.001 - 0.005)	<0.001 (<0.001 - 0.002)		0.001 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)	0.025 (<0.002 - 0.049)	0.017 (<0.002 - 0.046)		0.015 (<0.002 - 0.038)
Nitrate Nitrogen (mg/L)	0.082 (0.009 - 0.207)	0.066 (0.005 - 0.230)		0.047 (0.002 - 0.207)
Total Inorganic Nitrogen (mg/L)	0.17 (0.05 - 0.42)	0.13 (0.04 - 0.29)		0.11 (0.04 - 0.37)
Total Kjeldahl Nitrogen (mg/L)	0.43 (0.30 - 0.63)	0.42 (0.14 - 0.76)		0.38 (0.20 - 0.59)
Total Nitrogen (mg/L)	0.51 (0.32 - 0.64)	0.51 (0.16 - 1.00)		0.42 (0.21 - 0.60)
Orthophosphate Phosphorus (mg/L)	0.012 (0.003 - 0.036)	0.010 (0.005 - 0.022)		0.010 (0.005 - 0.028)
Total Phosphorus (mg/L)	0.06 (0.03 - 0.09)	0.07 (0.03 - 0.16)		0.04 (0.03 - 0.07)
Silica (as SiO ₂) (mg/L)	0.65 (0.37 - 1.60)	0.57 (0.31 - 0.90)		0.58 (0.31 - 1.40)
Chlorophyll- <i>a</i> (µg/L)	5.4 (1.1 - 11.9)	4.1 (0.9 - 8.5)		4.4 (0.8 - 11.0)
<i>E. coli</i> (count/100mL)	54 (8 - 170)	31 (2 - 100)		7 (1 - 58)
Faecal Coliforms (count/100mL)	110 (25 - 350)	57 (4 - 190)		14 (3 - 150)

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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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained.

Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the Western Buffer WCZ in 2021

Parameter	Hong Kong Island (West)		Tsing Yi (South)	Tsing Yi (West)
	WM1	WM2	WM3	WM4
Number of samples	11	12	11	11
Temperature (°C)	24.2 (19.7 - 28.4)	23.9 (18.1 - 28.4)	24.2 (20.0 - 28.4)	24.4 (19.8 - 28.4)
Salinity	32.6 (31.0 - 33.8)	31.4 (28.9 - 33.6)	32.2 (30.8 - 33.5)	31.5 (29.1 - 33.5)
Dissolved Oxygen (mg/L)	5.0 (3.3 - 6.5)	5.0 (4.3 - 6.6)	4.7 (3.7 - 5.8)	4.6 (3.6 - 5.6)
Bottom	4.6 (1.9 - 7.5)	5.0 (3.7 - 8.0)	4.3 (2.4 - 6.0)	4.2 (2.4 - 6.0)
Dissolved Oxygen (% Saturation)	71 (49 - 96)	71 (62 - 87)	66 (53 - 86)	65 (52 - 81)
Bottom	65 (25 - 107)	71 (54 - 103)	61 (34 - 85)	60 (35 - 84)
pH	7.6 (7.2 - 7.9)	7.6 (7.2 - 7.9)	7.5 (7.2 - 7.9)	7.5 (7.2 - 7.9)
Secchi Disc Depth (m)	2.7 (1.8 - 4.8)	2.4 (1.5 - 4.0)	2.2 (1.3 - 3.6)	2.5 (1.6 - 4.4)
Turbidity (NTU)	8.0 (3.1 - 29.7)	6.4 (2.8 - 18.6)	9.0 (3.6 - 26.2)	6.5 (3.7 - 11.3)
Suspended Solids (mg/L)	5.6 (1.2 - 9.8)	5.7 (2.5 - 8.7)	6.8 (2.0 - 11.7)	6.5 (1.9 - 11.4)
5-day Biochemical Oxygen Demand (mg/L)	0.8 (0.4 - 1.6)	1.1 (0.4 - 2.8)	0.8 (0.2 - 1.8)	0.8 (0.3 - 1.5)
Ammonia Nitrogen (mg/L)	0.070 (0.033 - 0.124)	0.122 (0.044 - 0.213)	0.146 (0.068 - 0.257)	0.122 (0.056 - 0.210)
Unionised Ammonia (mg/L)	0.001 (<0.001 - 0.005)	0.002 (<0.001 - 0.005)	0.003 (<0.001 - 0.006)	0.002 (<0.001 - 0.007)
Nitrite Nitrogen (mg/L)	0.033 (<0.002 - 0.063)	0.038 (0.005 - 0.086)	0.040 (0.006 - 0.075)	0.043 (0.006 - 0.084)
Nitrate Nitrogen (mg/L)	0.086 (0.013 - 0.220)	0.153 (0.058 - 0.280)	0.134 (0.064 - 0.260)	0.177 (0.073 - 0.393)
Total Inorganic Nitrogen (mg/L)	0.19 (0.07 - 0.33)	0.31 (0.19 - 0.48)	0.32 (0.23 - 0.45)	0.34 (0.23 - 0.53)
Total Kjeldahl Nitrogen (mg/L)	0.63 (0.35 - 1.38)	0.74 (0.43 - 1.09)	0.64 (0.55 - 0.76)	0.60 (0.34 - 0.89)
Total Nitrogen (mg/L)	0.69 (0.39 - 1.50)	0.86 (0.54 - 1.24)	0.76 (0.65 - 0.85)	0.75 (0.46 - 1.16)
Orthophosphate Phosphorus (mg/L)	0.011 (0.006 - 0.017)	0.015 (0.006 - 0.024)	0.018 (0.008 - 0.024)	0.016 (0.003 - 0.027)
Total Phosphorus (mg/L)	0.06 (0.05 - 0.09)	0.07 (0.05 - 0.09)	0.08 (0.06 - 0.10)	0.09 (0.05 - 0.14)
Silica (as SiO ₂) (mg/L)	0.73 (0.37 - 1.17)	0.84 (0.19 - 1.57)	0.93 (0.46 - 1.43)	1.05 (0.40 - 2.13)
Chlorophyll <i>a</i> (µg/L)	4.0 (0.6 - 10.4)	5.9 (0.5 - 19.0)	3.4 (0.5 - 9.0)	3.9 (0.8 - 13.3)
<i>E. coli</i> (count/100mL)	31 (1 - 4900)	240 (8 - 11000)	970 (69 - 11000)	230 (16 - 7800)
Faecal Coliforms (count/100mL)	60 (1 - 12000)	420 (11 - 14000)	2000 (130 - 26000)	450 (31 - 17000)

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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained. Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the Junk Bay WCZ in 2021

Parameter	Junk Bay	
	JM3	JM4
Number of samples	11	12
Temperature (°C)	24.0 (19.2 - 29.1)	23.3 (18.1 - 29.1)
Salinity	32.9 (31.5 - 33.7)	33.0 (31.3 - 33.7)
Dissolved Oxygen (mg/L)	5.1 (4.3 - 6.1)	5.2 (4.0 - 6.4)
Bottom	5.0 (2.7 - 6.5)	5.0 (2.5 - 6.6)
Dissolved Oxygen (% Saturation)	73 (64 - 84)	73 (59 - 89)
Bottom	71 (39 - 91)	71 (36 - 90)
pH	7.6 (7.4 - 7.9)	7.6 (7.3 - 7.9)
Secchi Disc Depth (m)	2.7 (1.4 - 4.2)	2.9 (2.0 - 4.8)
Turbidity (NTU)	5.6 (2.9 - 14.4)	5.8 (2.9 - 13.7)
Suspended Solids (mg/L)	6.5 (1.8 - 15.3)	5.1 (1.8 - 13.1)
5-day Biochemical Oxygen Demand (mg/L)	0.8 (0.2 - 1.5)	0.7 (0.2 - 2.2)
Ammonia Nitrogen (mg/L)	0.061 (0.024 - 0.130)	0.058 (0.037 - 0.140)
Unionised Ammonia (mg/L)	0.001 (<0.001 - 0.005)	0.001 (<0.001 - 0.005)
Nitrite Nitrogen (mg/L)	0.021 (0.002 - 0.043)	0.021 (<0.002 - 0.053)
Nitrate Nitrogen (mg/L)	0.075 (0.020 - 0.267)	0.089 (0.009 - 0.263)
Total Inorganic Nitrogen (mg/L)	0.16 (0.07 - 0.43)	0.17 (0.05 - 0.44)
Total Kjeldahl Nitrogen (mg/L)	0.43 (0.20 - 0.64)	0.47 (0.14 - 0.62)
Total Nitrogen (mg/L)	0.49 (0.31 - 0.68)	0.57 (0.29 - 0.72)
Orthophosphate Phosphorus (mg/L)	0.011 (0.007 - 0.022)	0.013 (0.006 - 0.022)
Total Phosphorus (mg/L)	0.04 (0.03 - 0.05)	0.05 (0.03 - 0.07)
Silica (as SiO ₂) (mg/L)	0.62 (0.32 - 1.50)	0.66 (0.39 - 1.43)
Chlorophyll- <i>a</i> (µg/L)	6.1 (1.0 - 19.0)	4.8 (1.0 - 10.7)
<i>E. coli</i> (count/100mL)	18 (4 - 120)	42 (9 - 130)
Faecal Coliforms (count/100mL)	47 (4 - 480)	88 (19 - 530)

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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained. Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the Deep Bay WCZ in 2021

Parameter	Inner Deep Bay			Outer Deep Bay	
	DM1	DM2	DM3	DM4	DM5
Number of samples	11	11	12	11	11
Temperature (°C)	26.4 (17.6 - 32.6)	26.7 (18.2 - 32.9)	26.0 (19.1 - 31.7)	26.7 (20.6 - 31.0)	26.2 (20.7 - 29.5)
Salinity	16.2 (9.4 - 22.2)	18.8 (9.8 - 26.5)	23.0 (14.1 - 30.2)	23.9 (14.7 - 32.2)	26.6 (20.1 - 33.2)
Dissolved Oxygen (mg/L)	5.5 (4.0 - 7.7)	6.0 (4.4 - 10.1)	5.8 (4.8 - 9.8)	5.3 (4.4 - 8.4)	5.1 (4.3 - 6.5)
	Bottom	N/A	N/A	5.1 (4.1 - 9.5)	4.8 (4.0 - 6.6)
Dissolved Oxygen (% Saturation)	74 (56 - 101)	83 (65 - 125)	81 (69 - 127)	75 (65 - 113)	73 (64 - 89)
	Bottom	N/A	N/A	73 (61 - 128)	69 (59 - 91)
pH	7.3 (6.9 - 7.8)	7.4 (6.9 - 7.9)	7.6 (7.1 - 8.0)	7.6 (7.1 - 7.9)	7.6 (7.2 - 7.9)
Secchi Disc Depth (m)	1.0 (0.9 - 1.3)	1.1 (0.7 - 1.5)	1.4 (0.9 - 2.1)	1.8 (1.2 - 2.4)	1.9 (1.5 - 2.3)
Turbidity (NTU)	23.6 (9.8 - 38.0)	33.6 (10.7 - 146.0)	18.3 (4.9 - 116.0)	9.1 (4.3 - 18.3)	6.4 (3.6 - 9.5)
Suspended Solids (mg/L)	29.5 (13.0 - 57.0)	29.0 (6.4 - 70.0)	9.8 (2.8 - 20.0)	6.6 (1.6 - 11.7)	6.0 (2.4 - 12.9)
5-day Biochemical Oxygen Demand (mg/L)	2.5 (1.1 - 12.0)	2.4 (0.4 - 9.0)	2.3 (0.5 - 9.2)	1.0 (0.5 - 2.1)	1.1 (0.3 - 4.6)
Ammonia Nitrogen (mg/L)	0.417 (0.150 - 0.950)	0.267 (0.041 - 1.000)	0.137 (0.030 - 0.340)	0.123 (0.014 - 0.465)	0.098 (0.033 - 0.270)
Unionised Ammonia (mg/L)	0.005 (0.002 - 0.009)	0.004 (<0.001 - 0.011)	0.003 (<0.001 - 0.007)	0.003 (<0.001 - 0.012)	0.002 (<0.001 - 0.008)
Nitrite Nitrogen (mg/L)	0.152 (0.060 - 0.260)	0.102 (0.026 - 0.180)	0.076 (0.013 - 0.130)	0.074 (0.022 - 0.135)	0.071 (0.010 - 0.130)
Nitrate Nitrogen (mg/L)	1.260 (0.490 - 2.700)	0.965 (0.350 - 2.400)	0.598 (0.069 - 2.000)	0.532 (0.043 - 1.250)	0.440 (0.073 - 1.070)
Total Inorganic Nitrogen (mg/L)	1.83 (0.82 - 3.41)	1.33 (0.50 - 2.81)	0.81 (0.15 - 2.20)	0.73 (0.10 - 1.42)	0.61 (0.19 - 1.22)
Total Kjeldahl Nitrogen (mg/L)	0.75 (0.51 - 0.86)	0.63 (0.40 - 0.94)	0.76 (0.27 - 1.20)	0.58 (0.29 - 1.15)	0.75 (0.24 - 1.53)
Total Nitrogen (mg/L)	1.95 (1.55 - 2.23)	1.48 (1.19 - 2.33)	1.11 (0.67 - 1.39)	0.95 (0.63 - 1.61)	1.01 (0.51 - 1.89)
Orthophosphate Phosphorus (mg/L)	0.159 (0.110 - 0.220)	0.110 (0.056 - 0.170)	0.052 (0.006 - 0.110)	0.036 (0.004 - 0.110)	0.023 (0.007 - 0.055)
Total Phosphorus (mg/L)	0.20 (0.14 - 0.26)	0.18 (0.11 - 0.28)	0.13 (0.06 - 0.23)	0.08 (0.03 - 0.12)	0.08 (0.03 - 0.12)
Silica (as SiO ₂) (mg/L)	6.18 (1.40 - 11.00)	4.68 (0.70 - 8.50)	2.91 (0.09 - 4.80)	2.75 (0.11 - 4.95)	2.06 (0.31 - 4.47)
Chlorophyll-a (µg/L)	8.3 (1.7 - 15.0)	11.0 (2.1 - 43.0)	16.4 (1.1 - 76.0)	5.8 (1.1 - 23.5)	7.8 (1.6 - 50.0)
<i>E. coli</i> (count/100mL)	160 (23 - 1600)	56 (9 - 3200)	7 (1 - 220)	16 (1 - 1700)	11 (2 - 6300)
Faecal Coliforms (count/100mL)	400 (86 - 3000)	120 (11 - 6000)	16 (2 - 580)	38 (2 - 6600)	28 (5 - 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.

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

5. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained. Full scale monitoring was conducted in the periods of February to December 2021.

Summary of water quality statistics for the North Western WCZ in 2021

Parameter	Lantau Island				Chek Lap Kok	
	(North) NM1	Pearl Island NM2	Pillar Point NM3	Urmston Road NM5	(North) NM6	(West) NM8
Number of samples	11	11	12	11	11	11
Temperature (°C)	24.5 (19.3 - 26.8)	24.8 (19.5 - 27.9)	24.1 (18.1 - 27.6)	24.8 (19.6 - 27.9)	25.0 (20.0 - 28.4)	24.9 (19.4 - 29.0)
Salinity	30.6 (27.1 - 33.5)	29.3 (22.9 - 33.5)	29.1 (24.0 - 33.4)	28.1 (21.3 - 33.3)	27.0 (19.3 - 33.2)	28.5 (16.6 - 33.7)
Dissolved Oxygen (mg/L)	4.8 (3.5 - 6.3)	4.9 (4.1 - 5.7)	5.1 (4.1 - 6.4)	5.0 (4.0 - 6.4)	5.2 (4.2 - 6.2)	5.2 (4.2 - 6.5)
	Bottom					
	4.2 (2.2 - 6.3)	4.9 (3.3 - 6.7)	4.9 (3.5 - 6.9)	4.6 (2.5 - 7.1)	5.1 (3.9 - 6.6)	5.1 (3.4 - 6.9)
Dissolved Oxygen (% Saturation)	67 (51 - 83)	70 (59 - 82)	71 (60 - 86)	69 (52 - 88)	73 (63 - 86)	73 (59 - 93)
	Bottom					
	59 (31 - 85)	69 (47 - 90)	68 (51 - 87)	65 (36 - 93)	72 (57 - 91)	73 (51 - 99)
pH	7.5 (7.2 - 7.9)	7.5 (7.2 - 7.9)	7.6 (7.2 - 8.0)	7.5 (7.2 - 8.0)	7.6 (7.2 - 8.0)	7.6 (7.3 - 8.0)
Secchi Disc Depth (m)	2.8 (1.5 - 5.2)	2.3 (1.7 - 3.5)	2.3 (1.5 - 3.0)	2.0 (1.6 - 2.4)	2.0 (1.5 - 2.5)	1.7 (1.0 - 2.5)
Turbidity (NTU)	6.5 (3.0 - 11.5)	6.0 (2.9 - 11.5)	12.2 (3.3 - 78.8)	10.9 (4.3 - 29.3)	7.7 (3.9 - 11.3)	14.4 (6.7 - 43.0)
Suspended Solids (mg/L)	6.1 (1.6 - 12.8)	4.9 (1.6 - 9.4)	5.1 (1.5 - 9.6)	7.1 (2.2 - 12.7)	6.4 (3.7 - 12.7)	14.2 (3.4 - 42.3)
5-day Biochemical Oxygen Demand (mg/L)	1.0 (0.2 - 2.8)	1.3 (0.2 - 4.9)	1.2 (0.3 - 2.8)	1.1 (0.5 - 2.6)	1.7 (0.5 - 6.4)	1.0 (0.2 - 2.7)
Ammonia Nitrogen (mg/L)	0.100 (0.041 - 0.173)	0.090 (0.038 - 0.167)	0.089 (0.048 - 0.170)	0.085 (0.034 - 0.163)	0.084 (0.035 - 0.200)	0.050 (0.024 - 0.095)
Unionised Ammonia (mg/L)	0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.007)	<0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)	0.053 (0.003 - 0.108)	0.063 (0.004 - 0.117)	0.062 (0.004 - 0.123)	0.070 (0.003 - 0.133)	0.070 (0.010 - 0.140)	0.052 (0.002 - 0.127)
Nitrate Nitrogen (mg/L)	0.216 (0.051 - 0.477)	0.280 (0.047 - 0.617)	0.315 (0.062 - 0.787)	0.379 (0.057 - 0.920)	0.409 (0.065 - 0.913)	0.319 (0.007 - 1.050)
Total Inorganic Nitrogen (mg/L)	0.37 (0.20 - 0.64)	0.43 (0.21 - 0.76)	0.47 (0.21 - 0.93)	0.53 (0.21 - 1.07)	0.56 (0.16 - 1.05)	0.42 (0.08 - 1.15)
Total Kjeldahl Nitrogen (mg/L)	0.69 (0.43 - 0.96)	0.61 (0.35 - 0.95)	0.56 (0.46 - 0.70)	0.55 (0.35 - 0.80)	0.60 (0.31 - 1.00)	0.55 (0.27 - 0.89)
Total Nitrogen (mg/L)	0.83 (0.63 - 1.09)	0.78 (0.59 - 1.11)	0.76 (0.64 - 0.92)	0.77 (0.63 - 0.98)	0.86 (0.57 - 1.32)	0.66 (0.37 - 1.03)
Orthophosphate Phosphorus (mg/L)	0.014 (0.007 - 0.026)	0.014 (0.003 - 0.027)	0.013 (<0.002 - 0.026)	0.016 (0.003 - 0.031)	0.014 (<0.002 - 0.026)	0.009 (0.005 - 0.015)
Total Phosphorus (mg/L)	0.05 (0.04 - 0.08)	0.06 (0.04 - 0.09)	0.06 (0.03 - 0.09)	0.06 (0.03 - 0.09)	0.06 (0.03 - 0.10)	0.06 (0.03 - 0.08)
Silica (as SiO ₂) (mg/L)	1.07 (0.34 - 1.80)	1.29 (0.34 - 2.10)	1.36 (0.30 - 2.67)	1.75 (0.37 - 3.43)	1.72 (0.32 - 3.17)	1.53 (0.50 - 3.83)
Chlorophyll- <i>a</i> (µg/L)	4.2 (0.4 - 12.5)	4.8 (0.8 - 15.5)	5.1 (0.6 - 12.1)	4.9 (1.0 - 14.6)	8.3 (0.9 - 26.7)	5.9 (1.0 - 17.7)
<i>E. coli</i> (count/100mL)	95 (8 - 590)	31 (6 - 350)	25 (4 - 290)	14 (3 - 160)	4 (1 - 80)	2 (<1 - 7)
Faecal Coliforms (count/100mL)	170 (18 - 910)	59 (14 - 610)	51 (10 - 660)	29 (6 - 450)	8 (2 - 120)	3 (1 - 11)

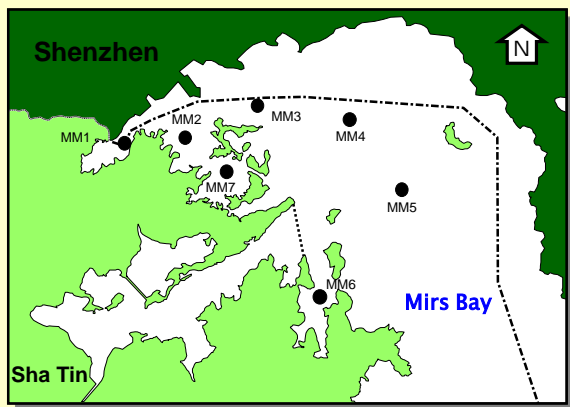
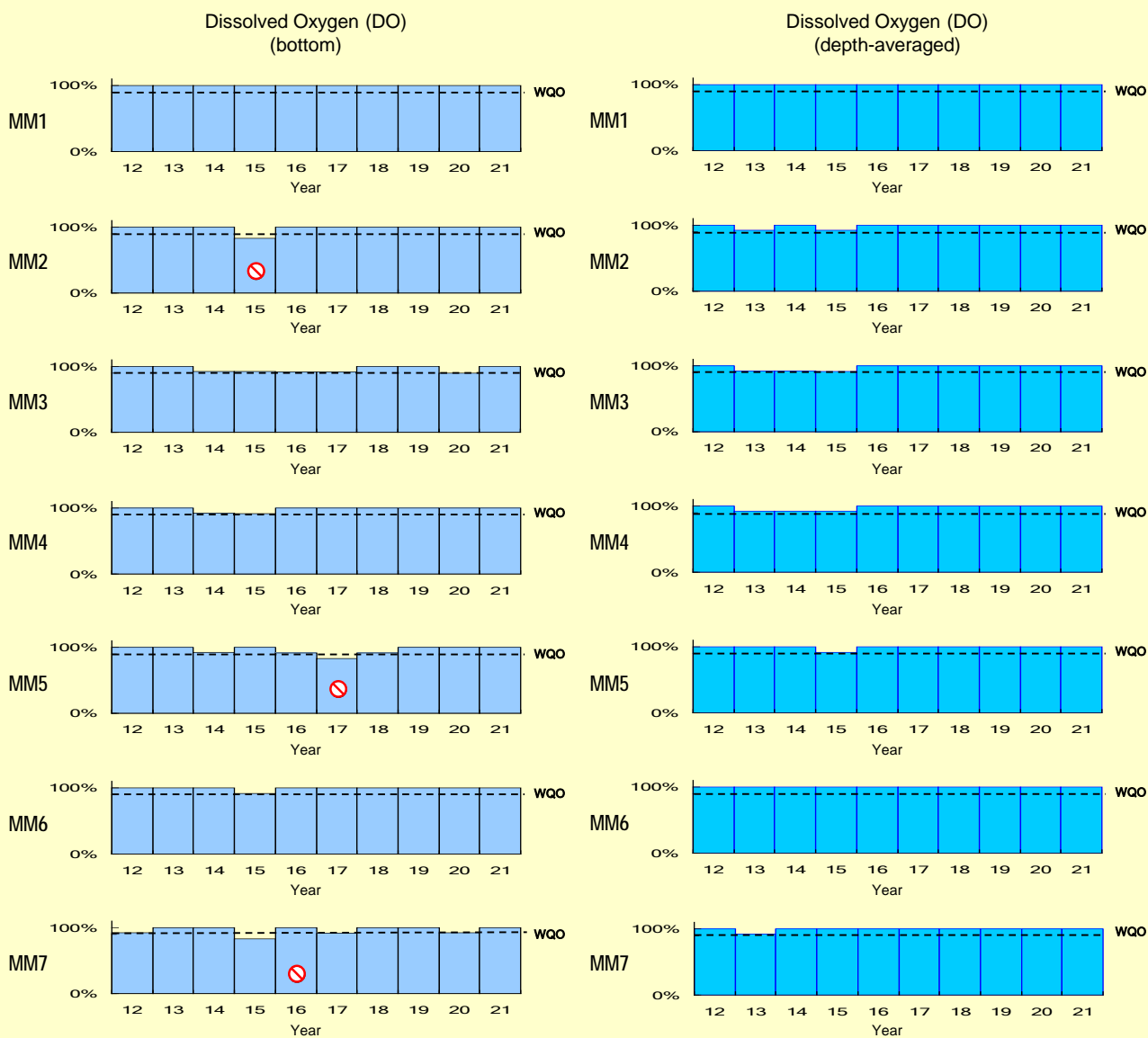
Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

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. During the periods of the special work arrangement under the COVID-19 pandemic in 2021, marine water quality monitoring frequency was adjusted and sampling at representative monitoring stations were maintained. Full scale monitoring was conducted in the periods of February to December 2021.

WQO compliance rates for the Mirs Bay WCZ

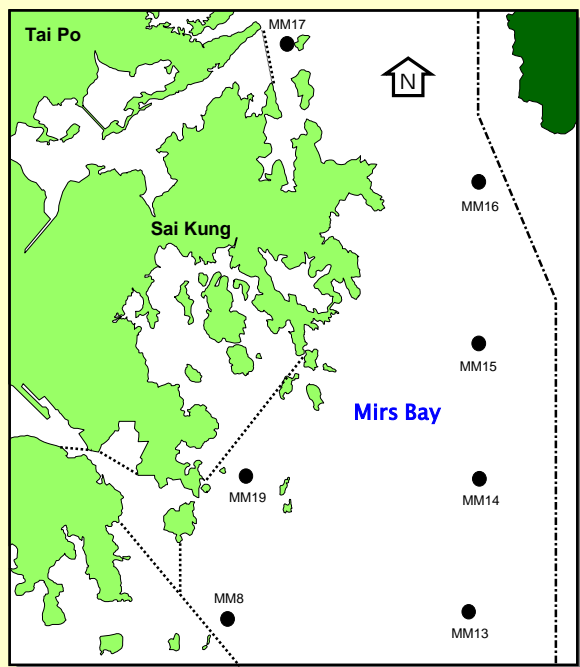
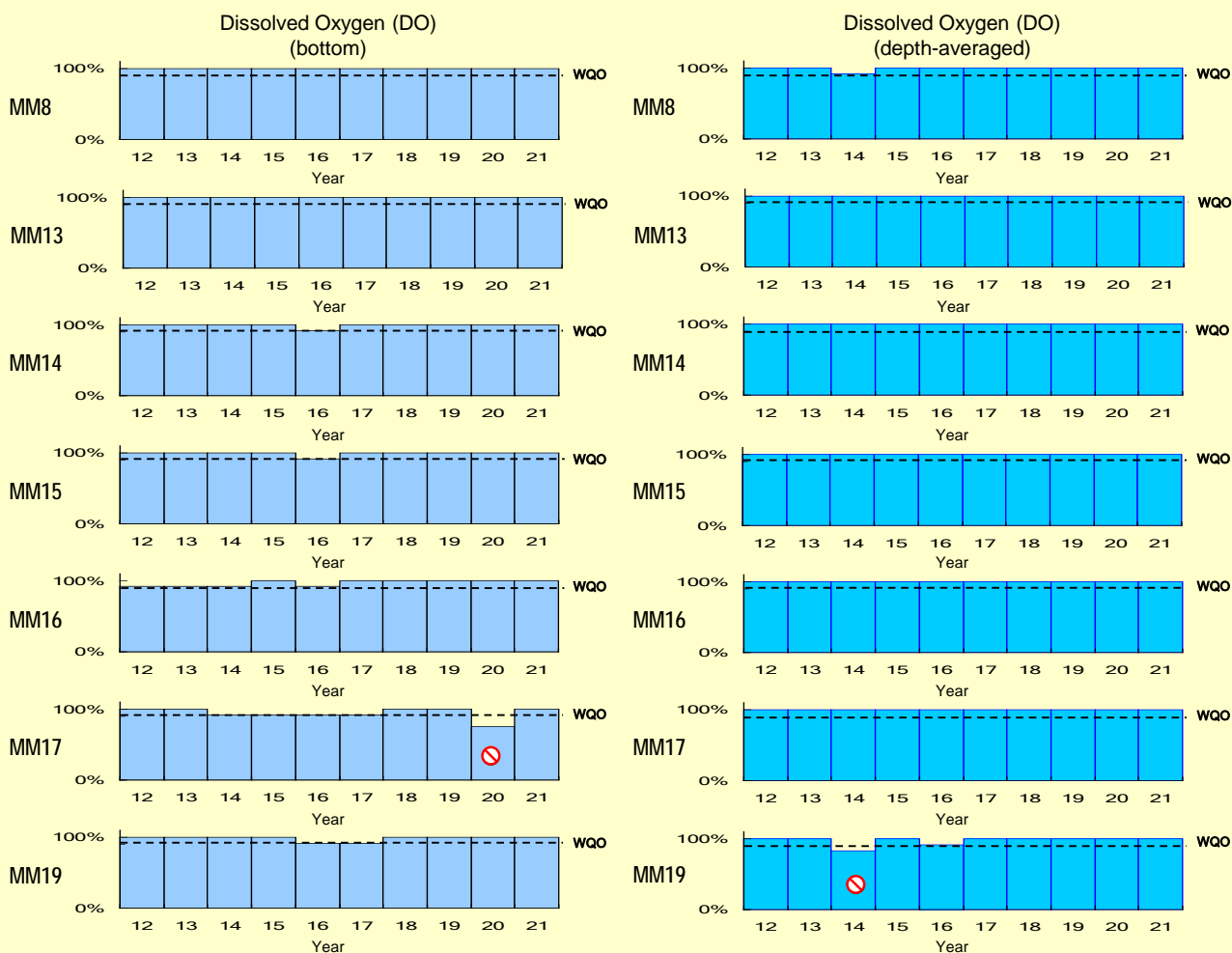


Dissolved Oxygen (DO)

- Bottom**
 WQO: 90% sample with bottom DO \geq 2 mg/L
 % sample with bottom DO \geq 2 mg/L
- Depth-averaged**
 WQO: 90% sample with depth-averaged DO \geq 4 mg/L
 % sample with depth-averaged DO \geq 4 mg/L

Non-compliance

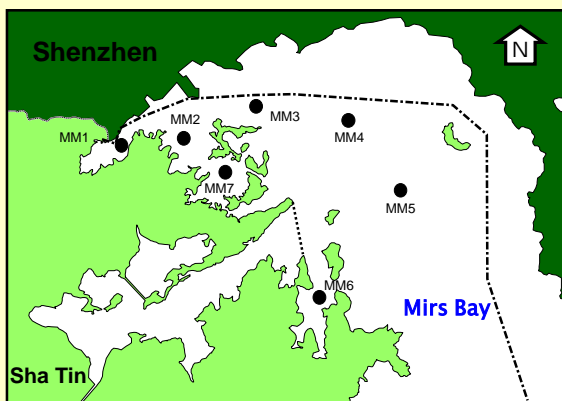
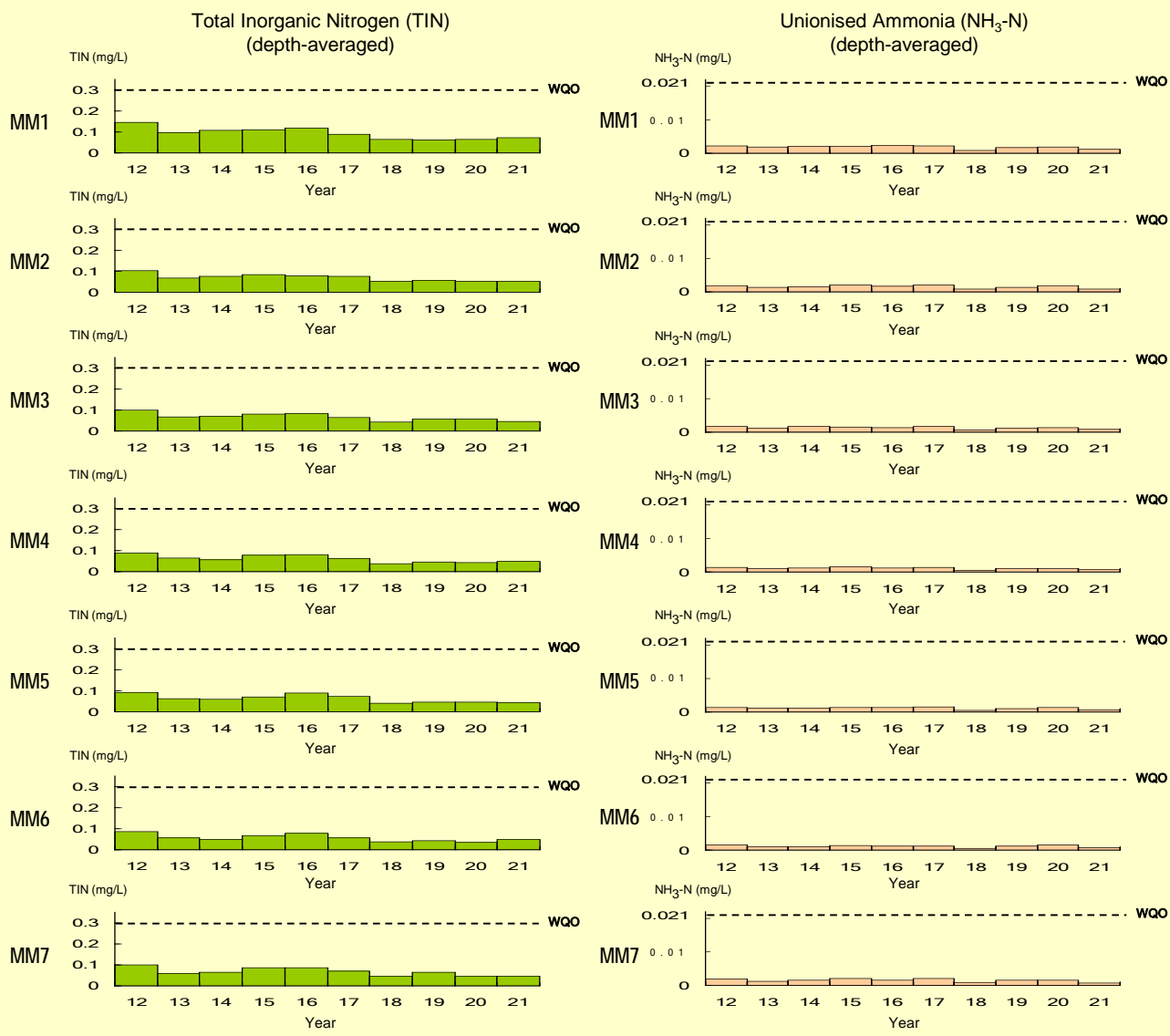
WQO compliance rates for the Mirs Bay WCZ (continued)



Dissolved Oxygen (DO)

- Bottom**
 WQO: 90% sample with bottom DO \geq 2 mg/L
 Legend: Blue bar = % sample with bottom DO \geq 2 mg/L. Red 'no' symbol = Non-compliance.
- Depth-averaged**
 WQO: 90% sample with depth-averaged DO \geq 4 mg/L
 Legend: Cyan bar = % sample with depth-averaged DO \geq 4 mg/L. Red 'no' symbol = Non-compliance.

WQO compliance rates for the Mirs Bay WCZ (continued)



Total Inorganic Nitrogen (TIN)

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

■ annual mean for depth-averaged TIN

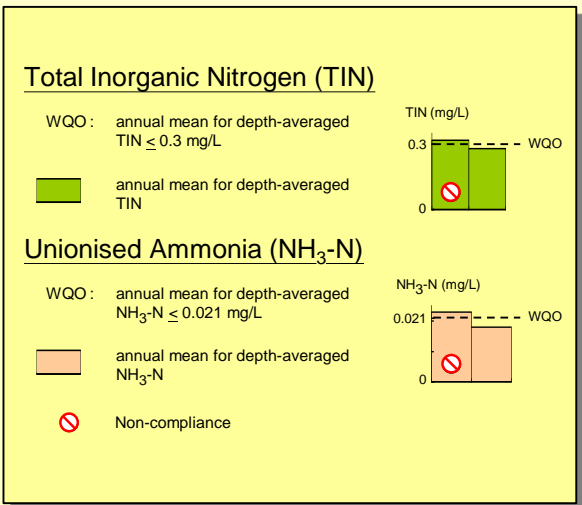
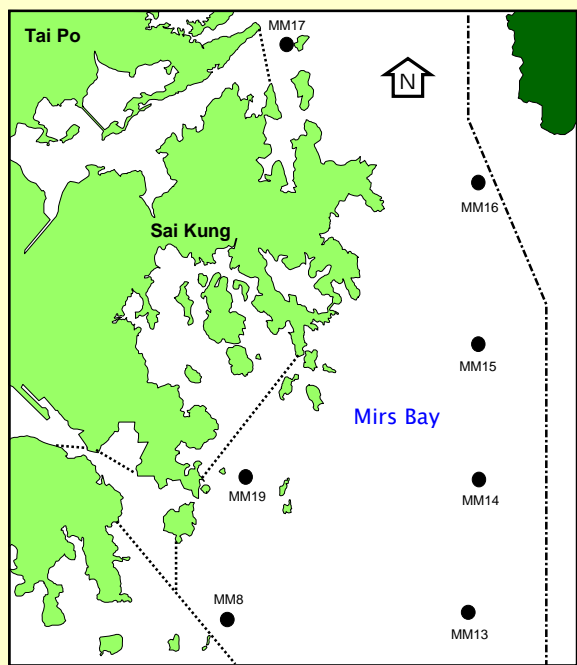
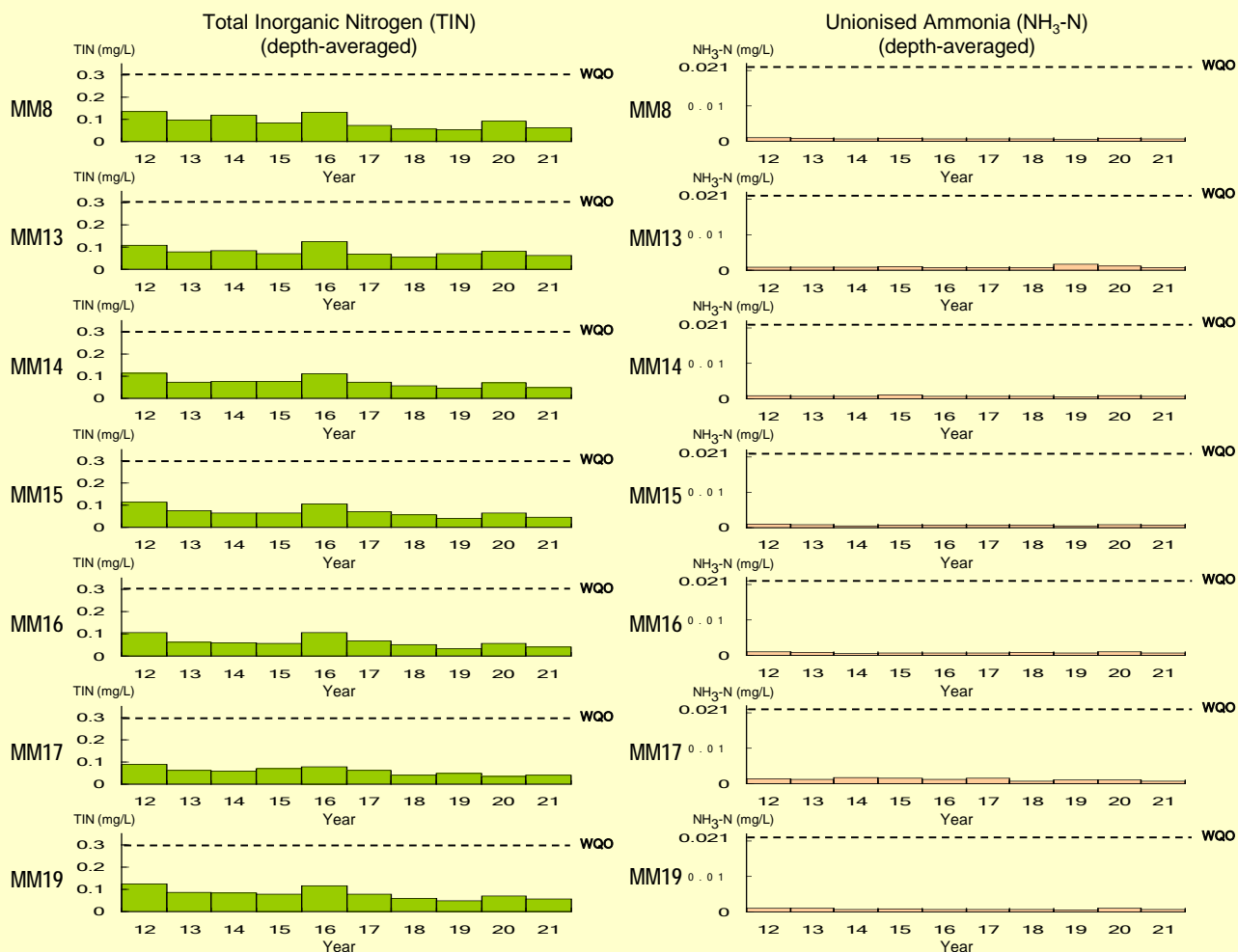
Unionised Ammonia (NH₃-N)

WQO: annual mean for depth-averaged NH₃-N ≤ 0.021 mg/L

■ annual mean for depth-averaged NH₃-N

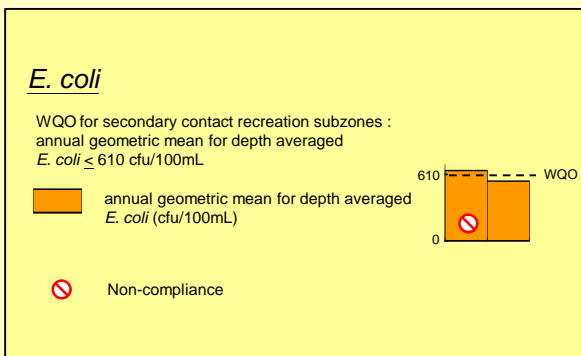
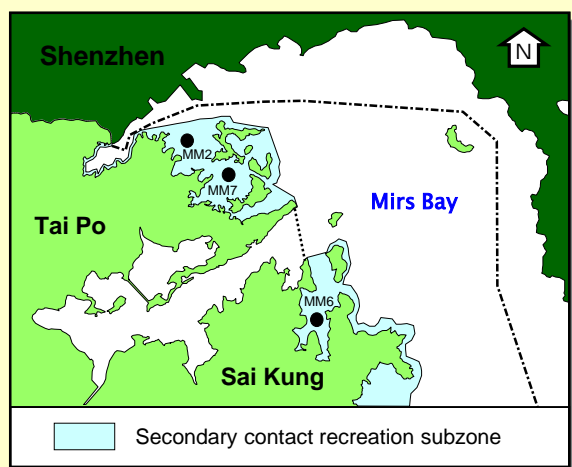
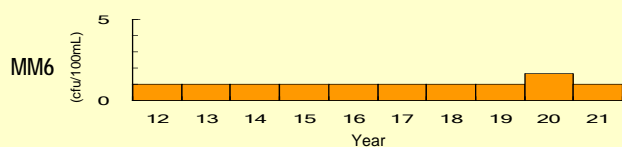
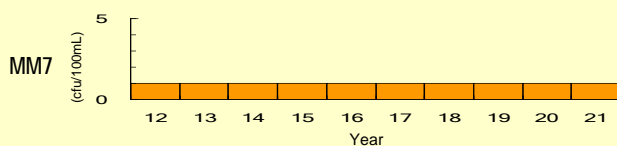
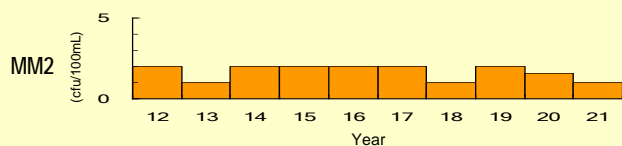
⊘ Non-compliance

WQO compliance rates for the Mirs Bay WCZ (continued)



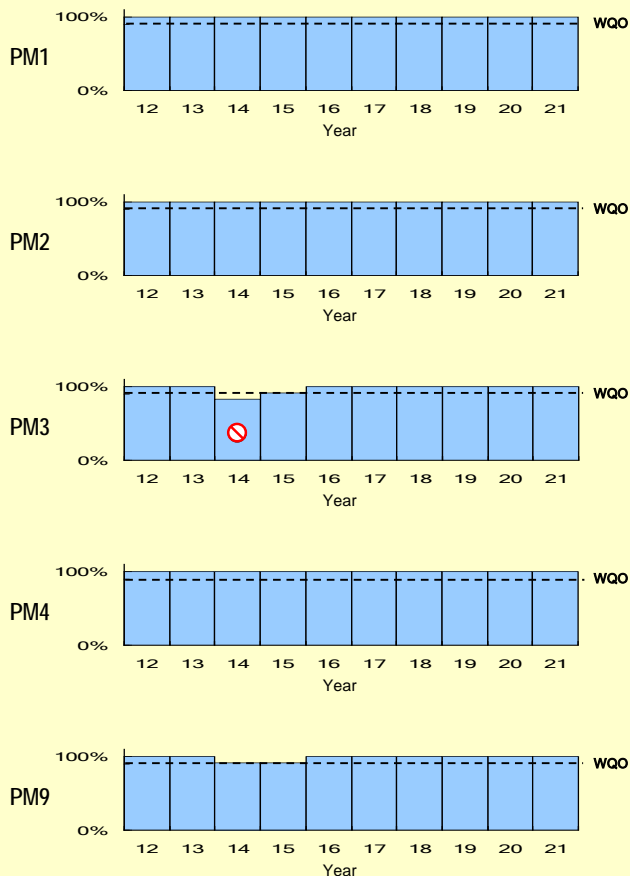
WQO compliance rates for the Mirs Bay WCZ (continued)

E. coli
(annual geometric mean)

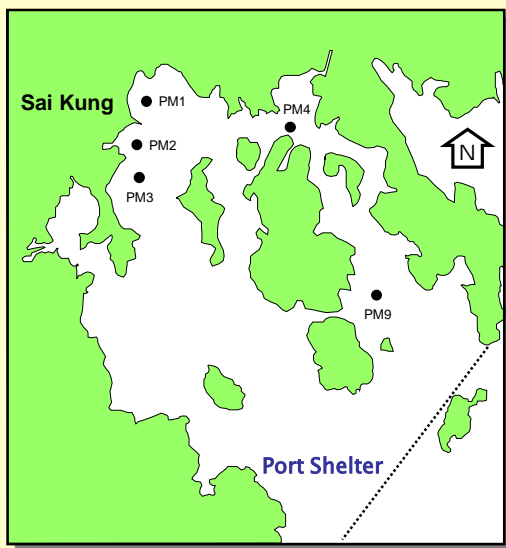
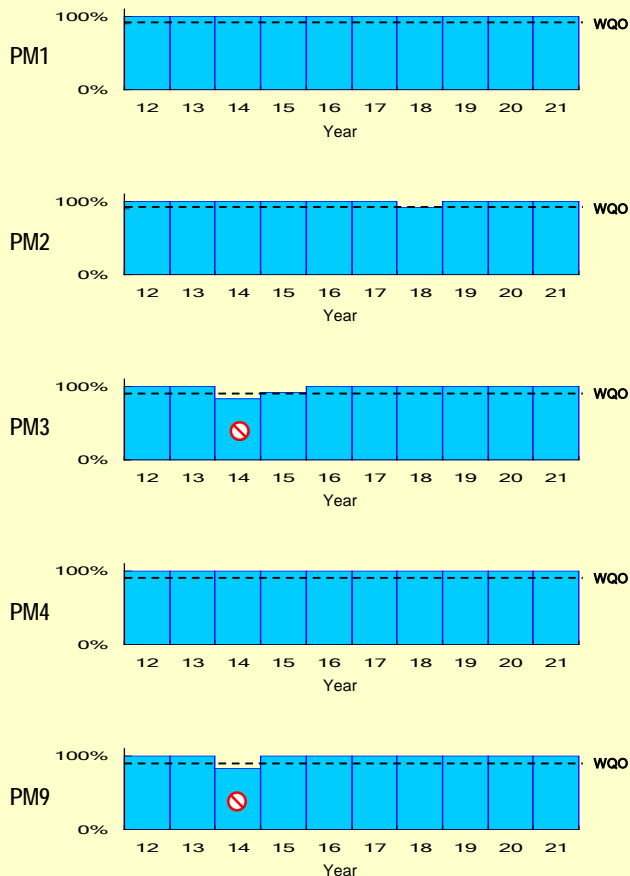


WQO compliance rates for the Port Shelter WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

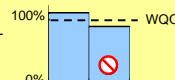


Dissolved Oxygen (DO)

1. Bottom

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

% sample with bottom DO \geq 2 mg/L



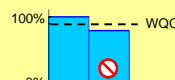
2. Depth-averaged

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

% sample with depth-averaged DO \geq 4 mg/L

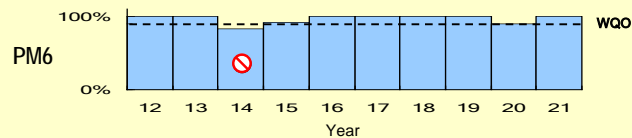


Non-compliance

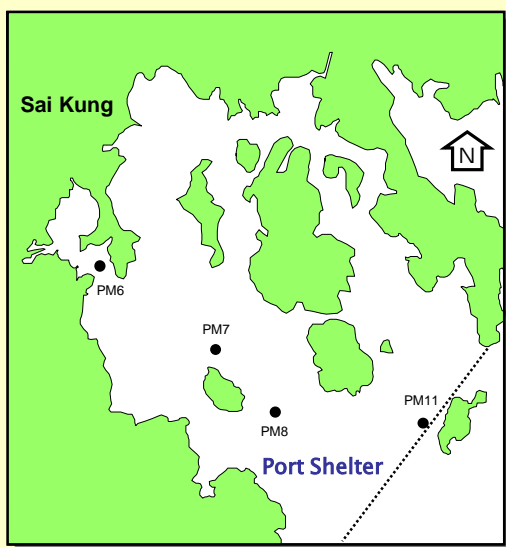
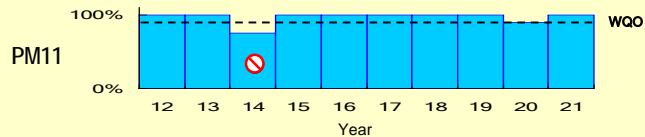
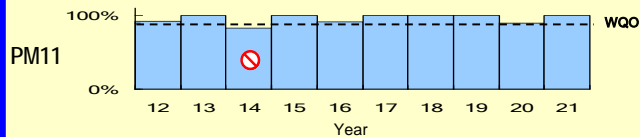
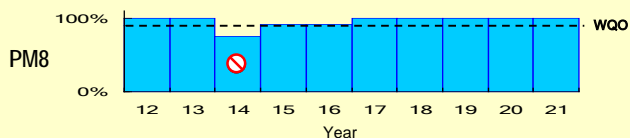
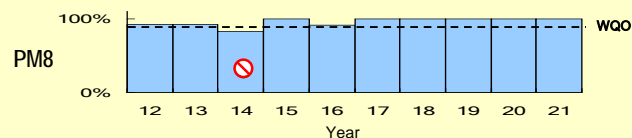
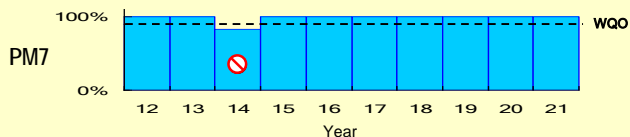
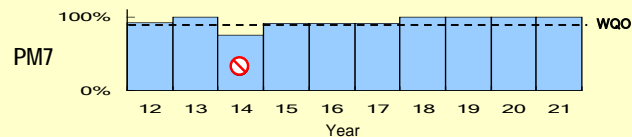
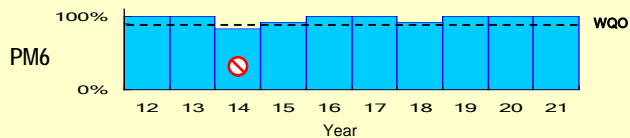


WQO compliance rates for the Port Shelter WCZ (continued)

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

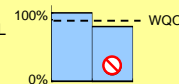


Dissolved Oxygen (DO)

1. Bottom

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

% sample with bottom DO \geq 2 mg/L

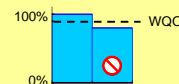


2. Depth-averaged

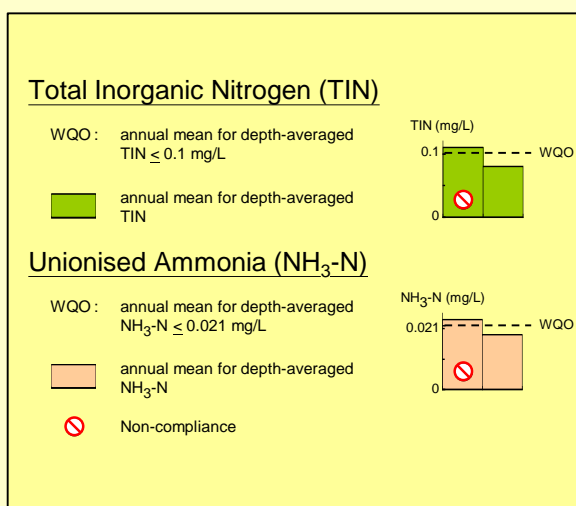
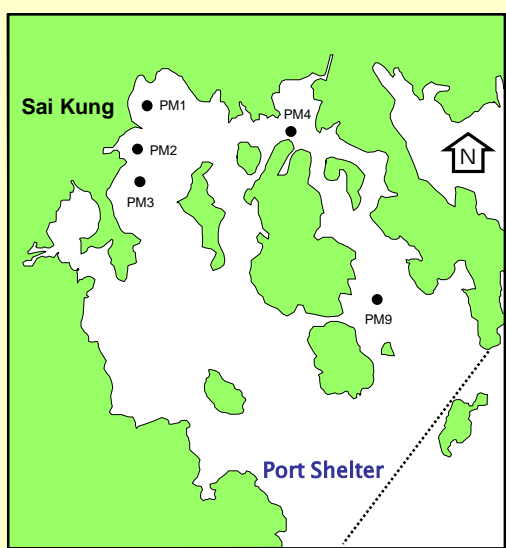
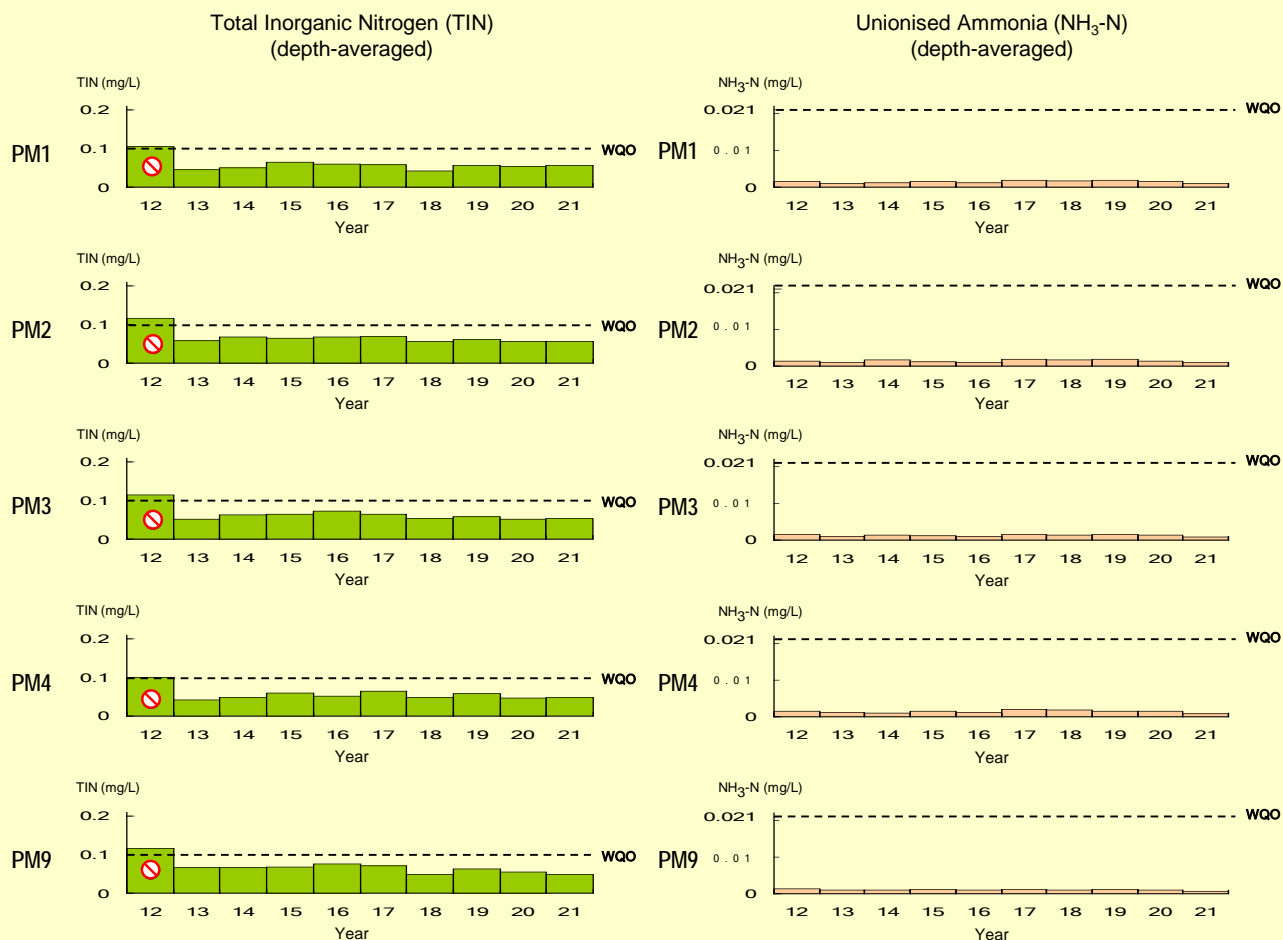
WQO : 90% sample with depth-averaged DO \geq 4 mg/L

% sample with depth-averaged DO \geq 4 mg/L

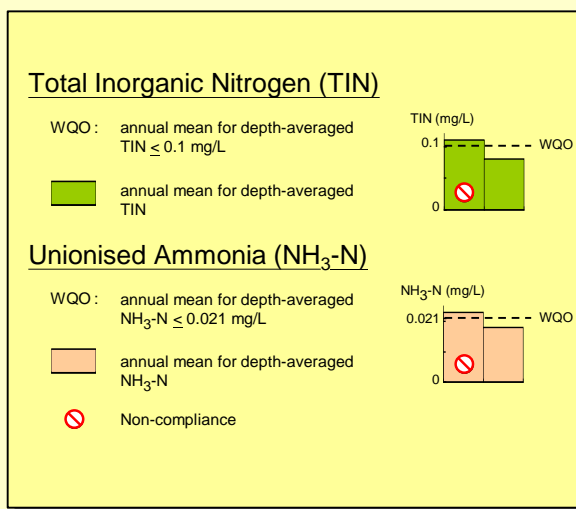
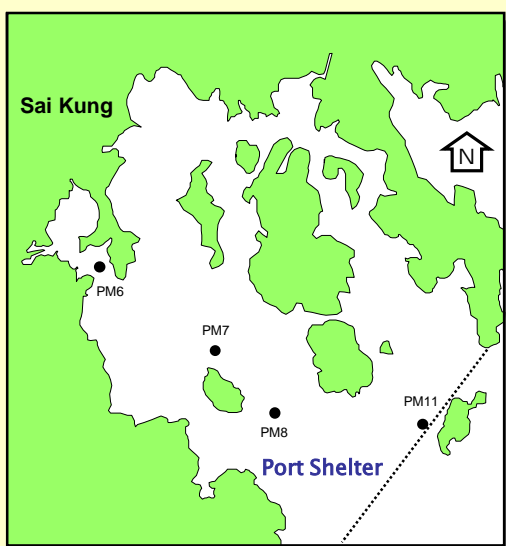
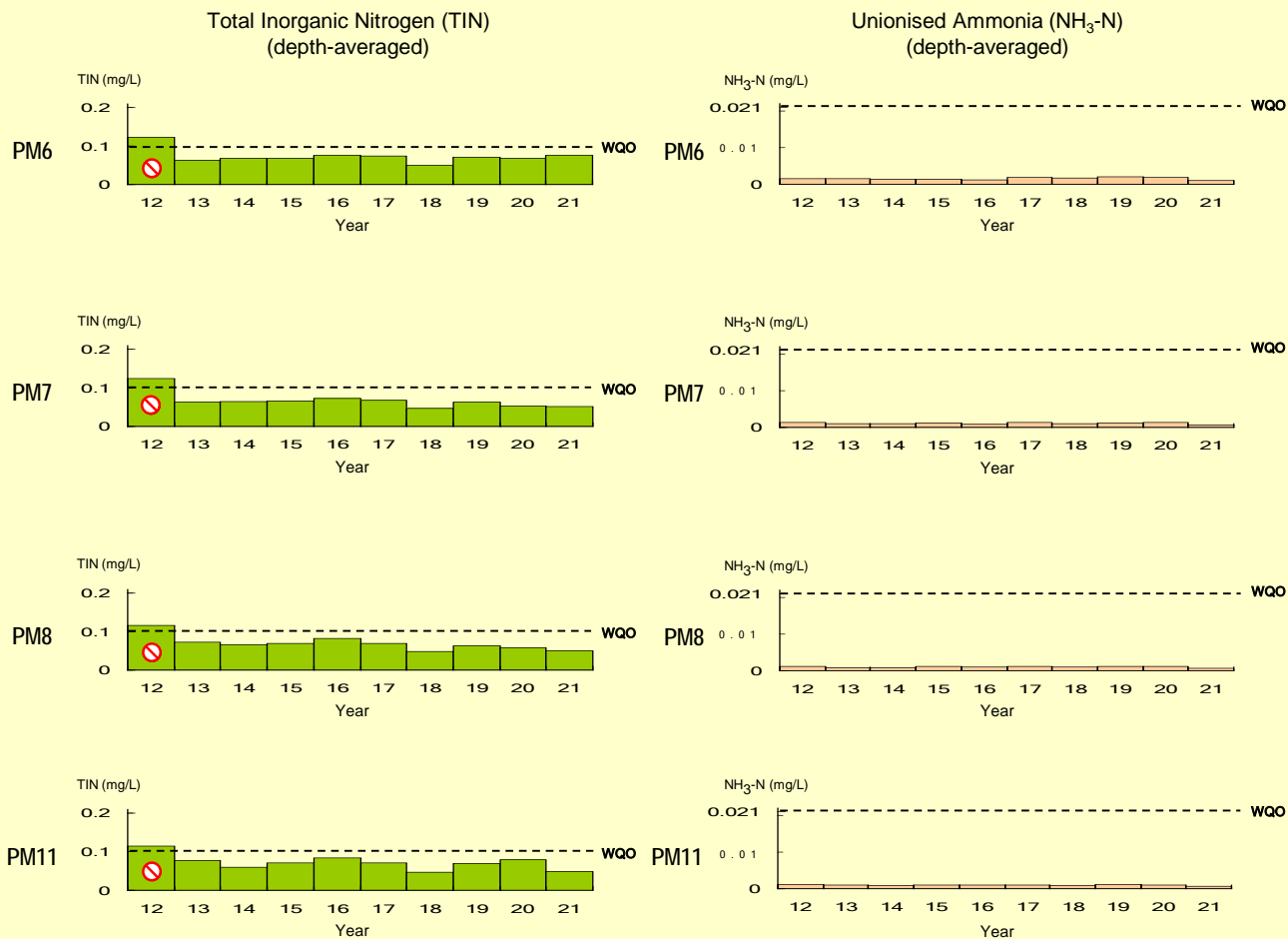
⊘ Non-compliance



WQO compliance rates for the Port Shelter WCZ (continued)

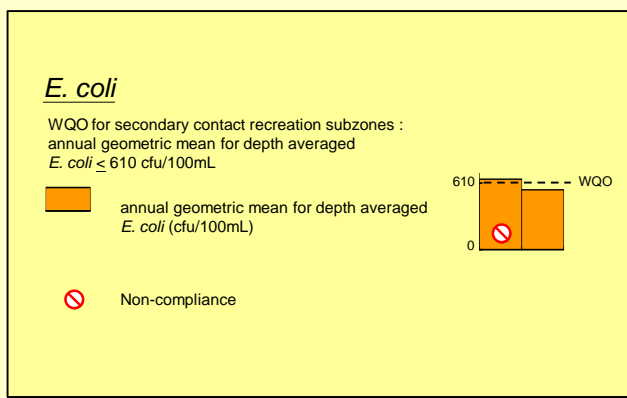
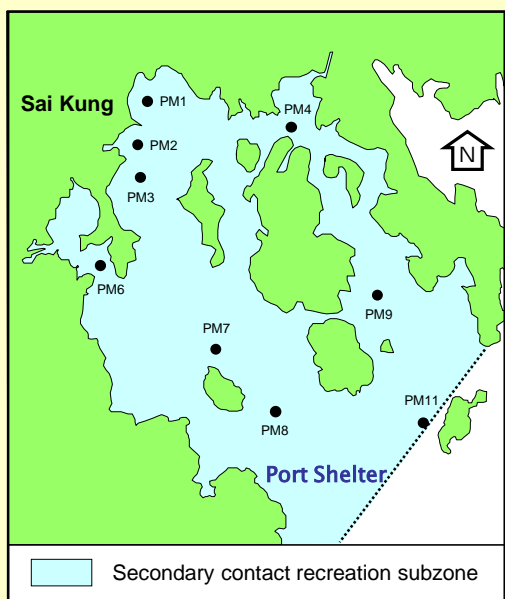
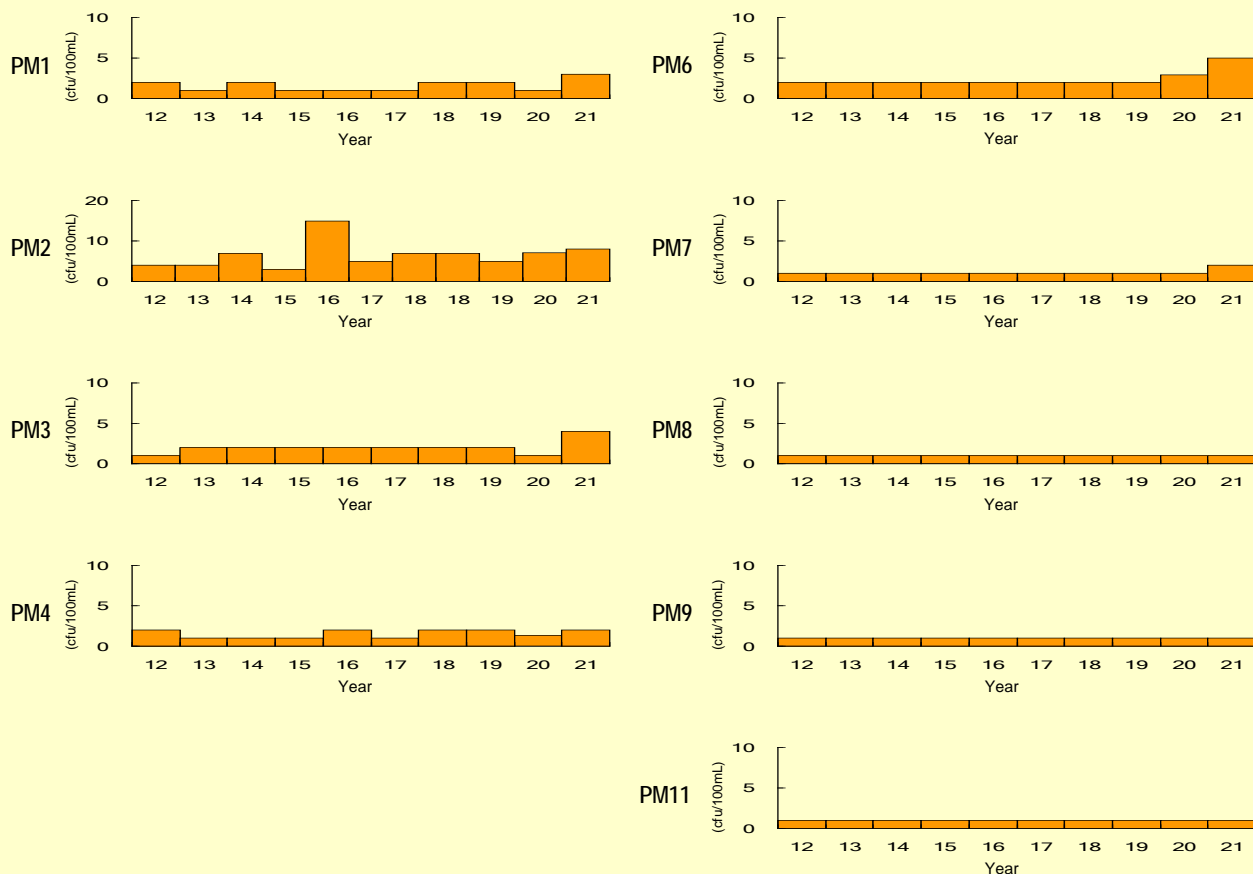


WQO compliance rates for the Port Shelter WCZ (continued)

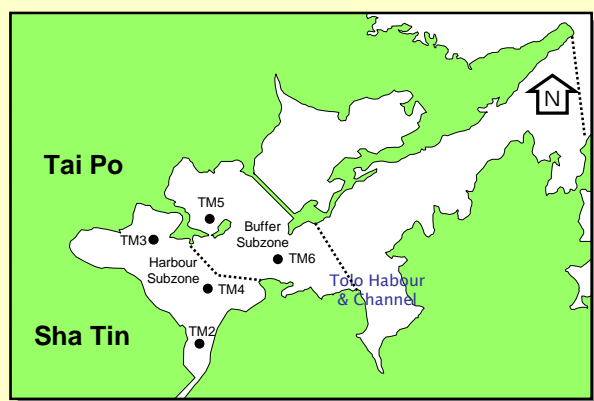
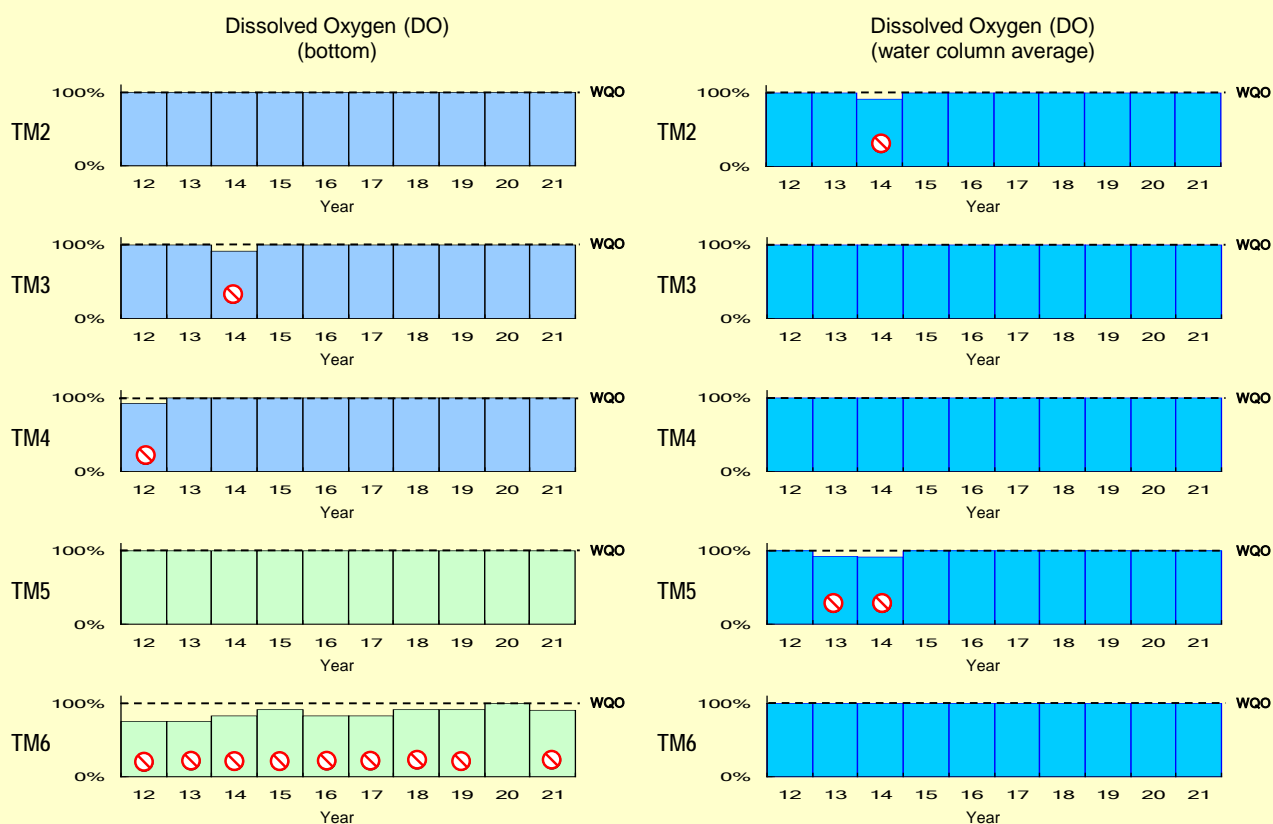


WQO compliance rates for the Port Shelter WCZ (continued)

E. coli
(annual geometric mean)



WQO compliance rates for the Tolo Harbour and Channel WCZ



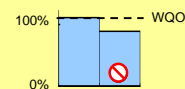
Dissolved Oxygen (DO)

Harbour Subzone (TM2 - TM4)

1. Bottom

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

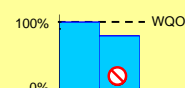
% sample with bottom DO \geq 2 mg/L



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

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

% sample with water column average DO \geq 4 mg/L

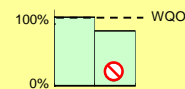


Buffer Subzone (TM5 - TM6)

1. Bottom

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

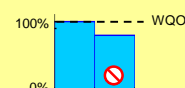
% sample with bottom DO \geq 3 mg/L



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

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

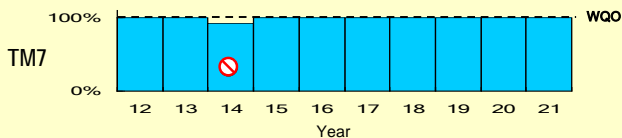
% sample with water column average DO \geq 4 mg/L



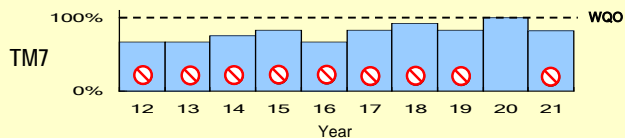
Non-compliance

WQO compliance rates for the Tolo Harbour and Channel WCZ (continued)

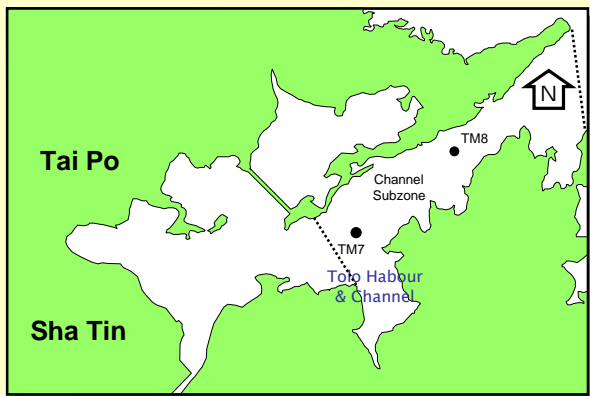
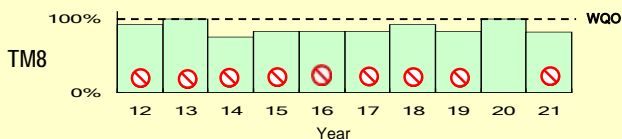
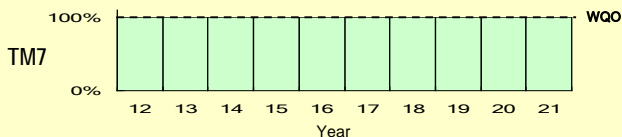
Dissolved Oxygen (DO)
(surface)



Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(middle)



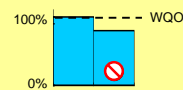
Dissolved Oxygen (DO)

Channel Subzone (TM7 - TM8)

1. Surface

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

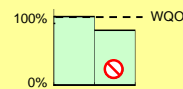
█ % sample with surface DO \geq 4 mg/L



2. Middle

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

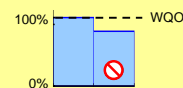
█ % sample with middle DO \geq 4 mg/L



3. Bottom

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

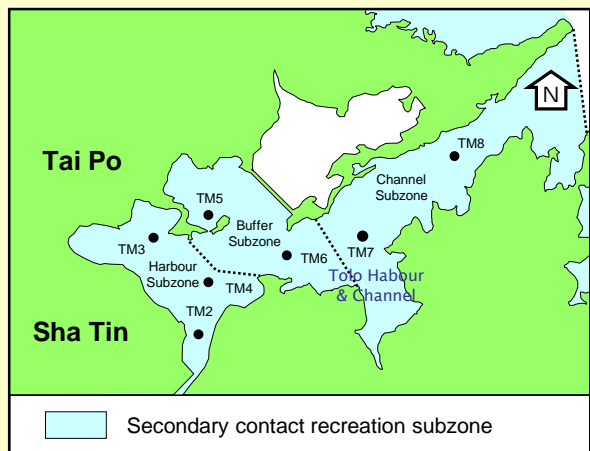
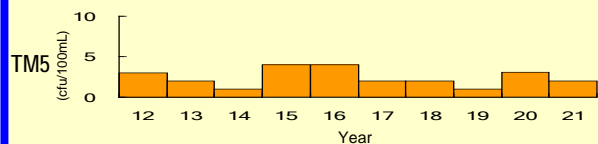
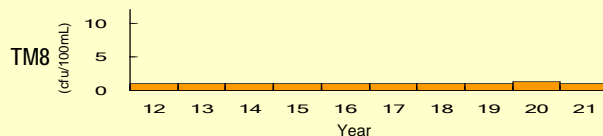
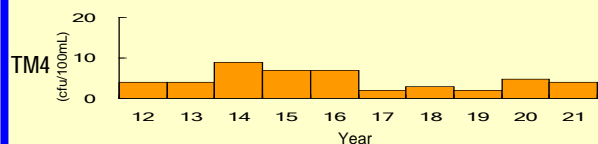
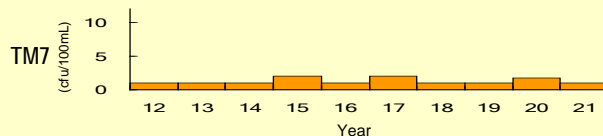
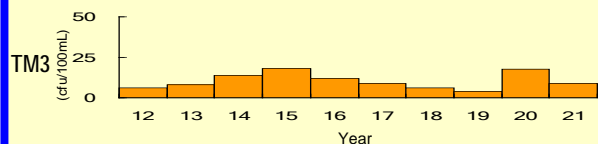
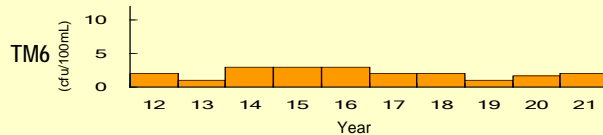
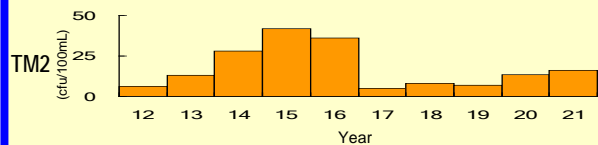
█ % sample with bottom DO \geq 4 mg/L



⊘ Non-compliance

WQO compliance rates for 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

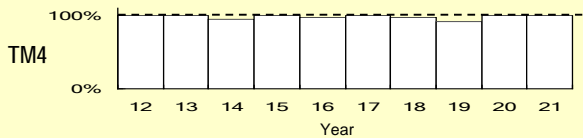
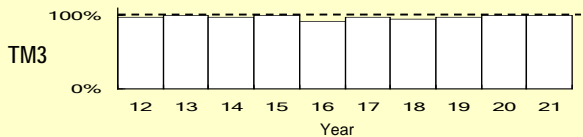
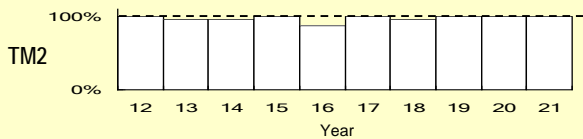
annual geometric mean for depth averaged *E. coli* (cfu/100mL)

⊘ Non-compliance

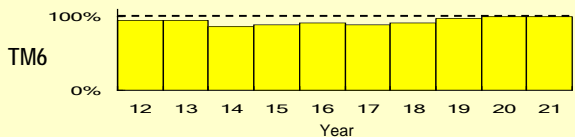
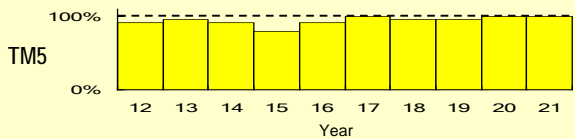
Chlorophyll-a levels in the Tolo Harbour and Channel WCZ

Chlorophyll-a

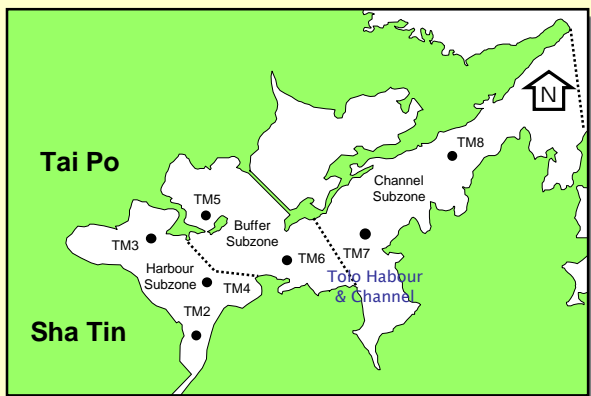
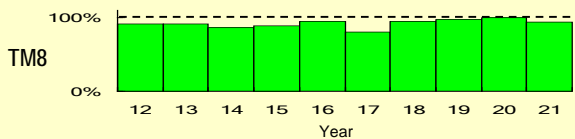
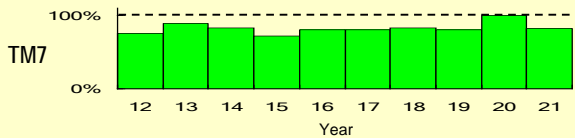
1. Harbour Subzone



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

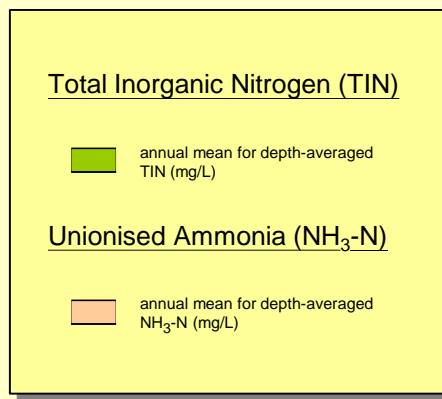
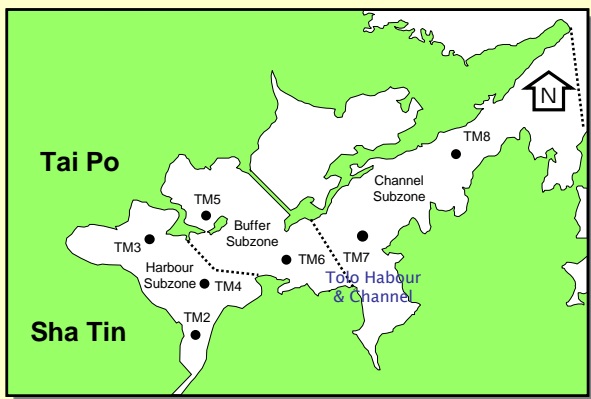
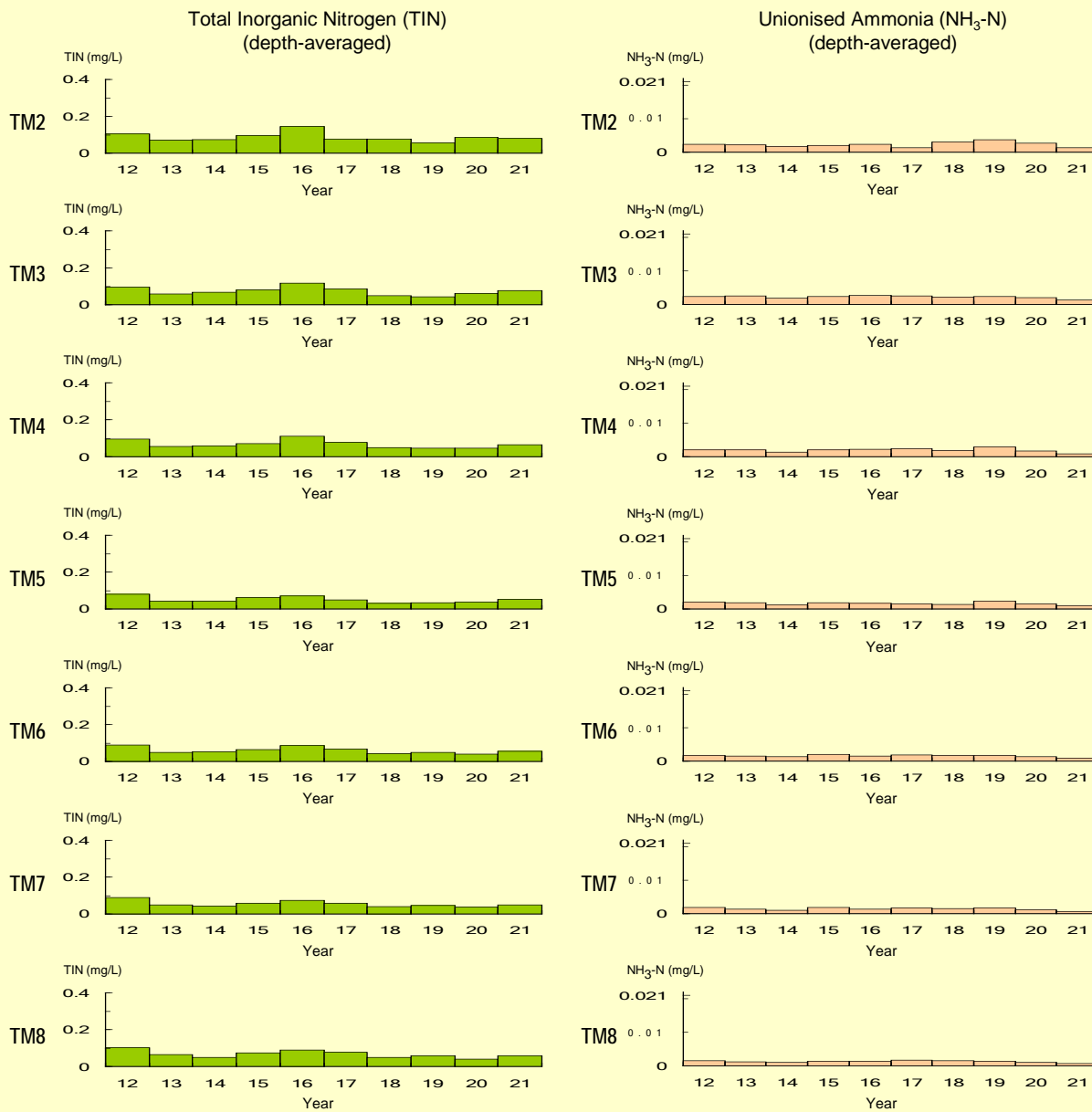
WQO: Chlorophyll-a ≤ 10 µg/L

3. Channel Subzone

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

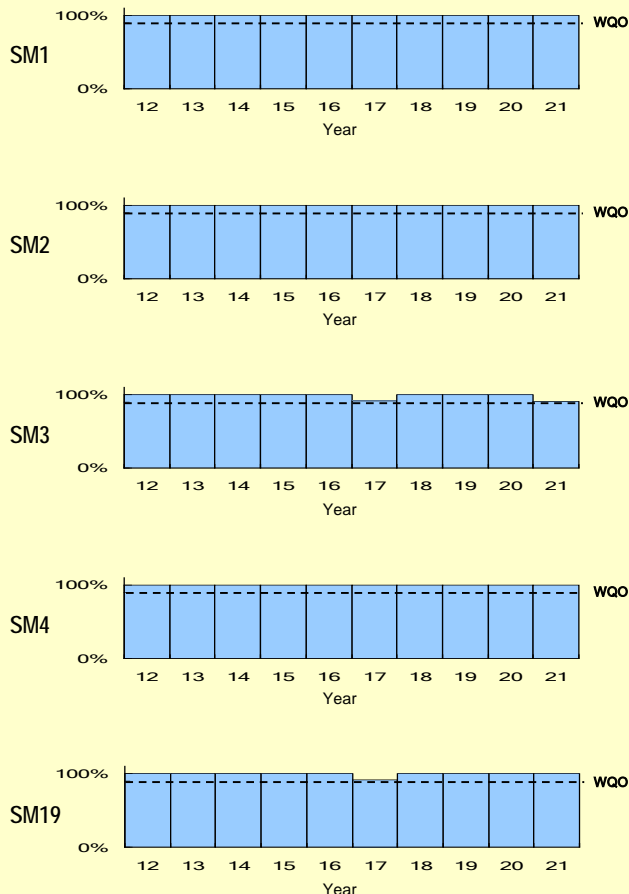
WQO: Chlorophyll-a ≤ 6 µg/L

Total inorganic nitrogen and unionised ammonia levels in the Tolo Harbour and Channel WCZ

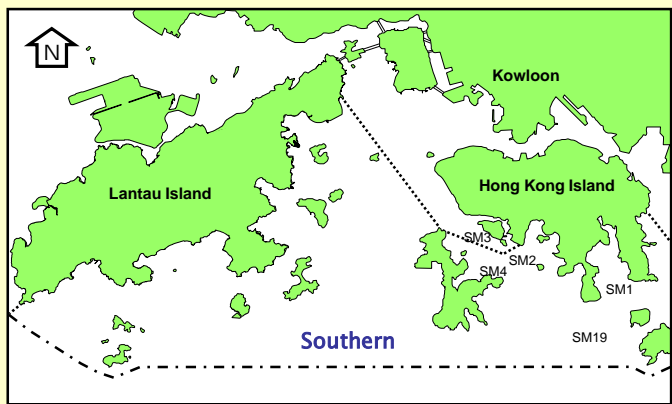
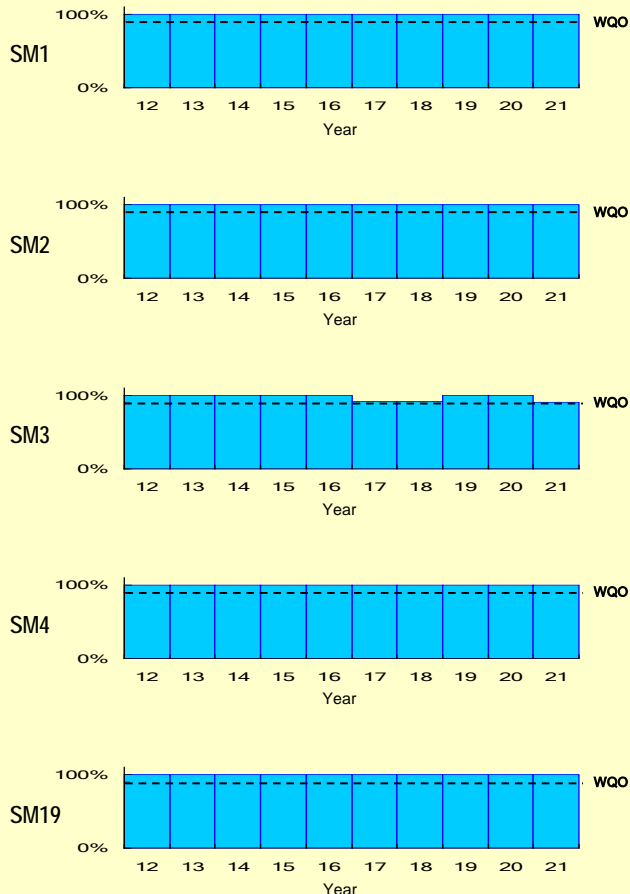


WQO compliance rates for the Southern WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

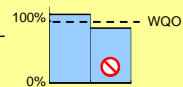


Dissolved Oxygen (DO)

1. Bottom

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

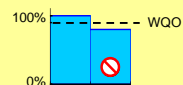
% sample with bottom DO \geq 2 mg/L



2. Depth-averaged

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

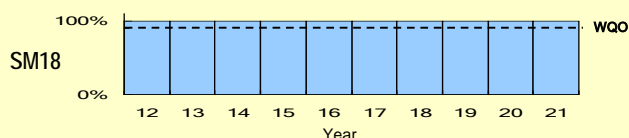
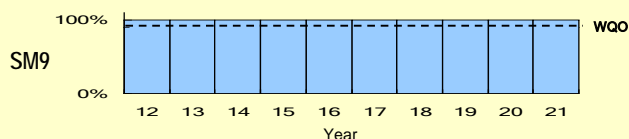
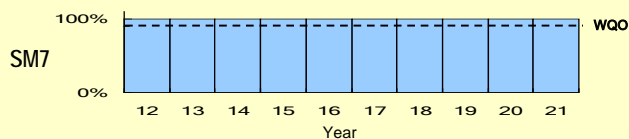
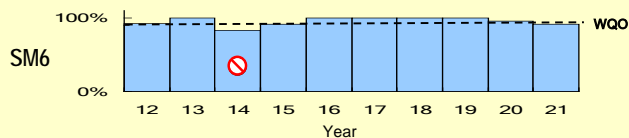
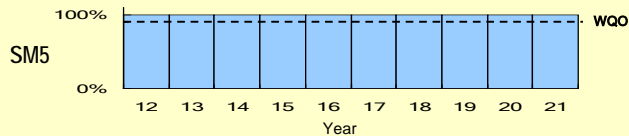
% sample with depth-averaged DO \geq 4 mg/L



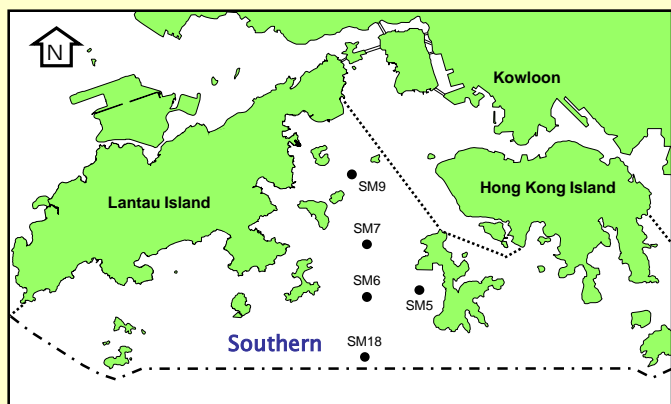
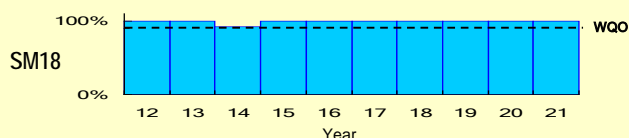
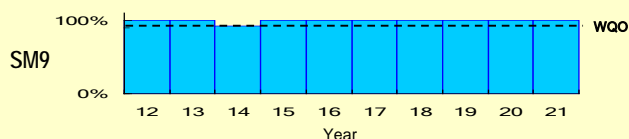
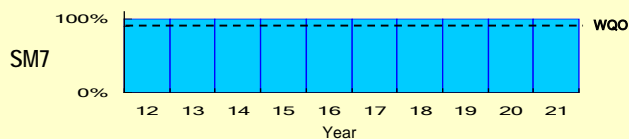
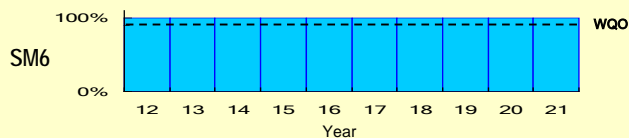
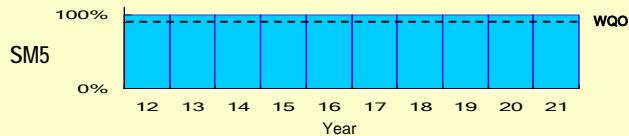
Non-compliance

WQO compliance rates for the Southern WCZ (continued)

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

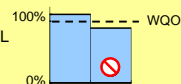


Dissolved Oxygen (DO)

1. Bottom

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

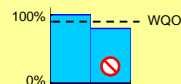
% sample with bottom DO \geq 2 mg/L



2. Depth-averaged

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

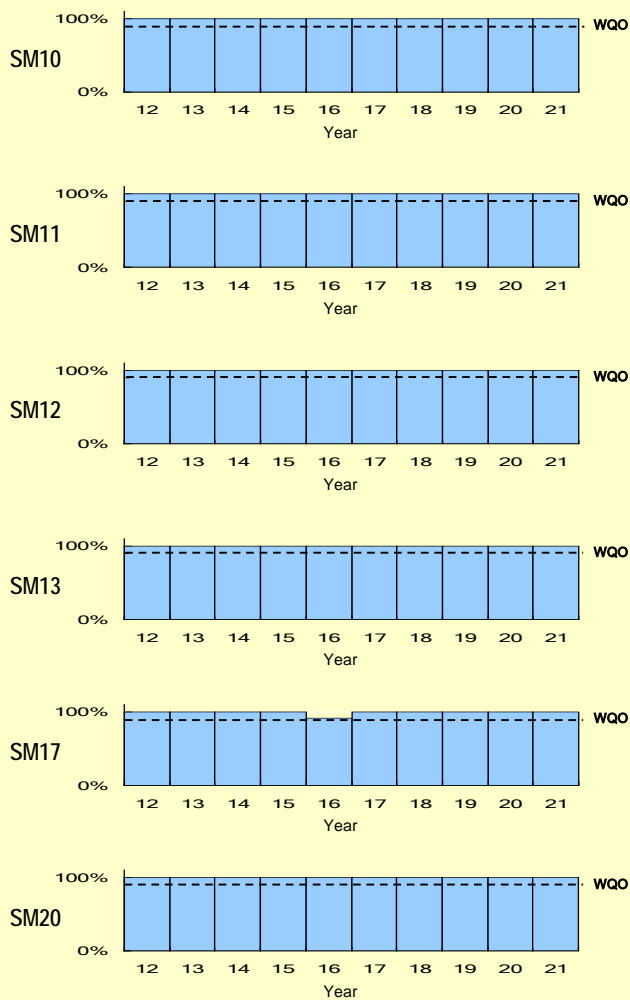
% sample with depth-averaged DO \geq 4 mg/L



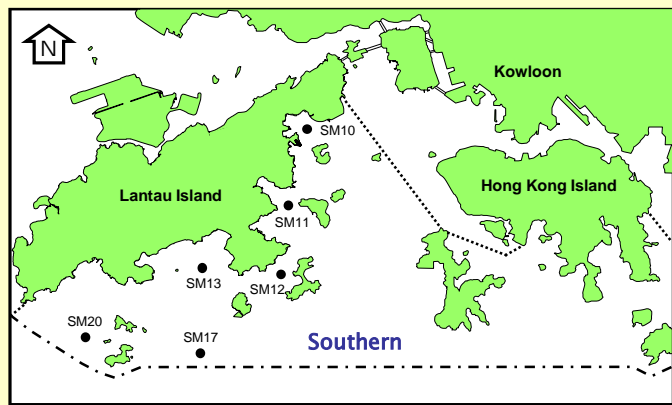
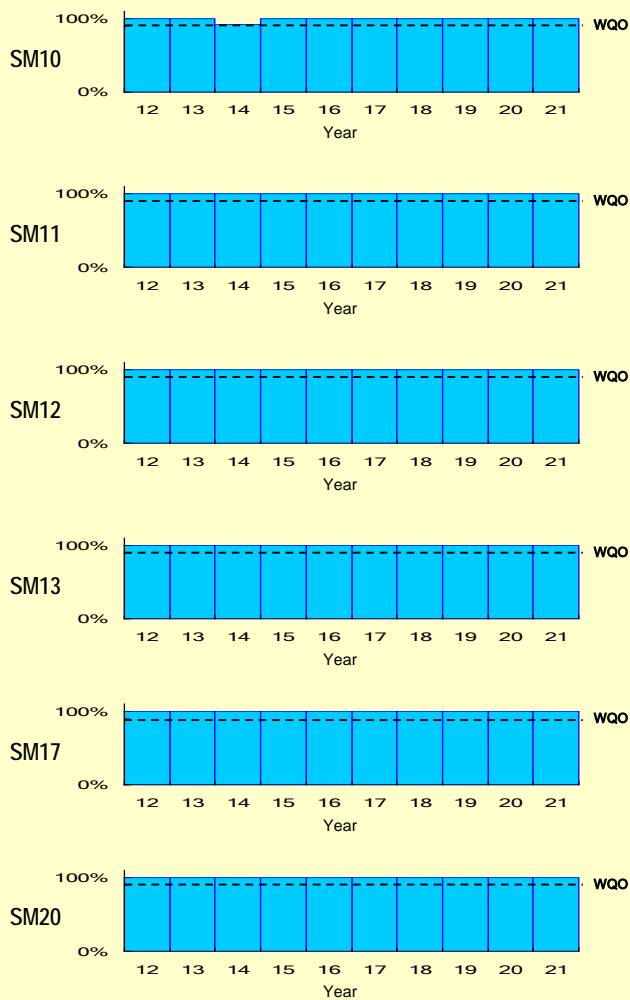
⊘ Non-compliance

WQO compliance rates for the Southern WCZ (continued)

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

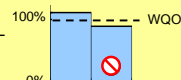


Dissolved Oxygen (DO)

1. Bottom

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

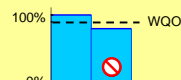
% sample with bottom DO \geq 2 mg/L



2. Depth-averaged

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

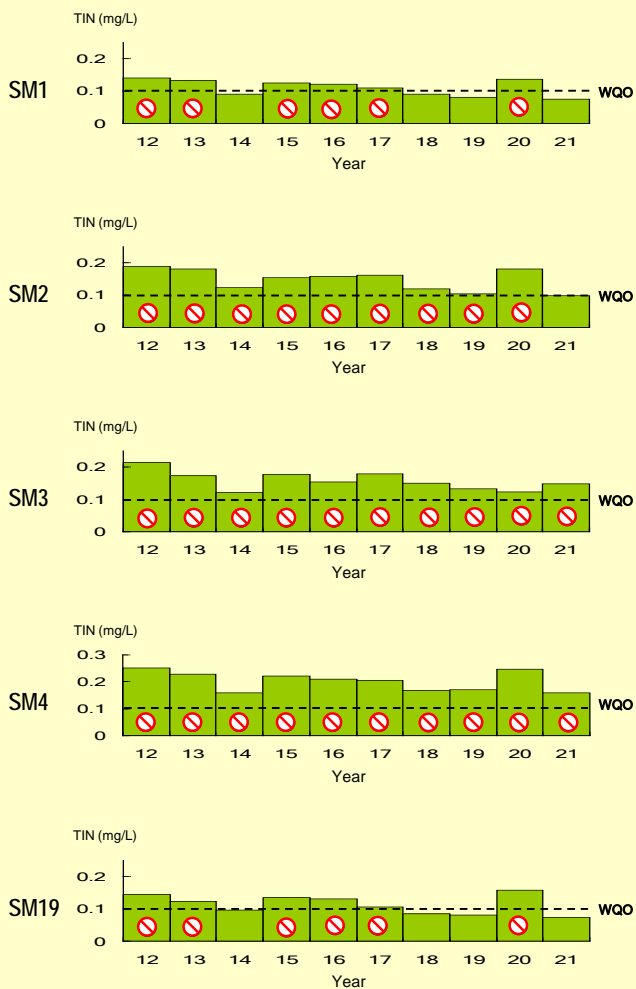
% sample with depth-averaged DO \geq 4 mg/L



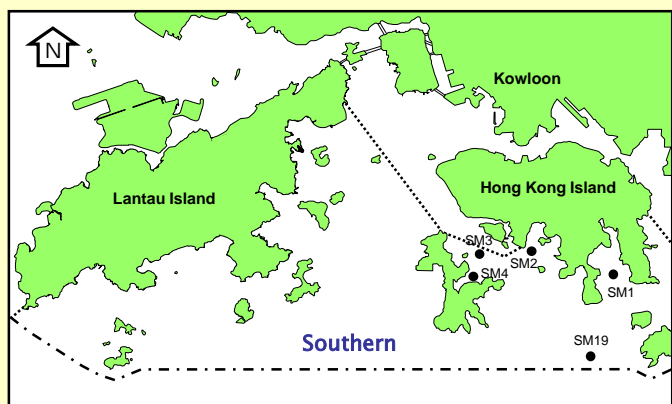
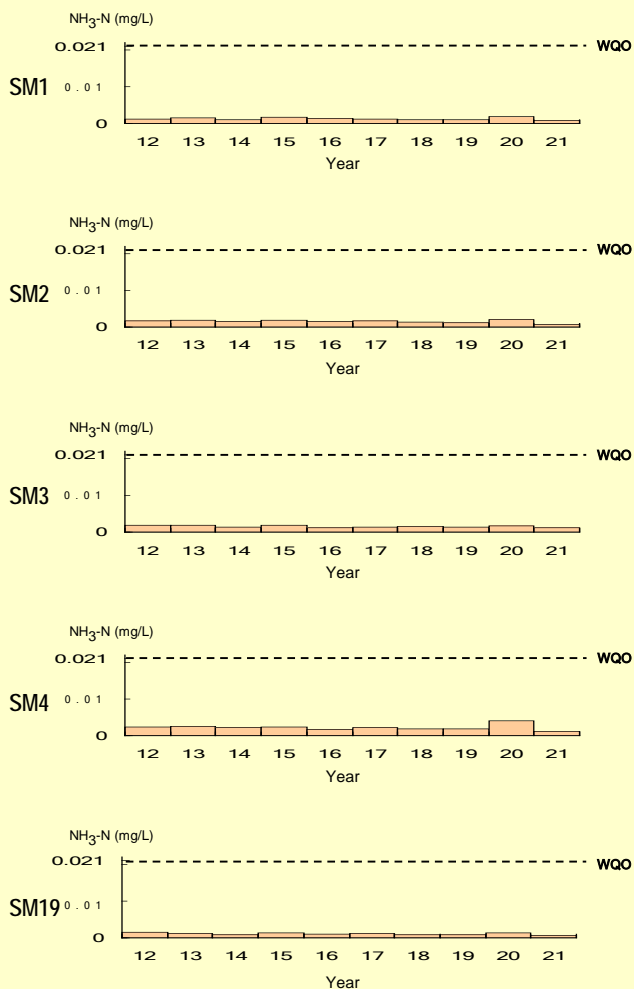
⊘ Non-compliance

WQO compliance rates for the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH₃-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 (NH₃-N)

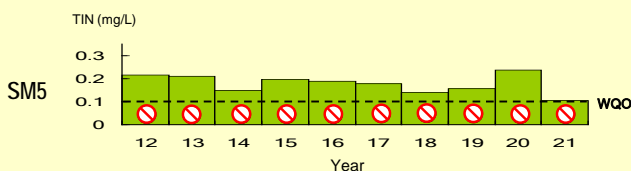
WQO : annual mean for depth-averaged NH₃-N ≤ 0.021 mg/L

■ annual mean for depth-averaged NH₃-N

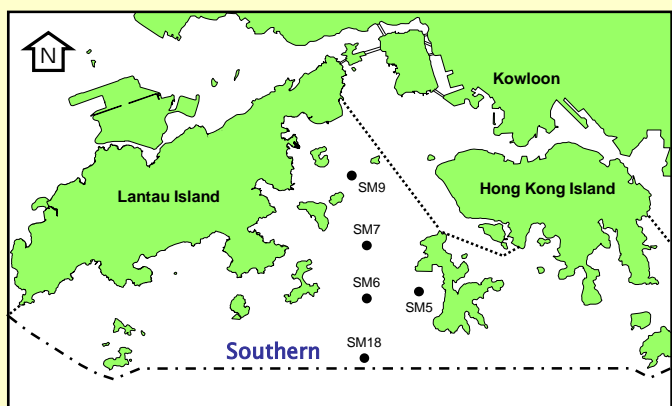
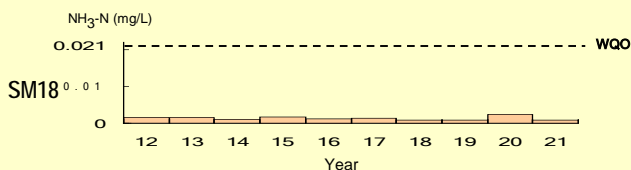
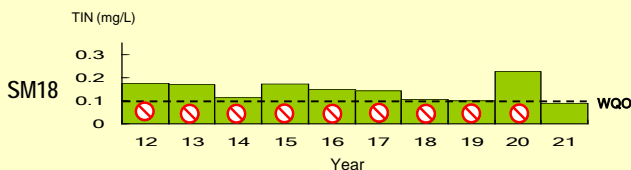
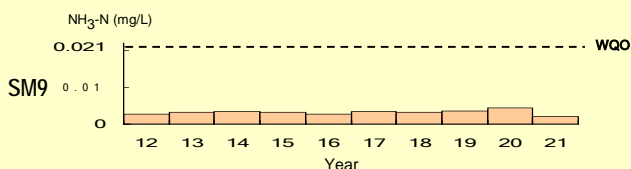
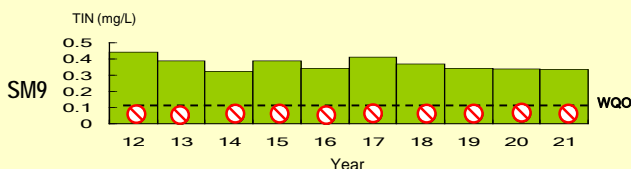
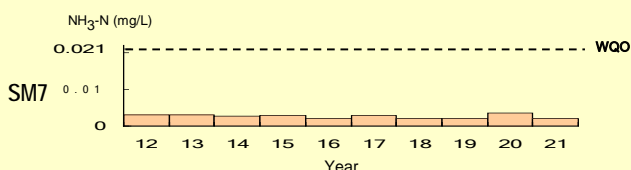
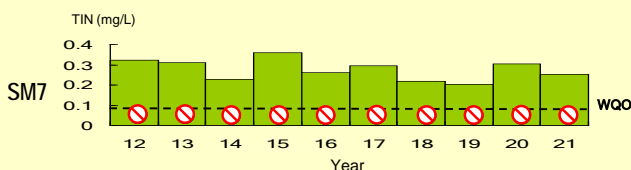
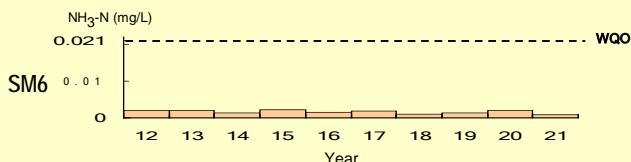
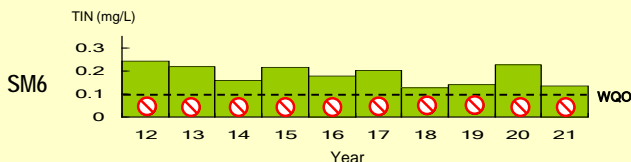
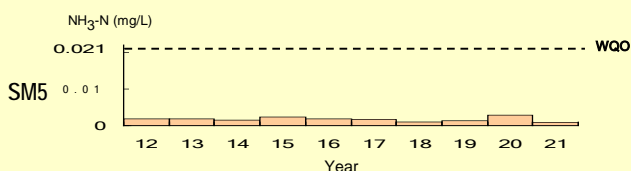
⊘ Non-compliance

WQO compliance rates for the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



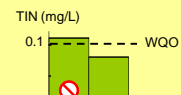
Unionised Ammonia (NH₃-N)
(depth-averaged)



Total Inorganic Nitrogen (TIN)

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

Green bar: annual mean for depth-averaged TIN

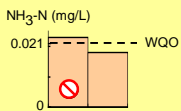


Unionised Ammonia (NH₃-N)

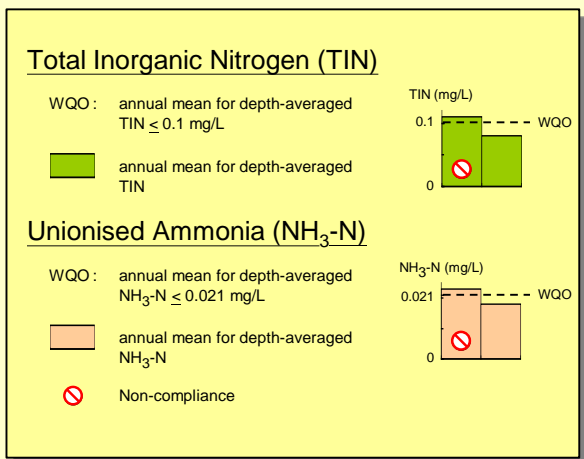
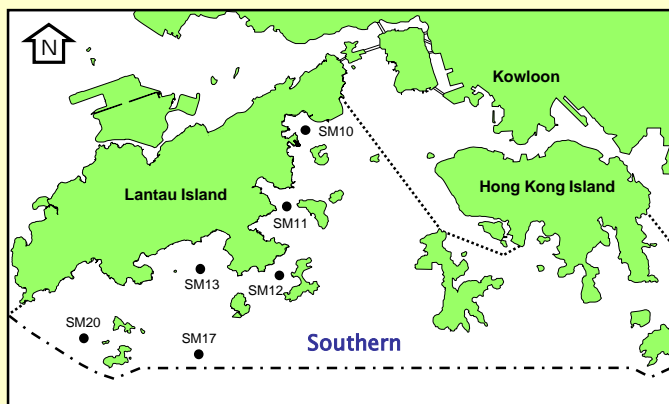
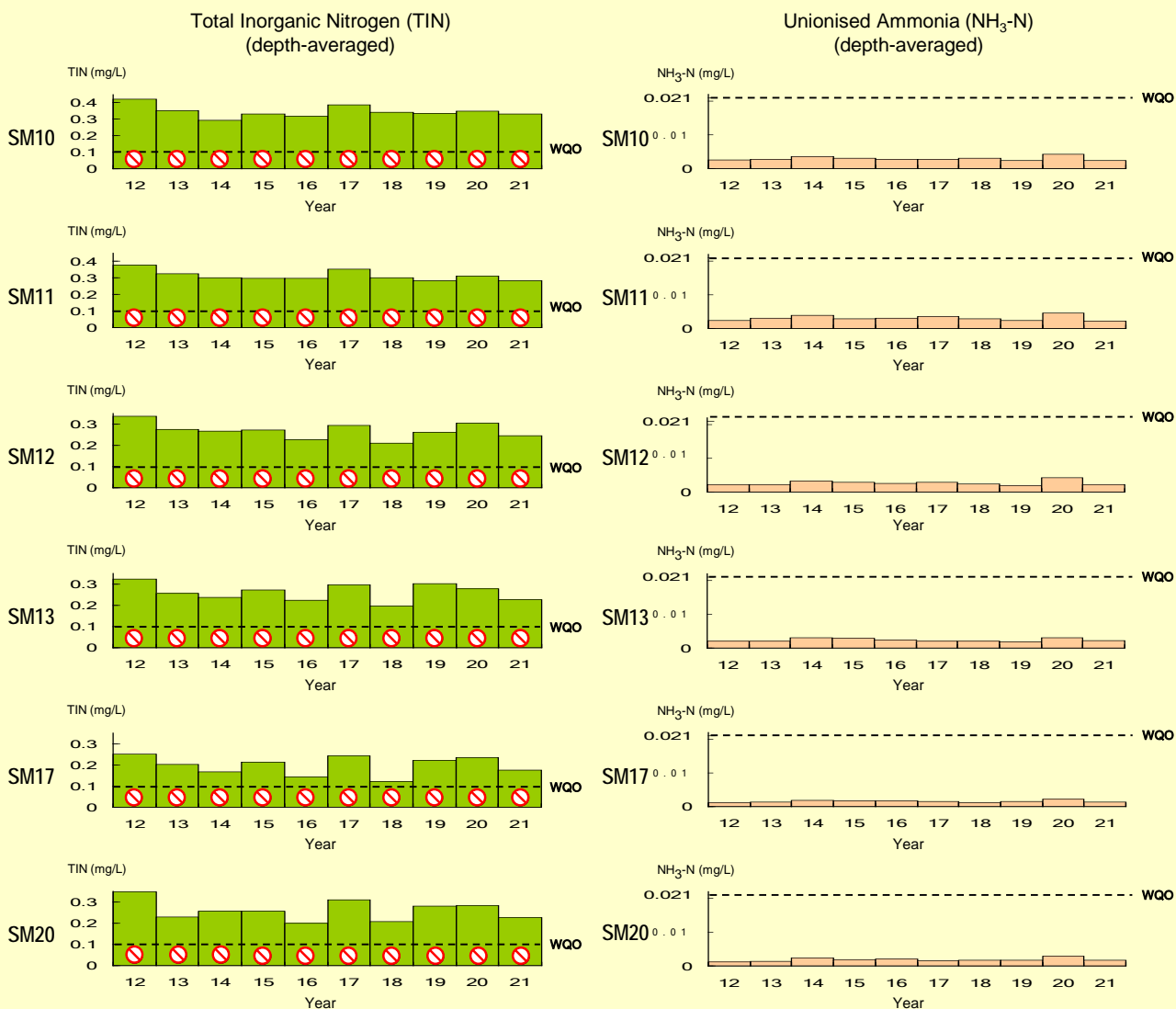
WQO: annual mean for depth-averaged NH₃-N ≤ 0.021 mg/L

Orange bar: annual mean for depth-averaged NH₃-N

Red prohibition sign: Non-compliance

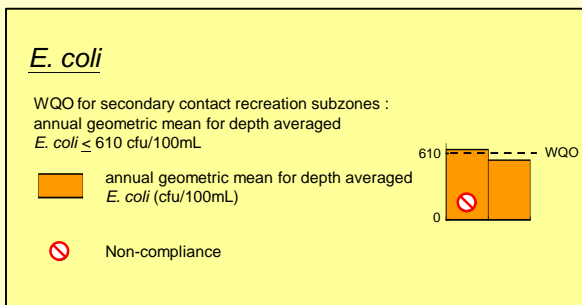
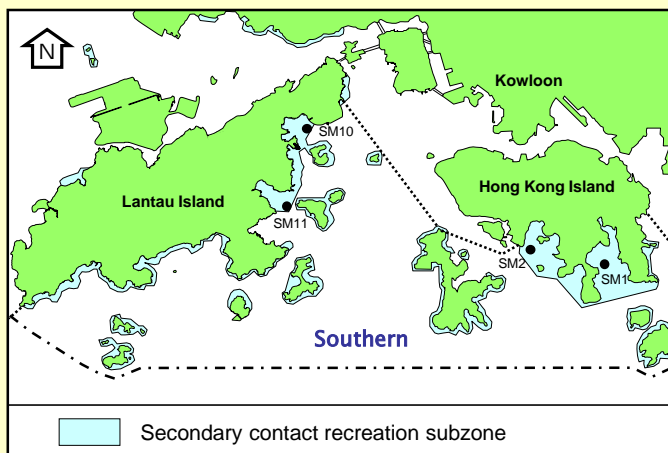
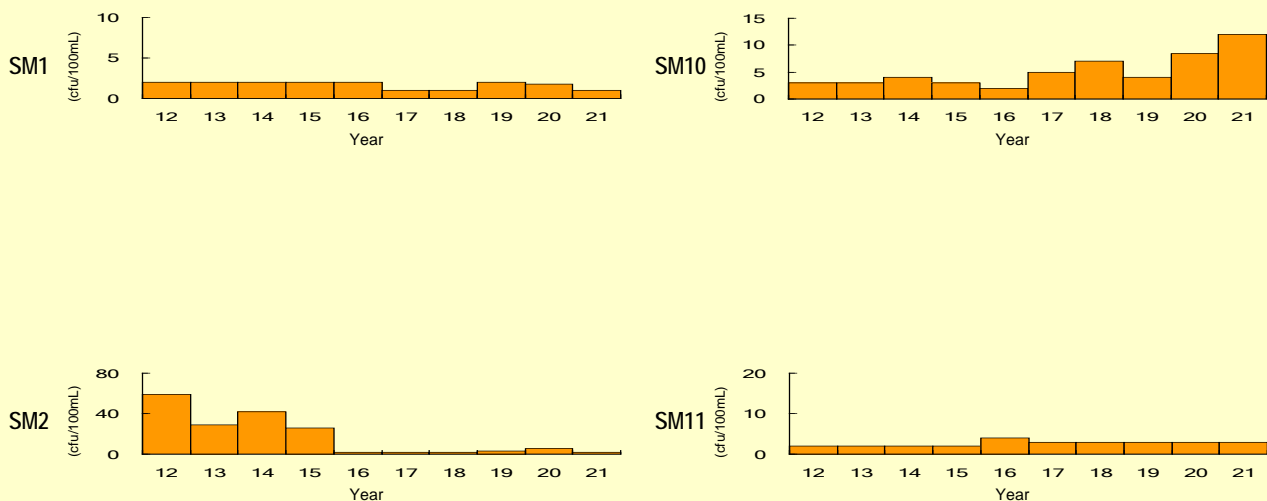


WQO compliance rates for the Southern WCZ (continued)



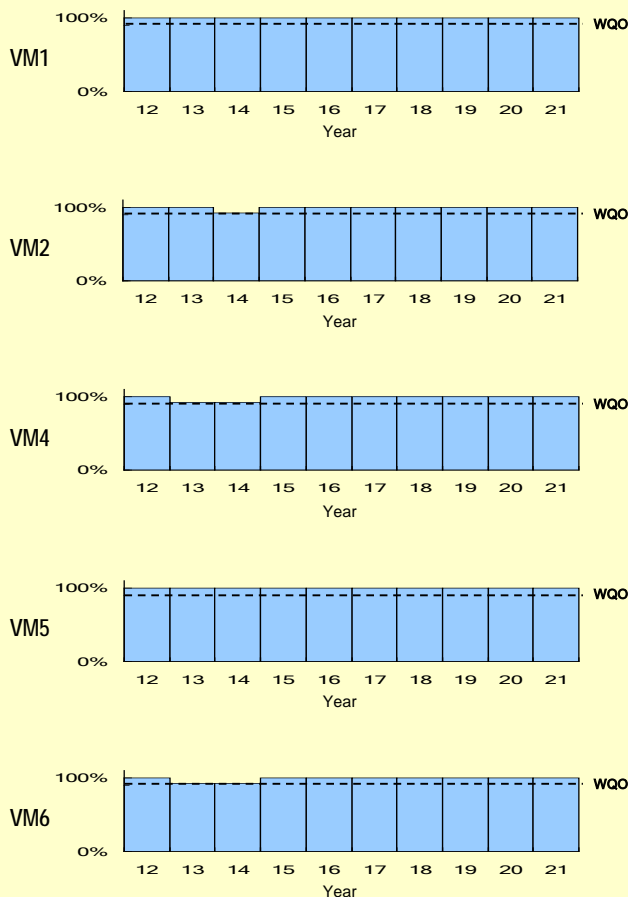
WQO compliance rates for the Southern WCZ (continued)

E. coli
(annual geometric mean)

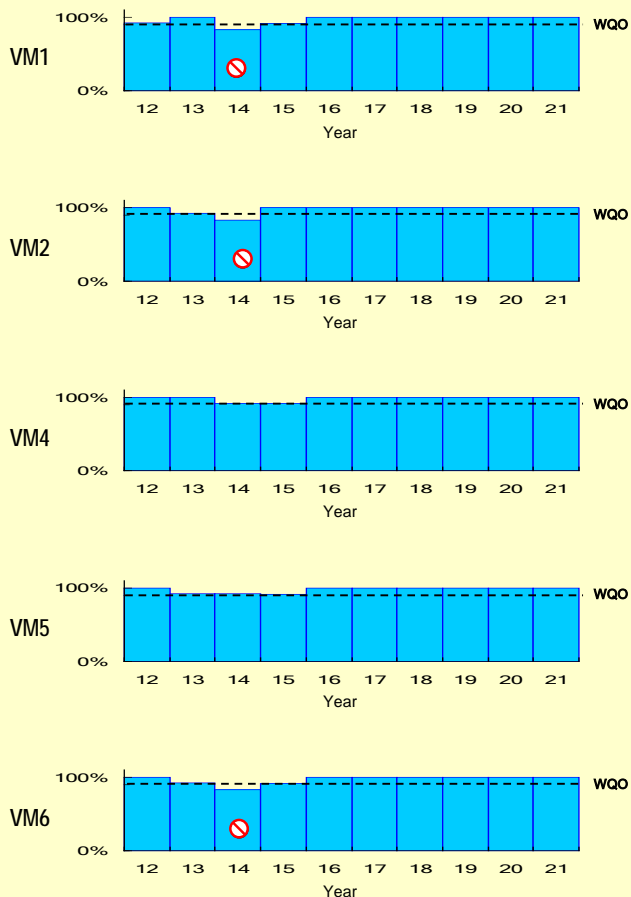


WQO compliance rates for the Victoria Harbour WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

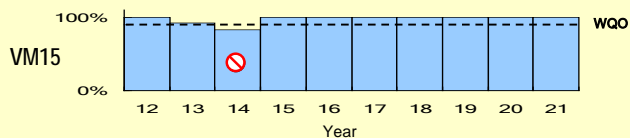
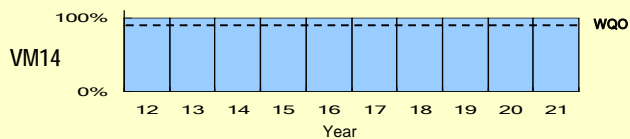
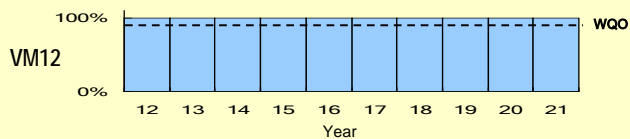
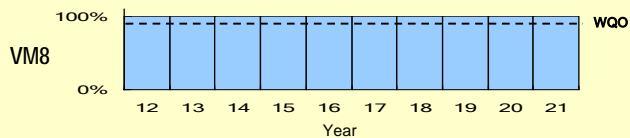
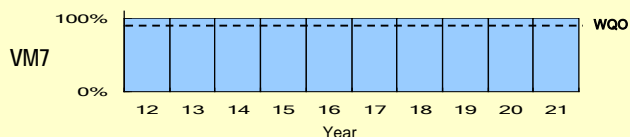


Dissolved Oxygen (DO)

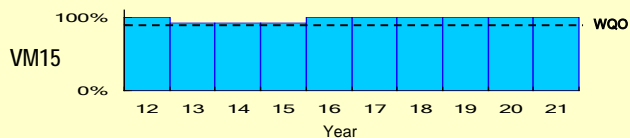
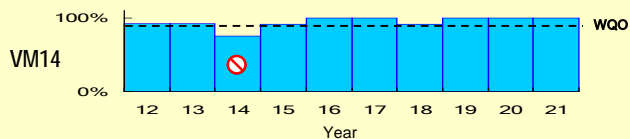
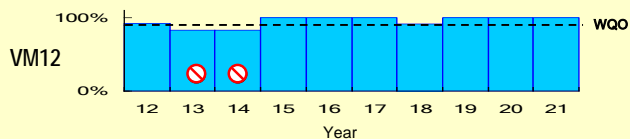
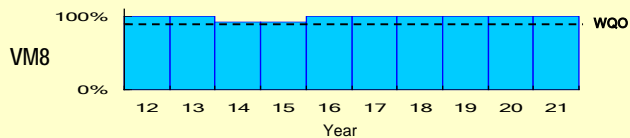
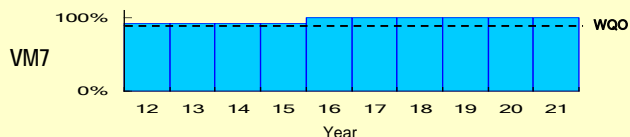
- Bottom**
 WQO : 90% sample with bottom DO \geq 2 mg/L
 Legend: Blue bar = % sample with bottom DO \geq 2 mg/L. Red circle with slash = Non-compliance.
- Depth-averaged**
 WQO : 90% sample with depth-averaged DO \geq 4 mg/L
 Legend: Cyan bar = % sample with depth-averaged DO \geq 4 mg/L. Red circle with slash = Non-compliance.

WQO compliance rates for the Victoria Harbour WCZ (continued)

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

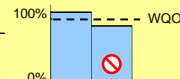


Dissolved Oxygen (DO)

1. Bottom

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

■ % sample with bottom DO \geq 2 mg/L



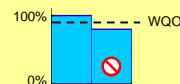
2. Depth-averaged

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

■ % sample with depth-averaged DO \geq 4 mg/L

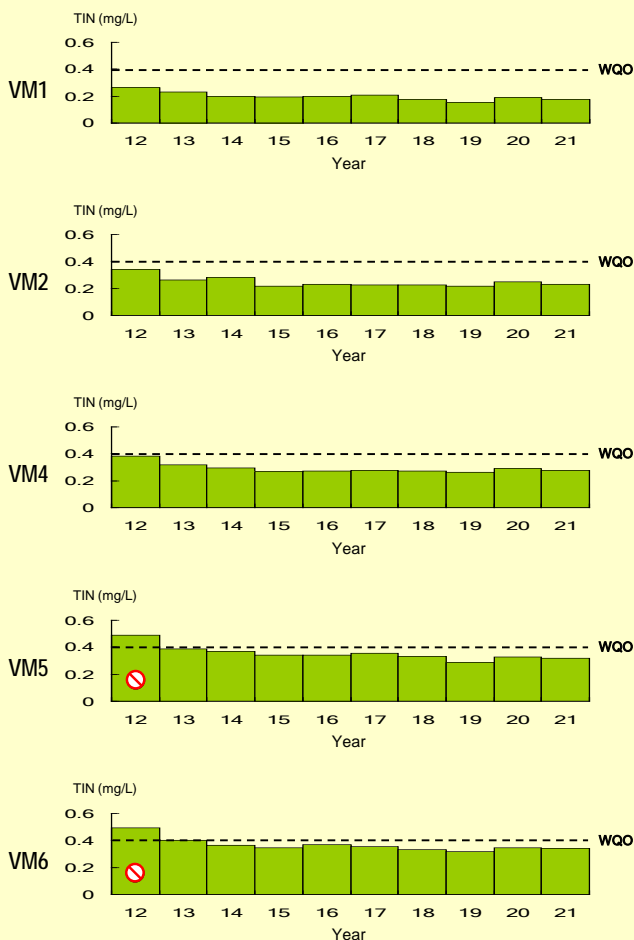


Non-compliance

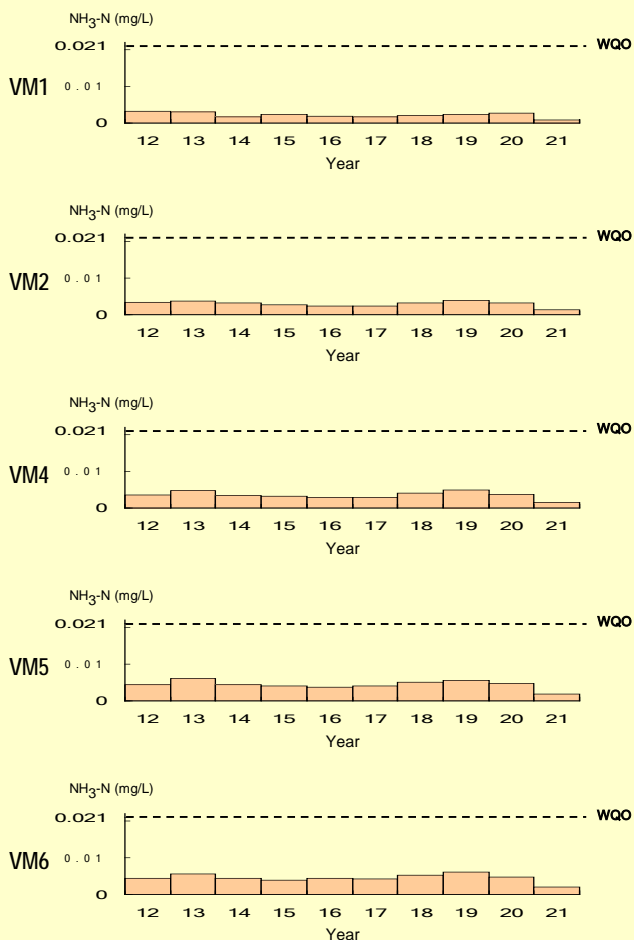


WQO compliance rates for the Victoria Harbour WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



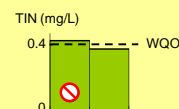
Unionised Ammonia (NH₃-N)
(depth-averaged)



Total Inorganic Nitrogen (TIN)

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

■ annual mean for depth-averaged TIN

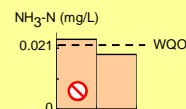


Unionised Ammonia (NH₃-N)

WQO: annual mean for depth-averaged NH₃-N ≤ 0.021 mg/L

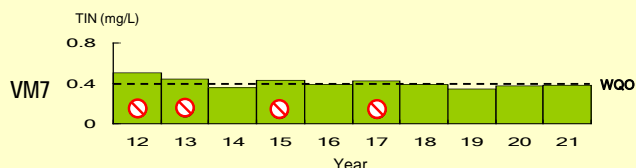
■ annual mean for depth-averaged NH₃-N

⊘ Non-compliance

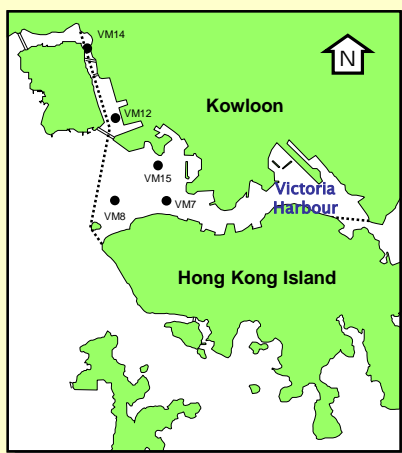
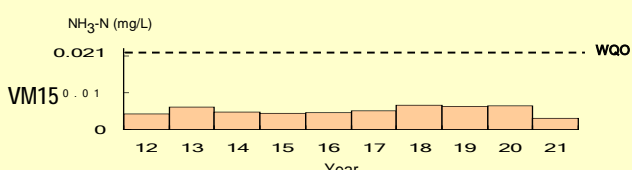
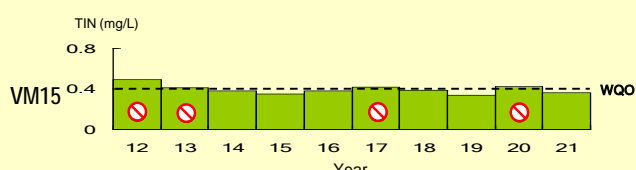
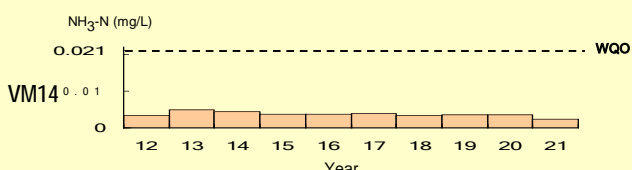
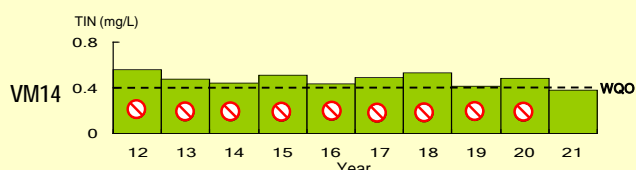
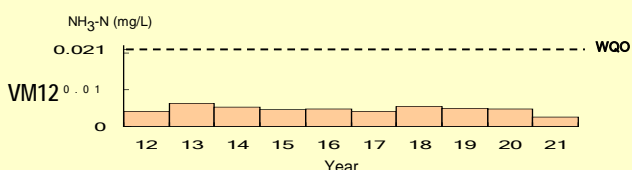
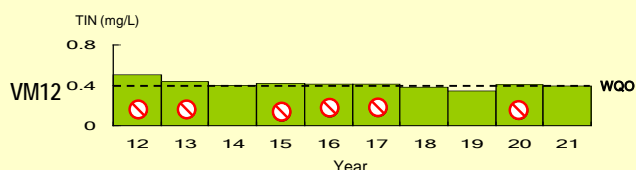
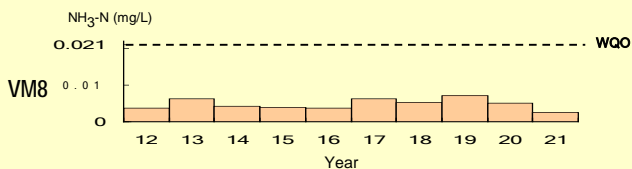
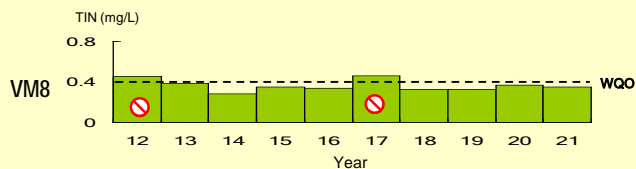
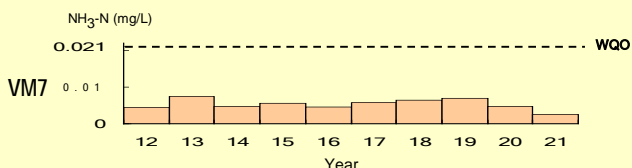


WQO compliance rates for the Victoria Harbour WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



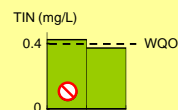
Unionised Ammonia (NH₃-N)
(depth-averaged)



Total Inorganic Nitrogen (TIN)

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

Green bar: annual mean for depth-averaged TIN

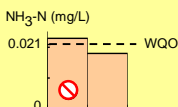


Unionised Ammonia (NH₃-N)

WQO: annual mean for depth-averaged NH₃-N ≤ 0.021 mg/L

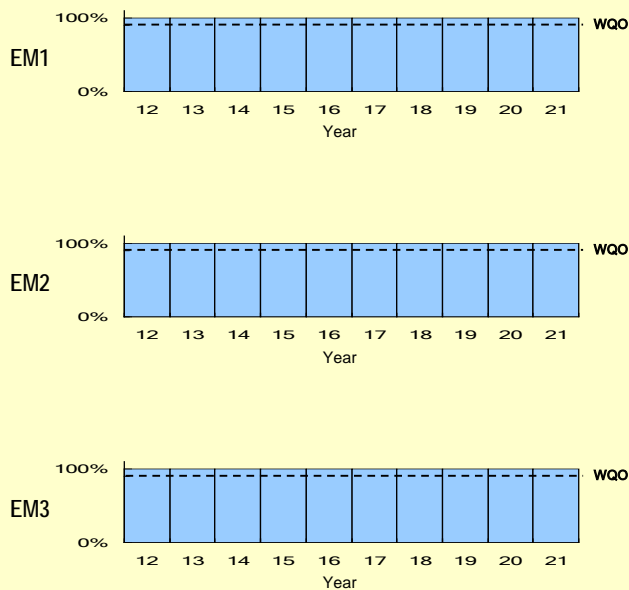
Orange bar: annual mean for depth-averaged NH₃-N

Red 'no' symbol: Non-compliance

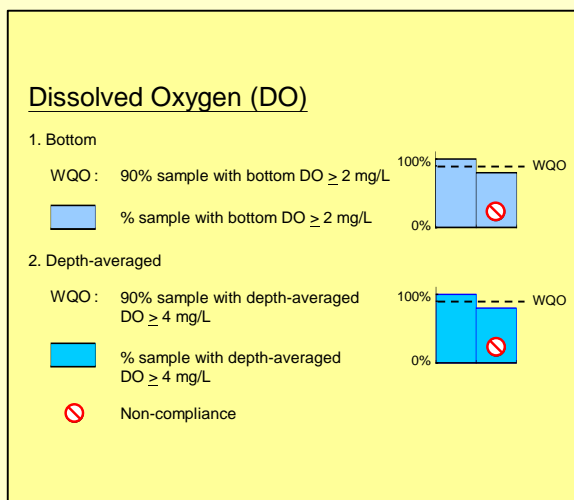
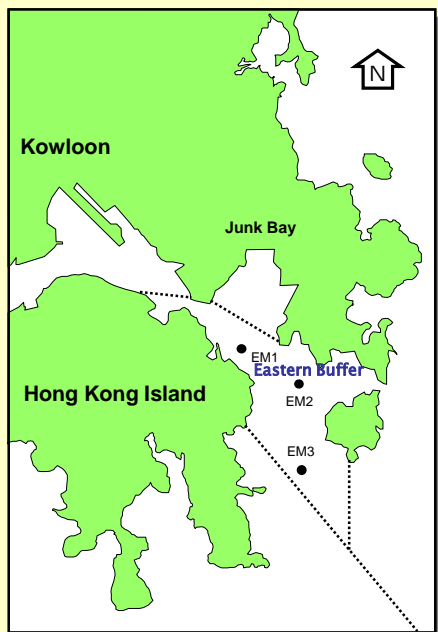
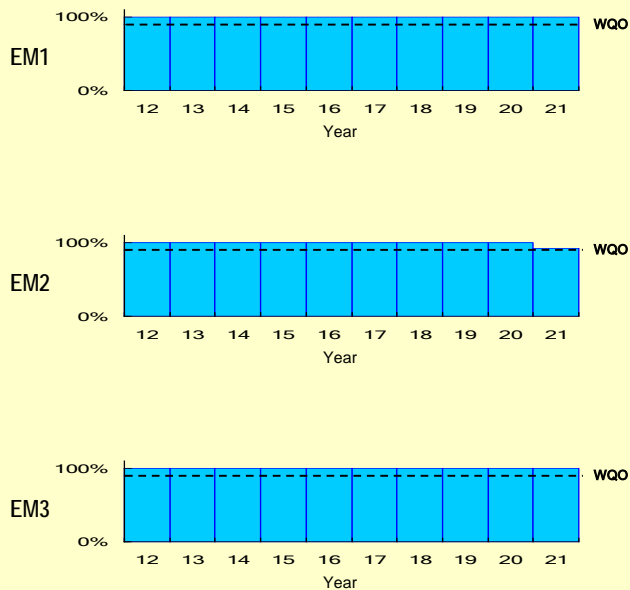


WQO compliance rates for the Eastern Buffer WCZ

Dissolved Oxygen (DO)
(bottom)



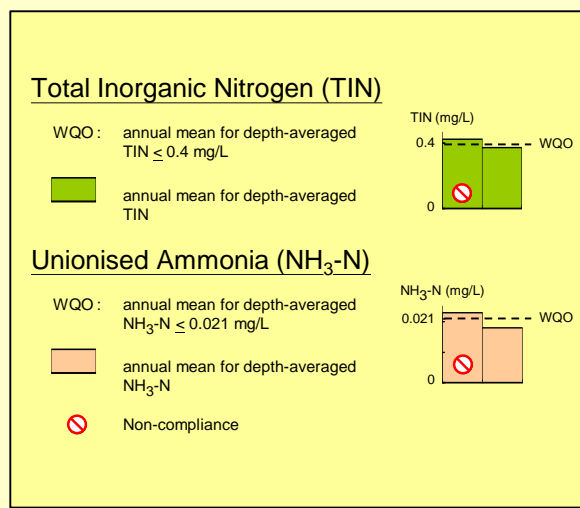
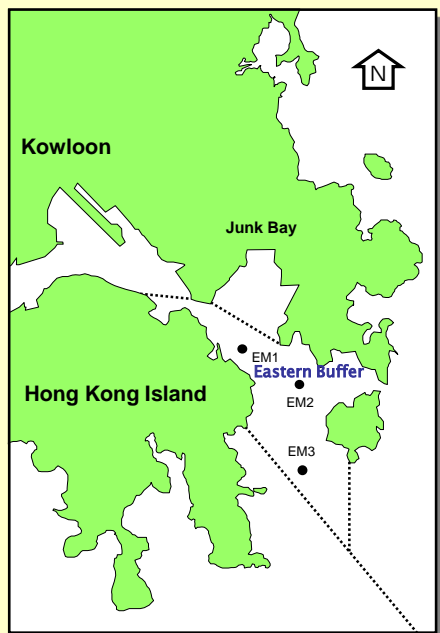
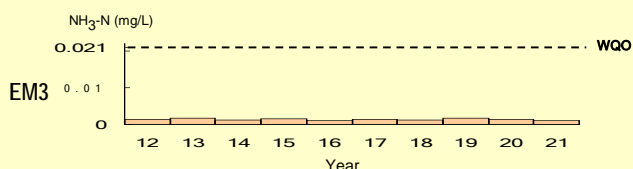
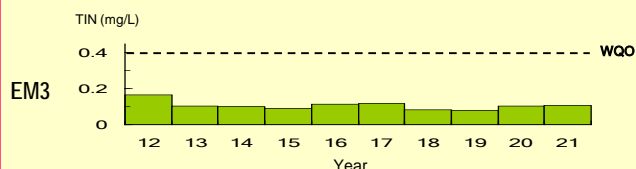
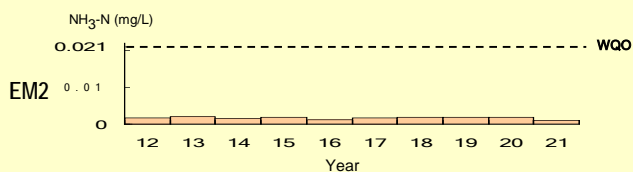
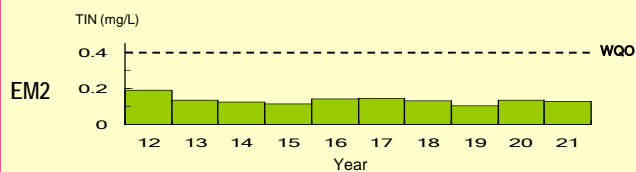
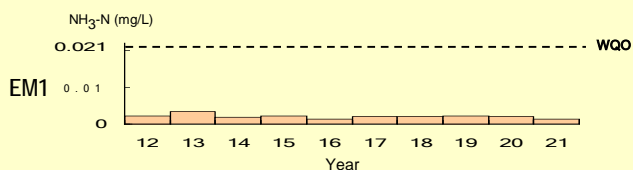
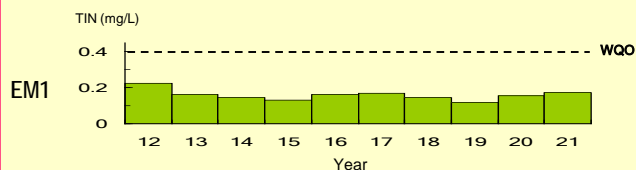
Dissolved Oxygen (DO)
(depth-averaged)



WQO compliance rates for the Eastern Buffer WCZ (continued)

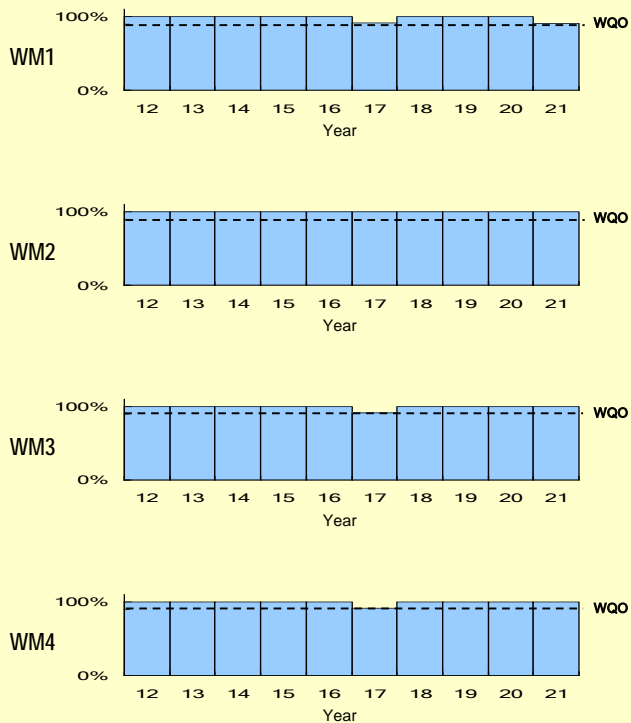
Total Inorganic Nitrogen (TIN)
(depth-averaged)

Unionised Ammonia (NH₃-N)
(depth-averaged)

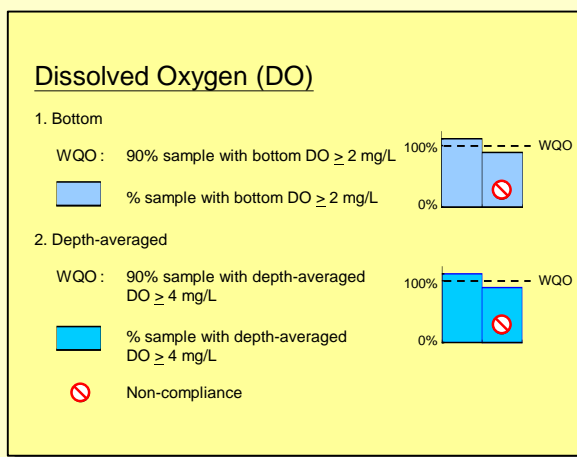
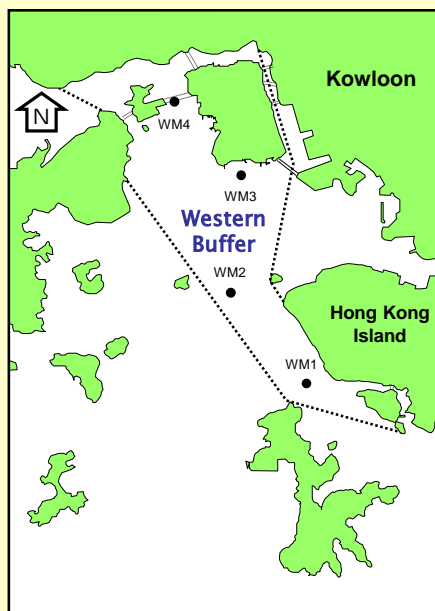
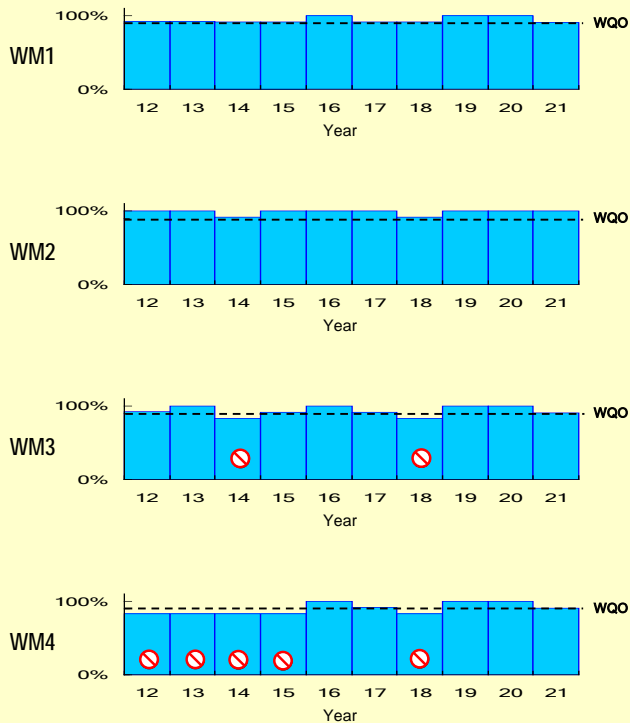


WQO compliance rates for the Western Buffer WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

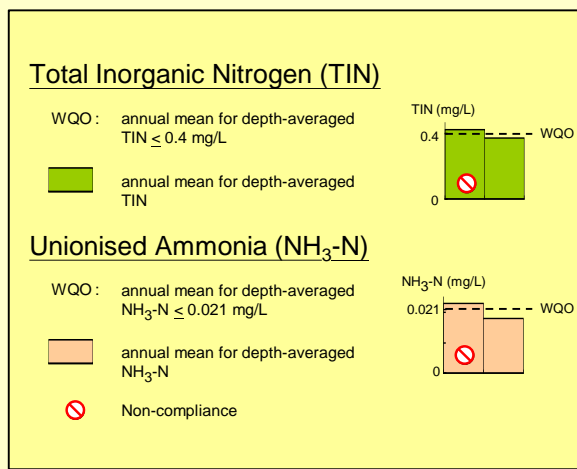
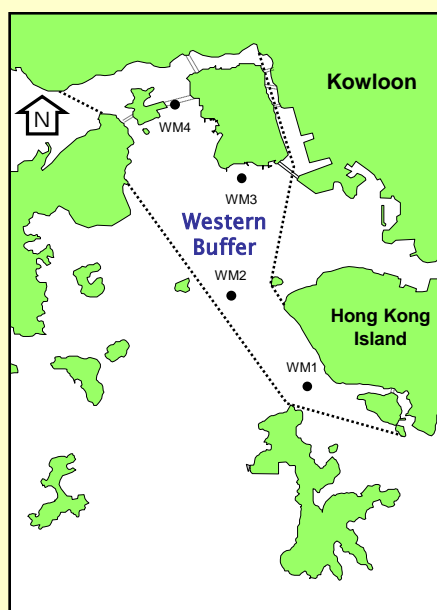
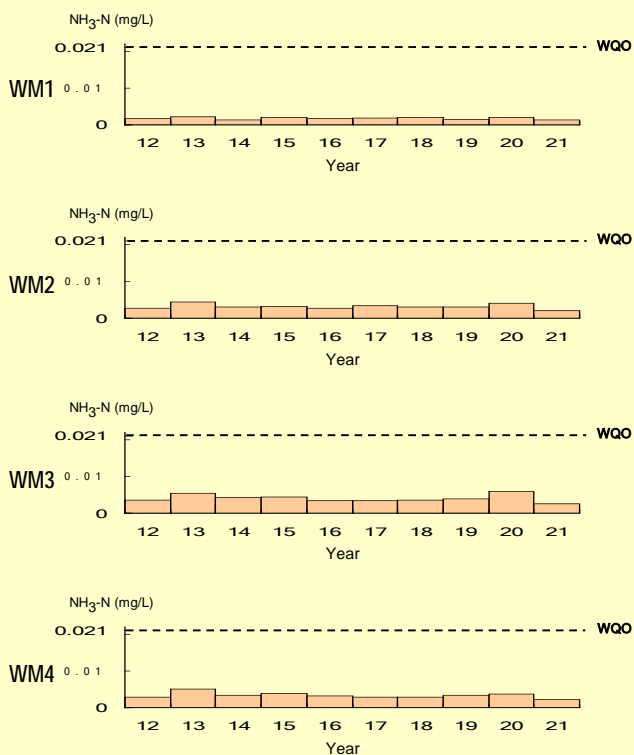


WQO compliance rates for the Western Buffer WCZ (continued)

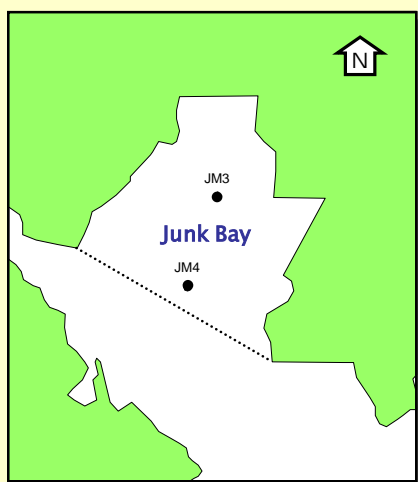
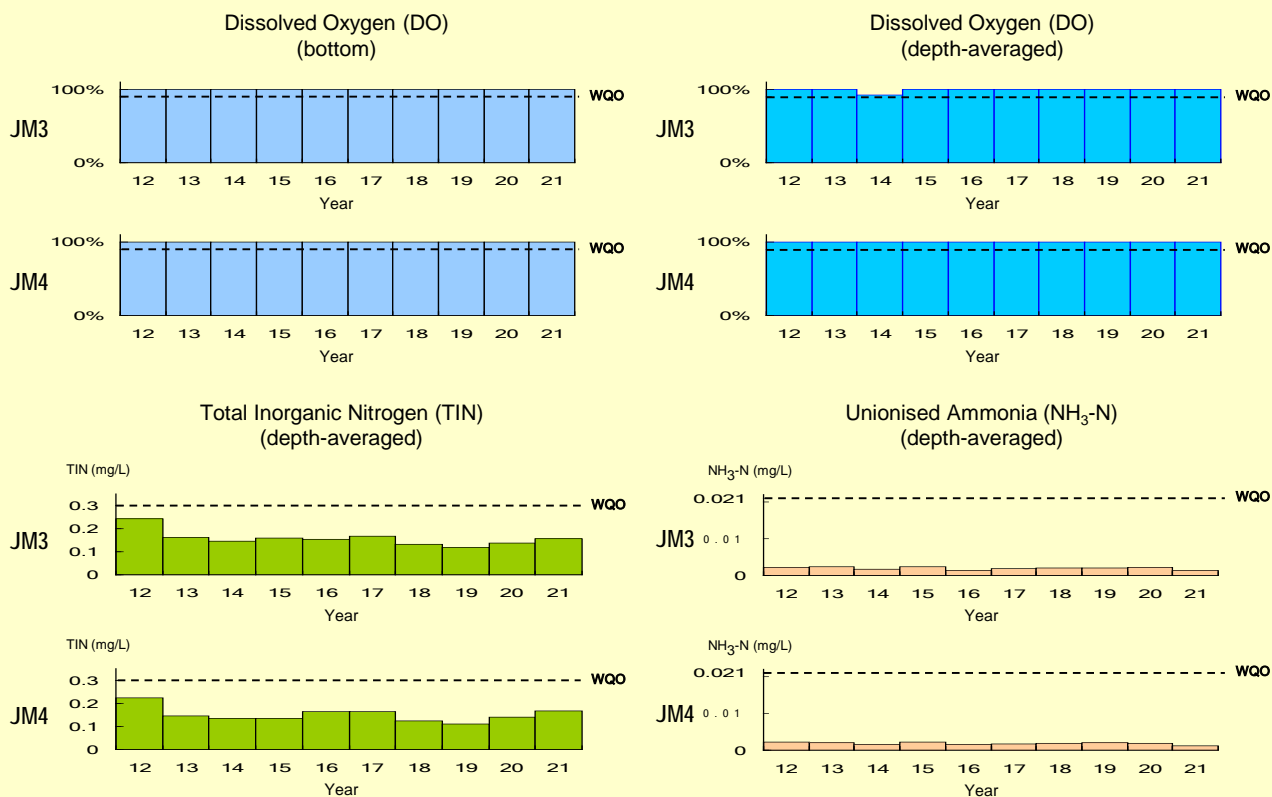
Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH₃-N)
(depth-averaged)



WQO compliance rates for the Junk Bay WCZ



Dissolved Oxygen (DO)

1. Bottom
 WQO: 90% sample with bottom DO \geq 2 mg/L
 % sample with bottom DO \geq 2 mg/L

2. Depth-averaged
 WQO: 90% sample with depth-averaged DO \geq 4 mg/L
 % sample with depth-averaged DO \geq 4 mg/L

Total Inorganic Nitrogen (TIN)

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

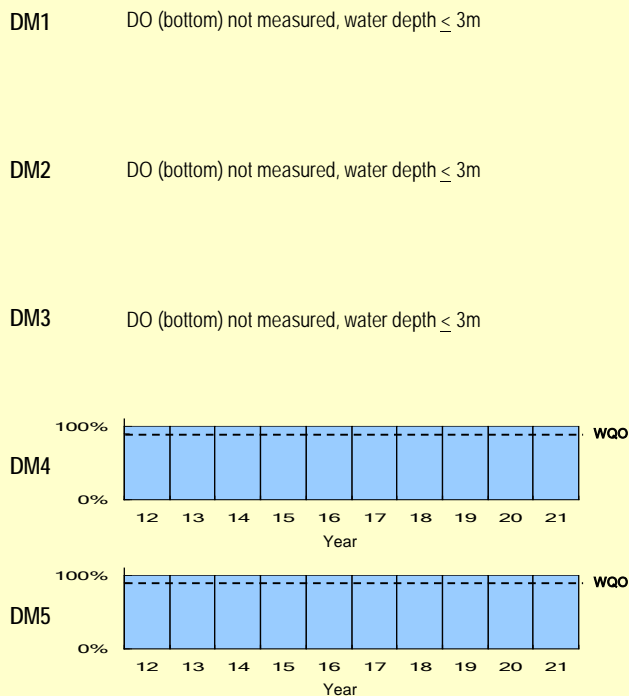
Unionised Ammonia (NH₃-N)

WQO: annual mean for depth-averaged NH₃-N \leq 0.021 mg/L
 annual mean for depth-averaged NH₃-N

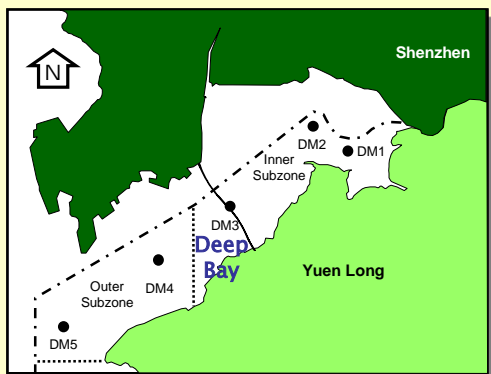
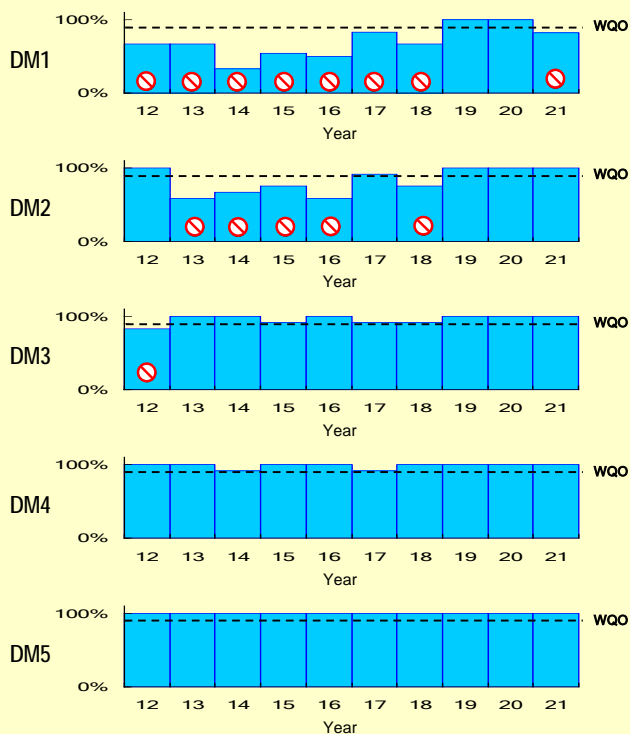
⊘ Non-compliance

WQO compliance rates for the Deep Bay WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)

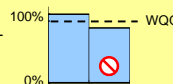


Dissolved Oxygen (DO)

1. Bottom

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

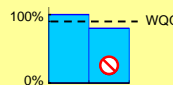
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

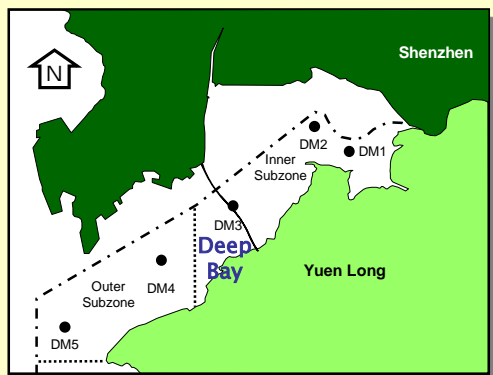
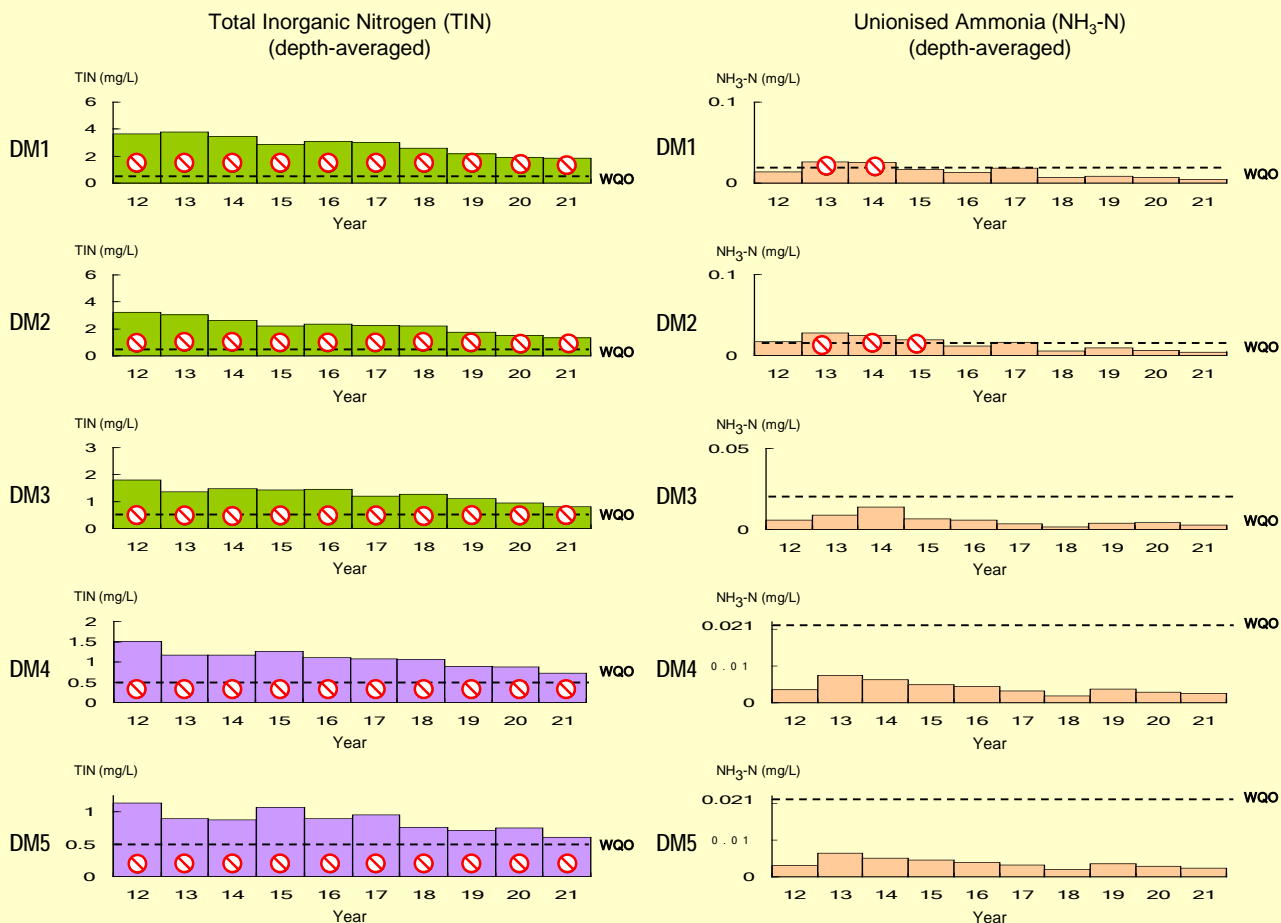
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

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



⊘ Non-compliance

WQO compliance rates for the Deep Bay WCZ (continued)



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

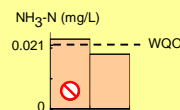
■ annual mean for depth-averaged TIN



Unionised Ammonia (NH₃-N)

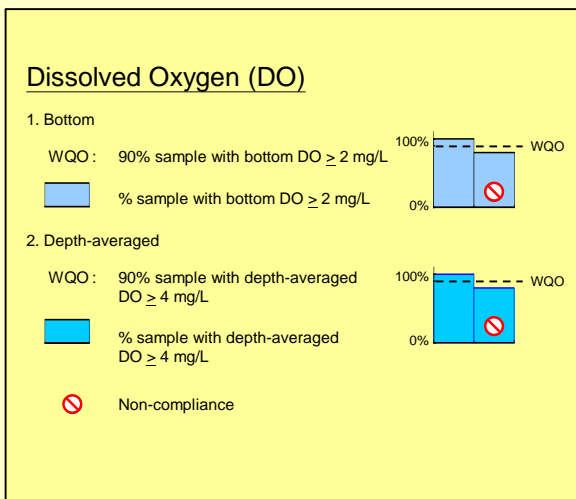
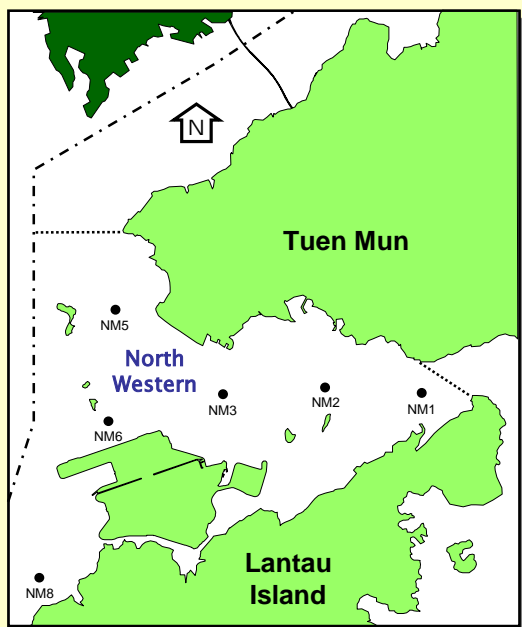
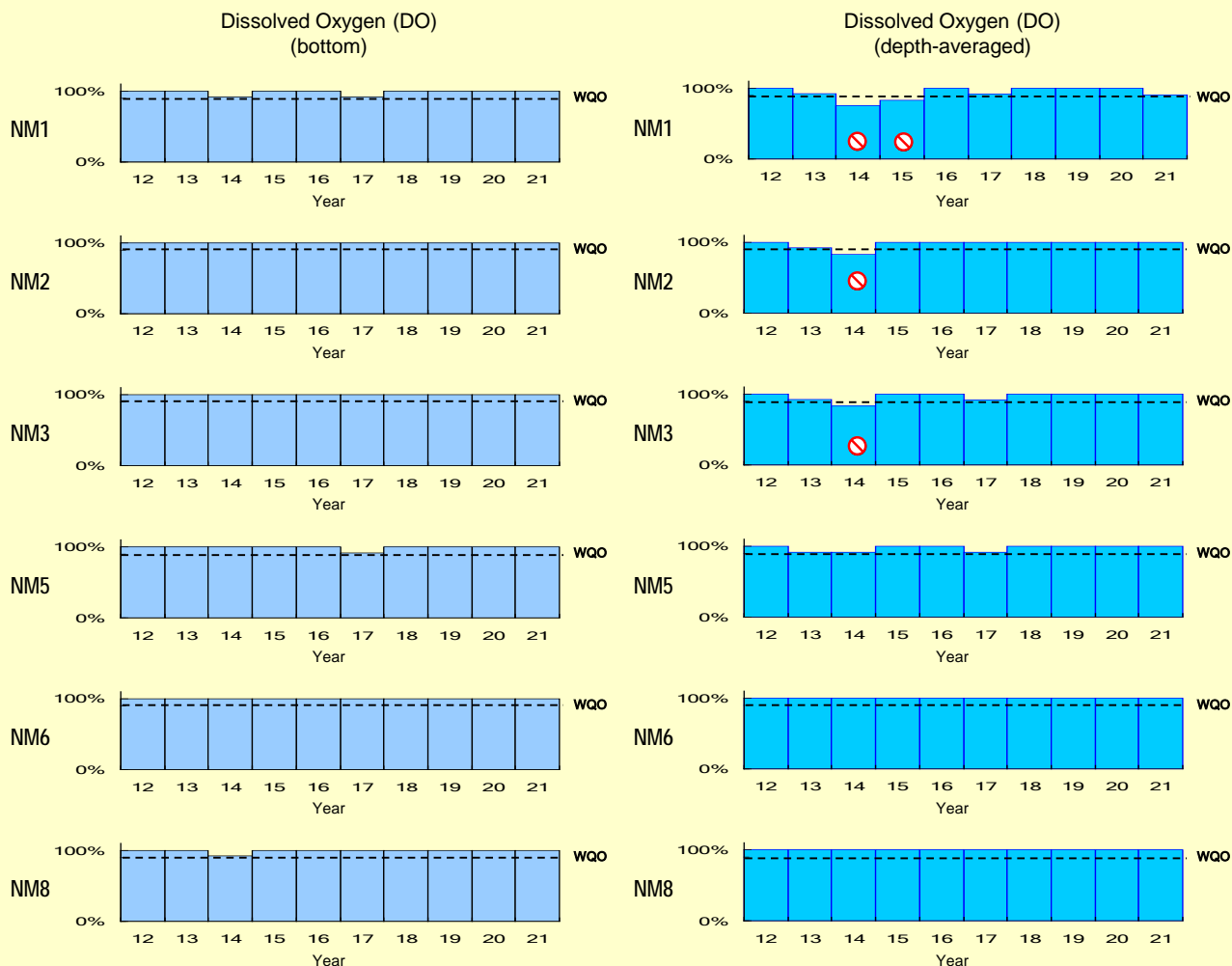
WQO: annual mean for depth-averaged NH₃-N ≤ 0.021 mg/L

■ annual mean for depth-averaged NH₃-N

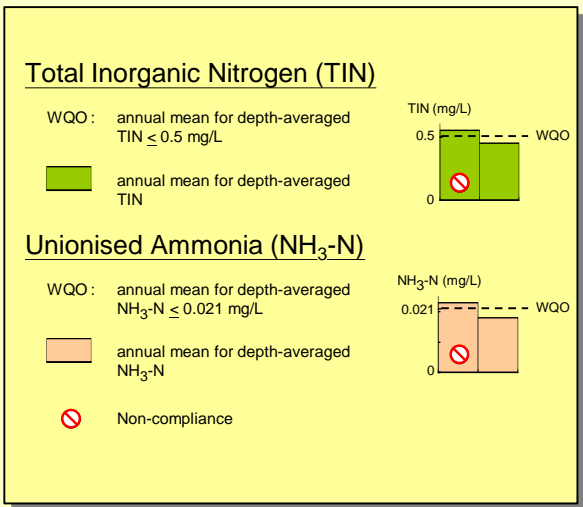
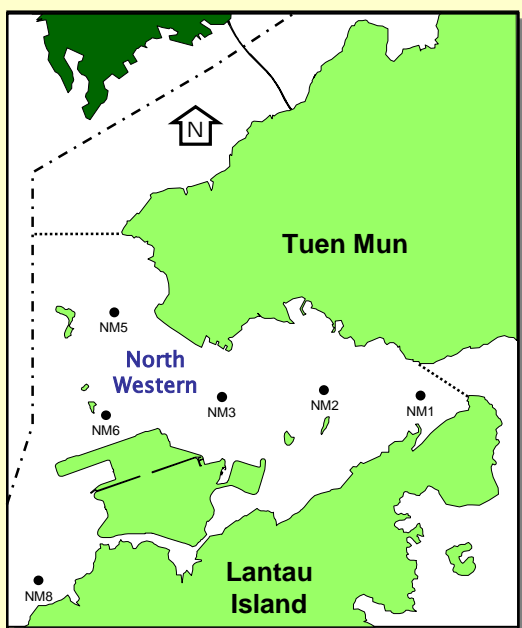
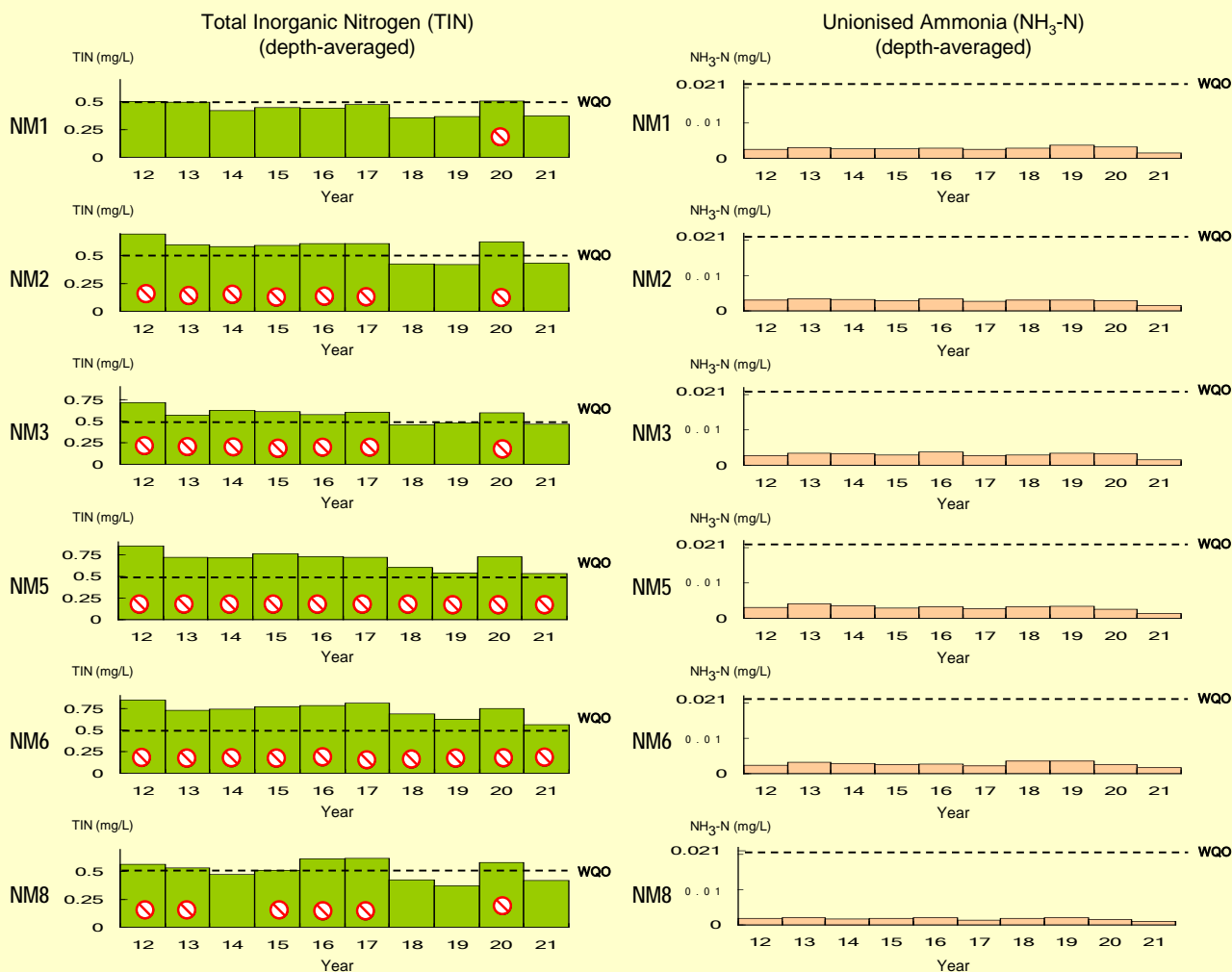


⊘ Non-compliance

WQO compliance rates for the North Western WCZ



WQO compliance rates for the North Western WCZ (continued)



Long-term water quality trend analyses in the Mirs Bay WCZ, 1991-2021

Monitoring Station		MM1	MM2	MM3	MM4	MM5	MM6	MM7
Monitoring Period		1991	1991	1991	1991	1991	1991	1991
		2021	2021	2021	2021	2021	2021	2021
Parameter	Water Depth							
	Surface							
Temperature (°C)	Middle	-	-	-	-	-	↗	-
	Bottom	↗	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Dissolved Oxygen (%)	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	-	↗	↗	↗	↗	↗	↗
Total volatile 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	-	↗	-	↗	↗	-	↗
<i>E. coli</i> (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

Long-term water quality trend analyses in the Mirs Bay WCZ, 1986-2021

Monitoring Station		MM8	MM13	MM14	MM15	MM16	MM17	MM19
Monitoring Period		1991	1991	1994	1994	1994	1986	2001
		2021	2021	2021	2021	2021	2021	2021
Parameter	Water Depth							
	Surface							
Temperature (°C)	Middle	↗	↗	-	-	↗	↗	-
	Bottom	↗	↗	-	-	↗	↗	-
	Average	↗	↗	-	-	↗	↗	-
	Average	↗	↗	-	-	↗	↗	-
Salinity	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	↘	-	↘	-	↘	-
	Middle	↘	↘	-	↘	-	↘	-
	Bottom	↘	↘	-	↘	-	↘	-
	Average	↘	↘	↘	↘	↘	↘	↘
Dissolved Oxygen (%)	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	↗	↗	↗	↗	↗	-	↗
Total volatile 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	-	-	↘	↘	-	↗	↘
<i>E. coli</i> (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

Long-term water quality trend analyses in the Port Shelter WCZ, 1986 - 2021

Monitoring Station		PM1	PM2	PM3	PM4	PM6	PM7	PM8	PM9	PM11
Monitoring Period		1986	1986	1986	1986	1986	1986	1986	1986	1993
		2021	2021	2021	2021	2021	2021	2021	2021	2021
Parameter	Water Depth									
	Surface									
Temperature (°C)	Middle	3	3	3	3	3	3	3	3	-
	Bottom	3	3	3	3	3	3	3	3	-
	Average	3	3	3	3	3	3	3	3	-
	Average	3	3	3	3	3	3	3	3	-
Salinity	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	4	4	4	4	4	4	4	4	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (%)	Surface	4	4	4	4	4	4	4	4	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	3	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
pH	Surface	4	4	4	4	4	4	4	4	4
	Middle	4	4	4	4	4	4	4	4	4
	Bottom	4	4	4	4	4	4	4	4	4
	Average	4	4	4	4	4	4	4	4	4
Secchi disc depth (m)		3	3	-	-	3	-	-	-	-
Turbidity (NTU)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	4
	Average	-	-	-	-	-	-	-	-	4
Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	3	-	-	3	3	3	3
	Average	-	-	-	-	-	-	-	-	3
Total volatile solids (mg/L)	Surface	3	-	-	-	3	-	-	-	-
	Middle	3	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	3
	Average	3	-	-	-	-	-	-	-	3
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	4	-	-	4	-	-	-	-
	Middle	-	4	-	-	4	-	-	-	-
	Bottom	-	4	-	-	4	-	-	-	-
	Average	-	4	-	-	4	-	-	-	-
Ammonia nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	4	4	4	4	4	4	4	4	4
	Middle	4	4	4	4	4	4	4	4	4
	Bottom	4	4	4	4	4	4	4	4	4
	Average	4	4	4	4	4	4	4	4	4
Nitrite nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	3	3	3	3
	Average	-	-	-	-	-	-	3	3	3
Nitrate nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	3	3	3	3
	Average	-	-	-	-	-	-	3	3	3
Total inorganic nitrogen (mg/L)	Surface	-	-	-	-	-	3	3	3	-
	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	4	4	4	4	4	4	4	4	4
	Middle	4	4	4	4	4	4	4	4	4
	Bottom	4	4	4	4	4	4	4	4	4
	Average	4	4	4	4	4	4	4	4	4
Total phosphorus (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	4	4	4	4	4	4	4	4	4
Silica (mg/L)	Surface	4	-	4	-	-	4	-	4	-
	Middle	4	-	4	-	-	4	-	4	-
	Bottom	4	-	4	-	-	4	-	4	-
	Average	4	-	4	-	-	4	-	4	-
Chlorophyll- <i>a</i> (µg/L)	Surface	3	-	3	3	-	3	3	-	-
	Middle	3	-	3	3	-	3	3	-	-
	Bottom	3	3	3	3	-	3	3	-	4
	Average	3	-	3	3	-	3	3	-	-
<i>E. coli</i> (cfu/100mL)	Surface	-	4	-	-	-	-	-	-	-
	Middle	-	4	-	-	-	-	-	-	-
	Bottom	-	4	-	-	-	-	-	-	-
	Average	-	4	-	-	-	-	-	-	-
Faecal coliforms (cfu/100mL)	Surface	-	-	-	-	4	-	-	-	-
	Middle	-	-	-	-	4	-	-	-	-
	Bottom	-	-	-	-	4	-	-	-	-
	Average	-	-	-	-	4	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$

2. - indicates no significant trend

3. 3 significant increase

4. 4 significant decrease

Long-term water quality trend analyses in the Tolo Harbour and Channel WCZ, 1986 - 2021

Monitoring Station		TM2	TM3	TM4	TM5	TM6	TM7	TM8
Monitoring Period		1986 | 2021	1986 | 2021	1986 | 2021	1988 | 2021	1986 | 2021	1988 | 2021	1986 | 2021
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 (%)	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	↘	-	-	↘	-	-	-
Total volatile 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- <i>a</i> (µg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
<i>E. coli</i> (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

Long-term water quality trend analyses in the Southern WCZ, 1986 - 2021

Monitoring Station		SM1	SM2	SM3	SM4	SM5	SM6	SM7	SM9
Monitoring Period		1986 | 2021	1986 | 2021	1986 | 2021	1986 | 2021	1986 | 2021	1986 | 2021	1986 | 2021	1988 | 2021
Parameter	Water Depth								
Temperature (°C)	Surface	↗	↗	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗	↗
Salinity	Surface	.	.	.	.	.	.	.	.
	Middle	.	.	.	.	.	.	.	.
	Bottom	.	.	.	.	.	.	.	.
	Average	.	.	.	.	.	.	.	.
Dissolved Oxygen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	.	.	.	.	.	.	.	.
	Bottom	.	.	.	.	.	.	.	.
	Average	↘	.	↘	↘	↘	↘	↘	.
Dissolved Oxygen (%)	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	.	.	.	.	.	.	.	↘
Total volatile 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	.	.	.	.	↗	.	↗	↗
<i>E. coli</i> (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

Long-term water quality trend analyses in the Southern WCZ, 1986 - 2021 (continued)

Monitoring Station		SM10	SM11	SM12	SM13	SM17	SM18	SM19	SM20
Monitoring Period		1986 | 2021	1986 | 2021	1986 | 2021	1986 | 2021	1989 | 2021	1989 | 2021	1989 | 2021	1999 | 2021
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 (%)	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	-	-	-	-	-	-	-	↘
Total volatile 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- <i>a</i> (µg/L)	Surface	↗	↗	↗	↗	↗	-	-	-
	Middle	NA	↗	↗	↗	↗	-	-	-
	Bottom	↗	↗	↗	↗	↗	-	-	-
	Average	↗	↗	↗	↗	↗	-	-	-
<i>E. coli</i> (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

Long-term water quality trend analyses in the Victoria Harbour WCZ, 1986 - 2021

Monitoring Station		VM1	VM2	VM4	VM5	VM6
Monitoring Period		1988 | 2021	1988 | 2021	1988 | 2021	1986 | 2021	1988 | 2021
Parameter	Water Depth					
Temperature (°C)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-
	Middle	↗	↗	↗	-	-
	Bottom	↗	↗	↗	-	-
	Average	↗	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Dissolved Oxygen (%)	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	↘	↘	↘	↘	↘
Total volatile 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- <i>a</i> (µg/L)	Surface	-	-	↗	↘	-
	Middle	-	-	↗	-	-
	Bottom	-	↗	↗	-	-
	Average	-	↗	↗	-	-
<i>E. coli</i> (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

Long-term water quality trend analyses in the Victoria Harbour WCZ, 1986 - 2021 (continued)

Monitoring Station		VM7	VM8	VM12	VM14	VM15
Monitoring Period		1986 | 2021	1986 | 2021	1986 | 2021	1986 | 2021	1993 | 2021
Parameter	Water Depth					
Temperature (°C)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	-	-	-
	Average	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	-	↗	↗	↗
	Middle	↗	-	↗	↗	↗
	Bottom	↗	-	↗	↗	↗
	Average	↗	-	↗	↗	↗
Dissolved Oxygen (%)	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	↘	↘	↘	↘	↘
Total volatile 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- <i>a</i> (µg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	-	-	-
	Average	-	-	-	-	-
<i>E. coli</i> (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

Long-term water quality trend analyses in the Eastern Buffer WCZ, 1986 - 2021

Monitoring Station		EM1	EM2	EM3
Monitoring Period		1986 | 2021	1986 | 2021	1988 | 2021
Parameter	Water Depth			
Temperature (°C)	Surface	↗	↗	↗
	Middle	↗	↗	↗
	Bottom	↗	↗	↗
	Average	↗	↗	↗
Salinity	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	-	-
	Middle	↗	-	-
	Bottom	↗	-	-
	Average	↗	-	-
Dissolved Oxygen (%)	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	↘	-	-
Total volatile 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- <i>a</i> (µg/L)	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
<i>E. coli</i> (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

Long-term water quality trend analyses in the Western Buffer WCZ, 1986 - 2021

Monitoring Station		WM1	WM2	WM3	WM4
Monitoring Period		1988 | 2021	1988 | 2021	1986 | 2021	1986 | 2021
Parameter	Water Depth				
Temperature (°C)	Surface	↗	↗	↗	↗
	Middle	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗
	Average	↗	↗	↗	↗
Salinity	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	↘	↘	↘
	Middle	-	↘	-	-
	Bottom	-	↘	-	-
	Average	-	↘	-	↘
Dissolved Oxygen (%)	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	-	-	↘	-
Total volatile 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- <i>a</i> (µg/L)	Surface	↗	↗	↗	↗
	Middle	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗
	Average	↗	↗	↗	↗
<i>E. coli</i> (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

Long-term water quality trend analyses in the Junk Bay WCZ, 1986 - 2021

Monitoring Station		JM3	JM4
Monitoring Period		1986 | 2021	1986 | 2021
Parameter	Water Depth		
Temperature (°C)	Surface	↗	↗
	Middle	↗	↗
	Bottom	↗	↗
	Average	↗	↗
Salinity	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Dissolved Oxygen (mg/L)	Surface	-	-
	Middle	↗	↗
	Bottom	↗	↗
	Average	↗	↗
Dissolved Oxygen (%)	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	-	-
Total volatile 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- <i>a</i> (µg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
<i>E. coli</i> (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

Long-term water quality trend analyses in the Deep Bay WCZ, 1986 - 2021

Monitoring Station		DM1	DM2	DM3	DM4	DM5
Monitoring Period		1986 | 2021	1986 | 2021	1986 | 2021	1986 | 2021	1991 | 2021
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 (%)	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	-	↗	-	-	↘
Total volatile 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	↗	↗	-	-	↗
<i>E. coli</i> (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

Long-term water quality trend analyses in the North Western WCZ, 1986 - 2021

Monitoring Station		NM1	NM2	NM3	NM5	NM6	NM8
Monitoring Period		1988 | 2021	1986 | 2021	1986 | 2021	1988 | 2021	1991 | 2021	1999 | 2021
Parameter	Water Depth						
Temperature (°C)	Surface	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	↘	-	-	↘
	Middle	-	-	↘	-	-	↘
	Bottom	-	-	↘	-	↘	↘
	Average	-	-	↘	-	-	↘
Dissolved Oxygen (mg/L)	Surface	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘
Dissolved Oxygen (%)	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	-	-	↘	-	-	-
Total volatile 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- <i>a</i> (µg/L)	Surface	-	-	↗	-	↗	-
	Middle	-	-	↗	-	↗	-
	Bottom	-	-	↗	-	↗	-
	Average	-	-	↗	-	↗	-
<i>E. coli</i> (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 marine sediment quality in the Tolo Harbour and Channel and Southern WCZs, 2017 - 2021

Parameter	Tolo Harbour and Channel				Hong Kong Island (South)		West Lamma Channel	
	Harbour Subzone		Buffer Subzone	Channel Subzone	SS1	SS2	SS3	SS4
	TS2	TS3	TS4	TS5				
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	71 (2 - 94)	82 (20 - 98)	68 (9 - 98)	86 (6 - 99)	47 (25 - 74)	72 (14 - 91)	77 (21 - 99)	73 (6 - 96)
Electrochemical Potential (mV)	-300 (-369 - -169)	-302 (-361 - -188)	-327 (-379 - -226)	-307 (-375 - -180)	-149 (-259 - -91)	-145 (-266 - -69)	-129 (-263 - -40)	-136 (-250 - -75)
Total Solids (%w/w)	37 (29 - 45)	37 (29 - 44)	37 (29 - 50)	31 (28 - 33)	60 (54 - 65)	49 (42 - 59)	50 (40 - 54)	46 (42 - 50)
Total Volatile Solids (%TS)	9.2 (5.9 - 12.0)	9.1 (7.4 - 11.0)	10.1 (6.3 - 12.0)	10.8 (9.0 - 15.0)	5.4 (4.8 - 6.0)	7.0 (5.4 - 8.0)	6.8 (5.4 - 8.5)	6.9 (5.2 - 7.5)
Chemical Oxygen Demand (mg/kg)	20700 (17000 - 25000)	21200 (18000 - 27000)	20000 (16000 - 25000)	17700 (13000 - 22000)	9820 (7800 - 11000)	11860 (7200 - 16000)	12190 (8000 - 16000)	12270 (9700 - 14000)
Total Carbon (%w/w)	0.8 (0.7 - 1.1)	0.7 (0.5 - 0.8)	1.0 (0.7 - 1.5)	0.8 (0.7 - 0.8)	1.0 (0.8 - 1.1)	0.8 (0.6 - 1.4)	0.8 (0.6 - 0.9)	0.6 (0.5 - 0.7)
Ammonical Nitrogen (mg/kg)	6.12 (3.40 - 8.50)	3.69 (0.99 - 9.20)	11.27 (3.50 - 24.00)	11.52 (5.30 - 17.00)	5.38 (0.44 - 11.00)	9.12 (1.30 - 51.00)	4.61 (0.30 - 9.70)	4.74 (0.27 - 9.30)
Total Kjeldahl Nitrogen (mg/kg)	650 (590 - 750)	610 (500 - 780)	750 (580 - 1300)	690 (500 - 770)	540 (330 - 1200)	530 (450 - 580)	500 (420 - 550)	600 (480 - 920)
Total Phosphorus (mg/kg)	190 (160 - 250)	170 (160 - 190)	210 (160 - 240)	190 (160 - 230)	240 (160 - 430)	230 (220 - 240)	240 (210 - 260)	230 (210 - 250)
Total Sulphide (mg/kg)	95.6 (11.0 - 260.0)	63.4 (18.0 - 160.0)	104.8 (7.1 - 230.0)	121.6 (23.0 - 230.0)	12.5 (2.7 - 26.0)	42.7 (3.7 - 260.0)	23.5 (8.8 - 54.0)	35.7 (8.2 - 100.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	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)
Arsenic (mg/kg)	13.2 (9.5 - 18.0)	13.5 (10.0 - 18.0)	11.1 (8.8 - 16.0)	9.0 (3.6 - 12.0)	7.8 (5.2 - 11.0)	10.0 (8.9 - 11.0)	8.8 (6.8 - 9.9)	9.8 (7.8 - 12.0)
Cadmium (mg/kg)	0.6 (0.4 - 0.8)	0.6 (0.4 - 0.8)	0.4 (0.2 - 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)	25 (14 - 32)	26 (20 - 32)	27 (19 - 34)	37 (29 - 55)	21 (15 - 29)	30 (25 - 35)	29 (21 - 36)	34 (27 - 46)
Copper (mg/kg)	42 (21 - 92)	37 (26 - 60)	45 (23 - 150)	25 (20 - 34)	17 (7 - 82)	23 (15 - 35)	18 (13 - 27)	27 (21 - 34)
Lead (mg/kg)	100 (72 - 180)	95 (67 - 130)	77 (59 - 100)	57 (50 - 86)	29 (21 - 42)	37 (32 - 56)	34 (30 - 39)	39 (35 - 43)
Mercury (mg/kg)	0.07 (<0.05 - 0.10)	0.06 (<0.05 - 0.08)	0.07 (<0.05 - 0.12)	0.06 (<0.05 - 0.08)	0.07 (<0.05 - 0.18)	0.09 (0.07 - 0.18)	0.15 (0.06 - 0.80)	0.12 (0.10 - 0.17)
Nickel (mg/kg)	16 (5 - 38)	15 (5 - 18)	18 (11 - 24)	26 (20 - 35)	15 (11 - 21)	21 (17 - 23)	20 (15 - 25)	22 (18 - 27)
Silver (mg/kg)	0.3 (0.2 - 0.4)	0.3 (0.2 - 0.5)	0.3 (<0.2 - 0.4)	0.2 (<0.2 - 0.3)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	0.2 (<0.2 - 0.2)
Zinc (mg/kg)	260 (170 - 410)	270 (170 - 410)	220 (120 - 410)	160 (120 - 220)	75 (50 - 140)	100 (80 - 130)	110 (69 - 250)	120 (87 - 180)
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 Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(4) (6)}	110 (90 - 310)	110 (90 - 190)	110 (90 - 150)	120 (90 - 220)	96 (90 - 140)	98 (90 - 170)	100 (90 - 230)	110 (90 - 250)
High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(5) (6)}	53 (27 - 110)	40 (22 - 82)	53 (25 - 130)	57 (33 - 100)	36 (19 - 52)	82 (21 - 270)	47 (26 - 91)	75 (26 - 140)

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, Dibenz(a,h)anthracene, Ben

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 marine sediment quality in the Southern, Junk Bay and Deep Bay WCZs, 2017 - 2021

Parameter	Lantau Island		Junk Bay	Inner Deep Bay		Outer Deep Bay	
	(East)	(South)		DS1	DS2	DS3	DS4
Number of samples	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	85 (7 - 99)	65 (48 - 78)	80 (2 - 99)	72 (17 - 98)	70 (15 - 93)	75 (10 - 99)	59 (20 - 92)
Electrochemical Potential (mV)	-174 (-234 - 68)	-164 (-252 - 82)	-188 (-382 - 93)	-208 (-458 - 93)	-185 (-455 - 94)	-187 (-454 - 90)	-191 (-450 - 90)
Total Solids (%w/w)	38 (36 - 42)	62 (54 - 68)	49 (39 - 73)	47 (39 - 55)	48 (36 - 53)	51 (45 - 66)	50 (41 - 68)
Total Volatile Solids (%TS)	7.9 (6.9 - 8.6)	4.1 (2.9 - 5.9)	6.9 (3.2 - 8.6)	6.8 (4.2 - 9.1)	6.8 (4.7 - 8.4)	6.5 (2.8 - 7.8)	6.4 (5.6 - 7.4)
Chemical Oxygen Demand (mg/kg)	13300 (11000 - 15000)	8170 (3600 - 12000)	14350 (8500 - 18000)	20700 (15000 - 30000)	14300 (12000 - 17000)	12210 (8200 - 16000)	12600 (10000 - 15000)
Total Carbon (%w/w)	0.5 (0.5 - 0.6)	0.5 (0.4 - 1.1)	0.7 (0.6 - 0.9)	0.7 (0.4 - 1.2)	0.6 (0.4 - 0.8)	0.5 (0.2 - 0.5)	0.6 (0.4 - 1.3)
Ammonical Nitrogen (mg/kg)	7.04 (<0.05 - 13.00)	7.98 (0.29 - 20.00)	3.63 (0.16 - 7.90)	26.87 (0.67 - 96.00)	2.45 (<0.05 - 8.30)	1.88 (0.14 - 8.00)	1.61 (0.12 - 5.90)
Total Kjeldahl Nitrogen (mg/kg)	580 (490 - 620)	330 (190 - 460)	560 (490 - 620)	670 (450 - 1000)	460 (360 - 550)	440 (290 - 540)	420 (270 - 530)
Total Phosphorus (mg/kg)	190 (180 - 200)	200 (170 - 230)	200 (100 - 230)	430 (240 - 630)	290 (250 - 320)	240 (210 - 260)	210 (170 - 250)
Total Sulphide (mg/kg)	29.5 (0.4 - 67.0)	10.0 (<0.2 - 30.0)	23.5 (<0.2 - 77.0)	276.6 (26.0 - 660.0)	10.7 (<0.2 - 32.0)	7.7 (<0.2 - 28.0)	18.4 (1.0 - 38.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.3)	0.2 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.2)
Arsenic (mg/kg)	9.5 (8.0 - 12.0)	6.8 (4.7 - 11.0)	8.0 (4.1 - 10.0)	13.3 (5.3 - 19.0)	16.9 (11.0 - 22.0)	15.0 (12.0 - 17.0)	14.0 (11.0 - 17.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.2)	0.7 (0.3 - 1.3)	0.4 (0.1 - 0.7)	0.2 (0.1 - 0.4)	0.1 (<0.1 - 0.2)
Chromium (mg/kg)	40 (32 - 47)	19 (13 - 24)	36 (12 - 54)	46 (21 - 64)	45 (28 - 77)	42 (29 - 60)	35 (25 - 52)
Copper (mg/kg)	36 (30 - 56)	9 (3 - 16)	65 (19 - 130)	67 (31 - 110)	53 (34 - 84)	50 (35 - 65)	35 (19 - 44)
Lead (mg/kg)	45 (38 - 53)	23 (17 - 28)	43 (24 - 54)	54 (31 - 82)	55 (49 - 76)	51 (41 - 59)	45 (34 - 53)
Mercury (mg/kg)	0.14 (0.10 - 0.16)	0.06 (<0.05 - 0.08)	0.24 (0.10 - 0.64)	0.22 (0.07 - 0.43)	0.15 (0.12 - 0.17)	0.12 (0.10 - 0.14)	0.09 (<0.05 - 0.11)
Nickel (mg/kg)	26 (21 - 30)	12 (7 - 16)	19 (6 - 25)	28 (18 - 41)	26 (16 - 42)	27 (18 - 35)	22 (16 - 30)
Silver (mg/kg)	0.3 (0.2 - 0.4)	<0.2 (<0.2 - <0.2)	0.8 (0.2 - 1.3)	0.6 (0.3 - 1.0)	0.4 (<0.2 - 0.6)	0.3 (0.3 - 0.4)	0.2 (<0.2 - 0.3)
Zinc (mg/kg)	150 (120 - 180)	65 (43 - 88)	140 (52 - 190)	290 (180 - 410)	200 (130 - 290)	160 (110 - 190)	130 (90 - 180)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) ⁽³⁾	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	19 (18 - 26)	18 (18 - 18)
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(4) (6)}	99 (90 - 180)	100 (90 - 190)	94 (90 - 99)	220 (90 - 830)	120 (90 - 260)	110 (90 - 260)	110 (90 - 180)
High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(5) (6)}	63 (29 - 89)	25 (19 - 55)	190 (54 - 350)	410 (75 - 1600)	99 (42 - 270)	67 (28 - 170)	75 (22 - 140)

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, Ben

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 marine sediment quality in the Port Shelter and Mirs Bay WCZs, 2017 - 2021

Parameter	Inner Port Shelter	Outer Port Shelter		Starling Inlet	Crooked Island		Port Island	Mirs Bay (North)
	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)	80 (10 - 96)	54 (9 - 96)	66 (9 - 89)	83 (26 - 98)	86 (4 - 99)	70 (1 - 99)	78 (6 - 99)	74 (7 - 94)
Electrochemical Potential (mV)	-240 (-348 - 103)	-178 (-316 - 74)	-189 (-322 - 95)	-229 (-331 - 139)	-309 (-360 - 194)	-326 (-380 - 214)	-218 (-333 - 58)	-222 (-343 - 108)
Total Solids (%w/w)	36 (30 - 39)	50 (40 - 64)	50 (44 - 54)	42 (37 - 47)	34 (30 - 38)	29 (27 - 34)	35 (31 - 39)	42 (36 - 46)
Total Volatile Solids (%TS)	11.8 (11.0 - 13.0)	8.7 (6.4 - 12.0)	8.6 (7.7 - 9.4)	7.3 (5.9 - 8.3)	9.1 (7.4 - 10.0)	10.5 (8.5 - 12.0)	9.6 (7.6 - 11.0)	7.7 (6.0 - 9.0)
Chemical Oxygen Demand (mg/kg)	15800 (11000 - 19000)	13700 (12000 - 17000)	13400 (11000 - 16000)	14100 (11000 - 17000)	16100 (13000 - 21000)	16700 (14000 - 21000)	15700 (14000 - 18000)	14700 (12000 - 20000)
Total Carbon (%w/w)	1.1 (0.8 - 1.3)	1.6 (1.2 - 2.3)	1.4 (1.0 - 1.8)	0.6 (0.3 - 0.8)	0.6 (0.5 - 0.7)	0.7 (0.6 - 0.8)	0.7 (0.5 - 0.8)	0.6 (0.5 - 0.8)
Ammonical Nitrogen (mg/kg)	7.80 (1.10 - 12.00)	5.35 (0.57 - 8.90)	4.55 (0.92 - 5.90)	8.48 (5.30 - 19.00)	10.76 (8.50 - 17.00)	9.70 (7.20 - 18.00)	8.27 (5.50 - 11.00)	8.27 (2.20 - 15.00)
Total Kjeldahl Nitrogen (mg/kg)	740 (670 - 1000)	570 (440 - 730)	640 (570 - 770)	530 (390 - 740)	620 (450 - 710)	700 (630 - 770)	710 (590 - 770)	580 (400 - 780)
Total Phosphorus (mg/kg)	200 (190 - 230)	190 (150 - 210)	230 (190 - 270)	200 (170 - 230)	190 (150 - 220)	180 (160 - 230)	210 (180 - 250)	200 (150 - 310)
Total Sulphide (mg/kg)	37.5 (4.2 - 65.0)	22.0 (4.3 - 43.0)	22.3 (3.5 - 45.0)	36.6 (4.3 - 170.0)	58.6 (26.0 - 140.0)	56.8 (17.0 - 100.0)	30.1 (9.8 - 55.0)	22.7 (2.9 - 48.0)
Total Cyanide (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)	0.2 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	7.2 (6.1 - 8.6)	6.8 (4.3 - 10.0)	7.3 (6.2 - 9.4)	10.5 (8.3 - 13.0)	10.1 (8.5 - 11.0)	8.1 (4.0 - 10.0)	9.2 (7.5 - 11.0)	8.6 (6.3 - 11.0)
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 - 0.1)	0.3 (0.2 - 0.4)	0.3 (0.2 - 0.5)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.1)
Chromium (mg/kg)	25 (22 - 30)	23 (14 - 30)	24 (19 - 30)	34 (26 - 43)	38 (30 - 49)	33 (25 - 43)	35 (26 - 51)	31 (22 - 44)
Copper (mg/kg)	22 (18 - 32)	16 (7 - 46)	12 (10 - 16)	20 (14 - 25)	25 (21 - 29)	22 (18 - 28)	18 (15 - 21)	14 (11 - 17)
Lead (mg/kg)	39 (33 - 44)	31 (22 - 38)	34 (28 - 37)	40 (31 - 53)	47 (36 - 54)	46 (38 - 56)	43 (38 - 49)	36 (29 - 54)
Mercury (mg/kg)	0.09 (0.06 - 0.12)	0.06 (<0.05 - 0.13)	0.05 (<0.05 - 0.06)	0.05 (<0.05 - 0.05)	0.06 (<0.05 - 0.09)	0.07 (<0.05 - 0.11)	0.06 (<0.05 - 0.10)	<0.05 (<0.05 - <0.05)
Nickel (mg/kg)	17 (15 - 19)	15 (10 - 20)	17 (14 - 22)	21 (16 - 26)	25 (20 - 29)	23 (17 - 28)	25 (19 - 31)	21 (15 - 26)
Silver (mg/kg)	0.2 (<0.2 - 0.3)	0.2 (<0.2 - 0.2)	<0.2 (<0.2 - <0.2)	0.2 (<0.2 - 0.4)	0.2 (<0.2 - 0.3)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)
Zinc (mg/kg)	110 (89 - 130)	92 (46 - 170)	81 (62 - 110)	110 (82 - 160)	130 (110 - 140)	110 (94 - 140)	110 (94 - 120)	87 (68 - 100)
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 Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(4) (6)}	98 (90 - 150)	100 (90 - 130)	94 (90 - 130)	110 (90 - 210)	110 (90 - 290)	120 (90 - 320)	91 (90 - 96)	120 (90 - 340)
High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(5) (6)}	51 (34 - 92)	32 (16 - 58)	26 (20 - 37)	32 (17 - 78)	30 (16 - 40)	65 (19 - 270)	37 (19 - 89)	26 (16 - 61)

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, Ben

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 marine sediment quality in the Mirs Bay WCZ, 2017 - 2021

Parameter	Mirs Bay (North)		Long Harbour	Waglan Island	Mirs Bay (South)	Mirs Bay (Central)		
	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)	83 (5 - 99)	86 (1 - 99)	74 (3 - 98)	74 (3 - 96)	75 (42 - 96)	86 (4 - 99)	84 (8 - 99)	69 (38 - 90)
Electrochemical Potential (mV)	-254 (-329 - -157)	-223 (-321 - -82)	-231 (-304 - -131)	-159 (-279 - -73)	-160 (-303 - -36)	-174 (-285 - -85)	-173 (-306 - -79)	-162 (-314 - -42)
Total Solids (%w/w)	39 (33 - 44)	38 (32 - 46)	34 (30 - 46)	49 (36 - 65)	53 (45 - 65)	50 (43 - 54)	50 (44 - 58)	54 (44 - 62)
Total Volatile Solids (%TS)	8.4 (6.5 - 9.6)	8.2 (5.3 - 11.0)	10.8 (8.8 - 13.0)	6.7 (5.3 - 8.9)	5.9 (4.8 - 6.8)	6.5 (5.6 - 7.4)	6.8 (6.1 - 8.3)	6.0 (4.9 - 7.6)
Chemical Oxygen Demand (mg/kg)	14400 (12000 - 17000)	14200 (12000 - 17000)	16000 (13000 - 18000)	10280 (8500 - 12000)	9630 (7200 - 14000)	9920 (6400 - 13000)	9530 (6100 - 11000)	9310 (5200 - 11000)
Total Carbon (%w/w)	0.7 (0.6 - 1.1)	0.6 (0.5 - 0.9)	1.0 (0.8 - 2.0)	0.7 (0.4 - 1.3)	0.6 (0.5 - 0.9)	0.6 (0.5 - 1.0)	0.6 (0.5 - 0.7)	0.6 (0.5 - 0.7)
Ammonical Nitrogen (mg/kg)	8.25 (5.20 - 13.00)	5.80 (0.45 - 10.00)	6.01 (0.78 - 10.00)	2.37 (0.08 - 3.90)	2.99 (1.40 - 6.20)	3.04 (2.30 - 4.20)	3.82 (0.08 - 7.20)	4.65 (0.33 - 8.70)
Total Kjeldahl Nitrogen (mg/kg)	620 (490 - 710)	650 (550 - 730)	720 (610 - 780)	510 (340 - 680)	440 (310 - 520)	520 (460 - 620)	530 (450 - 650)	530 (400 - 730)
Total Phosphorus (mg/kg)	200 (180 - 220)	200 (180 - 220)	210 (170 - 230)	210 (150 - 240)	220 (180 - 280)	240 (210 - 270)	250 (220 - 270)	250 (220 - 320)
Total Sulphide (mg/kg)	33.9 (10.0 - 85.0)	23.6 (3.4 - 44.0)	34.7 (9.7 - 78.0)	26.3 (2.0 - 140.0)	15.2 (-0.2 - 34.0)	13.5 (2.6 - 30.0)	14.5 (0.8 - 27.0)	15.8 (4.5 - 37.0)
Total Cyanide (mg/kg)	0.1 (-0.1 - 0.1)	0.1 (-0.1 - 0.2)	0.1 (-0.1 - 0.2)	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)	8.0 (5.0 - 11.0)	8.5 (6.9 - 10.0)	8.1 (3.5 - 11.0)	8.4 (5.2 - 11.0)	8.7 (5.7 - 11.0)	8.8 (7.4 - 9.9)	8.4 (6.6 - 11.0)	7.9 (6.3 - 10.0)
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 - <0.1)	<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 - 43)	33 (28 - 39)	34 (22 - 75)	30 (16 - 48)	29 (19 - 51)	31 (26 - 38)	30 (22 - 41)	27 (22 - 47)
Copper (mg/kg)	16 (7 - 29)	16 (14 - 20)	16 (7 - 22)	14 (11 - 21)	13 (8 - 24)	32 (10 - 200)	12 (9 - 16)	92 (8 - 830)
Lead (mg/kg)	38 (31 - 44)	43 (36 - 59)	42 (33 - 47)	35 (21 - 41)	33 (23 - 43)	34 (29 - 37)	34 (29 - 40)	30 (25 - 41)
Mercury (mg/kg)	0.05 (-0.05 - 0.06)	0.05 (-0.05 - 0.06)	0.06 (-0.05 - 0.09)	0.07 (-0.05 - 0.13)	0.06 (-0.05 - 0.10)	0.06 (-0.05 - 0.10)	0.05 (-0.05 - 0.06)	<0.05 (-0.05 - <0.05)
Nickel (mg/kg)	22 (12 - 28)	23 (20 - 28)	23 (15 - 33)	21 (11 - 29)	21 (13 - 31)	22 (17 - 27)	22 (16 - 27)	21 (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)	97 (47 - 160)	100 (86 - 130)	110 (74 - 130)	84 (51 - 99)	84 (50 - 130)	120 (71 - 400)	82 (63 - 120)	110 (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 Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(4) (6)}	120 (90 - 300)	100 (90 - 230)	110 (90 - 220)	92 (90 - 100)	100 (90 - 170)	96 (90 - 140)	110 (90 - 300)	100 (90 - 200)
High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(5) (6)}	31 (17 - 59)	27 (16 - 35)	40 (17 - 89)	64 (19 - 200)	31 (18 - 65)	30 (20 - 69)	23 (18 - 30)	20 (18 - 23)

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, Dibenz(a,h)anthracene, Ben

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 marine sediment quality in the North Western and Western Buffer WCZs, 2017 - 2021

	Pearl Island	Pillar Point	Urmston Road	Chek Lap Kok (North)	Tsing Yi (South)	Hong Kong Island (West)
Parameter	NS2	NS3	NS4	NS6	WS1	WS2
Number of samples	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	65 (20 - 97)	61 (25 - 96)	53 (28 - 89)	64 (13 - 88)	70 (17 - 94)	69 (26 - 91)
Electrochemical Potential (mV)	-125 (-170 - 59)	-152 (-217 - -103)	-154 (-197 - -109)	-135 (-222 - -87)	-179 (-258 - -109)	-170 (-265 - -102)
Total Solids (%w/w)	51 (39 - 63)	49 (42 - 59)	56 (49 - 64)	50 (41 - 64)	44 (38 - 52)	46 (38 - 54)
Total Volatile Solids (%TS)	6.5 (4.8 - 7.8)	6.7 (5.3 - 8.5)	5.5 (4.2 - 6.7)	6.6 (4.6 - 8.2)	7.5 (6.2 - 9.1)	7.4 (5.9 - 9.8)
Chemical Oxygen Demand (mg/kg)	11520 (9200 - 13000)	13570 (6700 - 17000)	13080 (8800 - 17000)	11780 (9800 - 15000)	15370 (8700 - 19000)	13480 (9800 - 17000)
Total Carbon (%w/w)	0.6 (0.5 - 1.0)	0.7 (0.6 - 0.8)	0.6 (0.4 - 0.8)	0.5 (0.4 - 1.2)	0.7 (0.6 - 0.8)	0.7 (0.5 - 1.2)
Ammonical Nitrogen (mg/kg)	5.27 (0.23 - 11.00)	9.23 (0.40 - 18.00)	5.77 (0.20 - 24.00)	7.75 (-0.05 - 45.00)	15.47 (1.40 - 27.00)	6.92 (0.65 - 22.00)
Total Kjeldahl Nitrogen (mg/kg)	440 (280 - 540)	450 (380 - 530)	450 (330 - 740)	430 (340 - 570)	600 (500 - 770)	510 (370 - 650)
Total Phosphorus (mg/kg)	220 (170 - 280)	220 (180 - 230)	220 (180 - 250)	240 (180 - 310)	230 (200 - 270)	210 (170 - 250)
Total Sulphide (mg/kg)	32.4 (2.5 - 77.0)	71.2 (3.3 - 230.0)	25.3 (4.3 - 78.0)	23.5 (1.2 - 87.0)	137.7 (9.4 - 320.0)	33.5 (-0.2 - 81.0)
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)	0.1 (-0.1 - 0.2)
Arsenic (mg/kg)	12.0 (7.7 - 23.0)	12.8 (9.7 - 15.0)	11.1 (8.3 - 15.0)	16.1 (13.0 - 22.0)	10.2 (7.5 - 12.0)	10.2 (7.8 - 13.0)
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 - 0.1)	0.2 (0.1 - 0.2)	0.1 (-0.1 - 0.3)
Chromium (mg/kg)	34 (21 - 53)	31 (22 - 47)	25 (17 - 44)	34 (22 - 49)	35 (26 - 46)	34 (25 - 48)
Copper (mg/kg)	33 (17 - 48)	28 (17 - 37)	26 (16 - 44)	28 (15 - 39)	51 (26 - 100)	36 (20 - 63)
Lead (mg/kg)	46 (29 - 90)	39 (33 - 48)	34 (25 - 41)	43 (34 - 52)	42 (33 - 52)	39 (32 - 45)
Mercury (mg/kg)	0.10 (0.06 - 0.14)	0.10 (0.06 - 0.12)	0.12 (0.06 - 0.54)	0.11 (0.06 - 0.17)	0.16 (0.10 - 0.25)	0.15 (0.08 - 0.32)
Nickel (mg/kg)	20 (13 - 31)	19 (13 - 27)	16 (10 - 26)	22 (15 - 27)	21 (17 - 26)	21 (18 - 28)
Silver (mg/kg)	0.2 (-0.2 - 0.3)	0.2 (-0.2 - 0.3)	<0.2 (-0.2 - <0.2)	0.2 (-0.2 - 0.2)	0.6 (0.3 - 1.7)	0.4 (-0.2 - 0.9)
Zinc (mg/kg)	150 (79 - 220)	120 (92 - 160)	120 (78 - 200)	120 (82 - 180)	160 (94 - 300)	140 (86 - 180)
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 Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(4) (6)}	110 (90 - 150)	110 (90 - 220)	100 (90 - 150)	100 (90 - 200)	120 (90 - 320)	110 (90 - 220)
High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(5) (6)}	69 (40 - 110)	96 (30 - 200)	74 (28 - 230)	51 (24 - 90)	180 (91 - 390)	250 (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, Ben

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 marine sediment quality in the Eastern Buffer and Victoria Harbour WCZs, 2017 - 2021

Parameter	Eastern Buffer			Victoria Harbour			Rambler Channel	
	Chai Wan	Tathong Channel		(East)	(Central)	(West)		
	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)	68 (34 - 99)	68 (10 - 98)	79 (47 - 97)	58 (17 - 96)	80 (20 - 97)	66 (11 - 98)	84 (10 - 98)	76 (5 - 98)
Electrochemical Potential (mV)	-184 (-361 - -98)	-192 (-366 - -103)	-187 (-357 - -115)	-186 (-337 - -102)	-267 (-377 - -168)	-213 (-293 - -65)	-257 (-387 - -189)	-214 (-335 - -112)
Total Solids (%w/w)	57 (42 - 69)	57 (46 - 73)	52 (35 - 64)	44 (36 - 55)	44 (35 - 73)	46 (36 - 60)	41 (36 - 51)	41 (33 - 58)
Total Volatile Solids (%TS)	6.1 (4.3 - 8.6)	6.1 (3.8 - 8.0)	6.8 (4.7 - 9.3)	7.8 (6.7 - 9.2)	8.3 (6.0 - 9.6)	7.4 (5.3 - 11.0)	7.5 (5.0 - 9.2)	7.7 (5.4 - 8.8)
Chemical Oxygen Demand (mg/kg)	11730 (8100 - 17000)	10730 (6400 - 15000)	14460 (9600 - 21000)	17600 (15000 - 22000)	16580 (9800 - 24000)	17700 (11000 - 24000)	14290 (7200 - 19000)	15600 (10000 - 22000)
Total Carbon (%w/w)	1.0 (0.7 - 1.2)	0.9 (0.6 - 2.5)	0.9 (0.6 - 1.9)	0.7 (0.4 - 1.0)	0.8 (0.6 - 1.4)	0.8 (0.6 - 1.2)	0.6 (0.5 - 0.9)	0.7 (0.5 - 0.9)
Ammonical Nitrogen (mg/kg)	3.95 (0.15 - 9.30)	6.58 (0.09 - 29.00)	4.83 (0.15 - 17.00)	3.89 (<0.05 - 11.00)	9.67 (<0.05 - 27.00)	11.03 (0.15 - 46.00)	13.91 (0.28 - 31.00)	6.82 (0.95 - 15.00)
Total Kjeldahl Nitrogen (mg/kg)	470 (280 - 730)	460 (280 - 700)	500 (380 - 620)	550 (410 - 670)	590 (490 - 780)	620 (490 - 770)	550 (420 - 780)	550 (450 - 670)
Total Phosphorus (mg/kg)	200 (160 - 250)	190 (140 - 230)	210 (180 - 240)	200 (180 - 210)	190 (160 - 210)	230 (200 - 290)	210 (170 - 300)	210 (170 - 250)
Total Sulphide (mg/kg)	15.7 (4.6 - 36.0)	24.2 (<0.2 - 83.0)	34.0 (2.3 - 59.0)	94.7 (14.0 - 180.0)	162.7 (11.0 - 450.0)	111.9 (15.0 - 240.0)	170.9 (38.0 - 440.0)	110.3 (7.5 - 500.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.2)	0.2 (0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.3)	0.2 (<0.1 - 0.4)	0.2 (0.1 - 0.3)
Arsenic (mg/kg)	6.2 (4.7 - 8.0)	6.2 (3.6 - 9.4)	7.2 (4.1 - 10.0)	8.5 (6.4 - 11.0)	9.2 (6.1 - 12.0)	10.6 (8.0 - 12.0)	10.3 (8.5 - 12.0)	11.0 (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 - 0.4)	0.3 (0.2 - 0.5)	0.3 (0.2 - 0.4)	0.8 (0.2 - 6.1)	0.4 (0.2 - 0.8)
Chromium (mg/kg)	23 (15 - 42)	23 (8 - 38)	31 (17 - 41)	37 (23 - 48)	42 (20 - 52)	37 (21 - 46)	49 (32 - 120)	59 (28 - 120)
Copper (mg/kg)	25 (14 - 50)	21 (5 - 44)	48 (23 - 83)	84 (49 - 110)	100 (42 - 210)	70 (33 - 110)	100 (43 - 400)	130 (48 - 220)
Lead (mg/kg)	29 (21 - 40)	30 (15 - 39)	39 (22 - 55)	48 (33 - 59)	53 (41 - 61)	59 (44 - 110)	46 (36 - 92)	53 (37 - 79)
Mercury (mg/kg)	0.13 (<0.05 - 0.41)	0.08 (<0.05 - 0.14)	0.19 (0.10 - 0.38)	0.29 (0.22 - 0.43)	0.37 (0.18 - 0.81)	0.37 (0.25 - 0.70)	0.22 (0.13 - 0.50)	0.19 (0.10 - 0.27)
Nickel (mg/kg)	14 (10 - 25)	15 (6 - 23)	17 (9 - 25)	18 (11 - 24)	21 (10 - 26)	18 (12 - 23)	27 (19 - 62)	27 (13 - 43)
Silver (mg/kg)	0.3 (<0.2 - 0.6)	0.2 (<0.2 - 0.6)	0.7 (0.3 - 1.6)	1.5 (0.8 - 2.8)	1.4 (0.7 - 1.8)	1.0 (0.5 - 1.4)	1.4 (0.6 - 5.4)	1.5 (0.5 - 2.9)
Zinc (mg/kg)	84 (53 - 150)	77 (30 - 140)	130 (63 - 210)	170 (120 - 240)	210 (120 - 340)	210 (160 - 340)	170 (130 - 400)	220 (99 - 360)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) ⁽³⁾	18 (18 - 18)	18 (18 - 18)	18 (18 - 21)	19 (18 - 25)	18 (18 - 20)	21 (18 - 51)	18 (18 - 22)	20 (18 - 33)
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(4) (6)}	100 (90 - 180)	100 (90 - 180)	120 (90 - 340)	200 (90 - 740)	120 (90 - 200)	140 (90 - 320)	110 (90 - 250)	110 (90 - 170)
High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(5) (6)}	140 (37 - 440)	88 (17 - 210)	220 (43 - 560)	890 (87 - 4700)	420 (160 - 630)	460 (51 - 1500)	150 (44 - 380)	270 (120 - 910)

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.

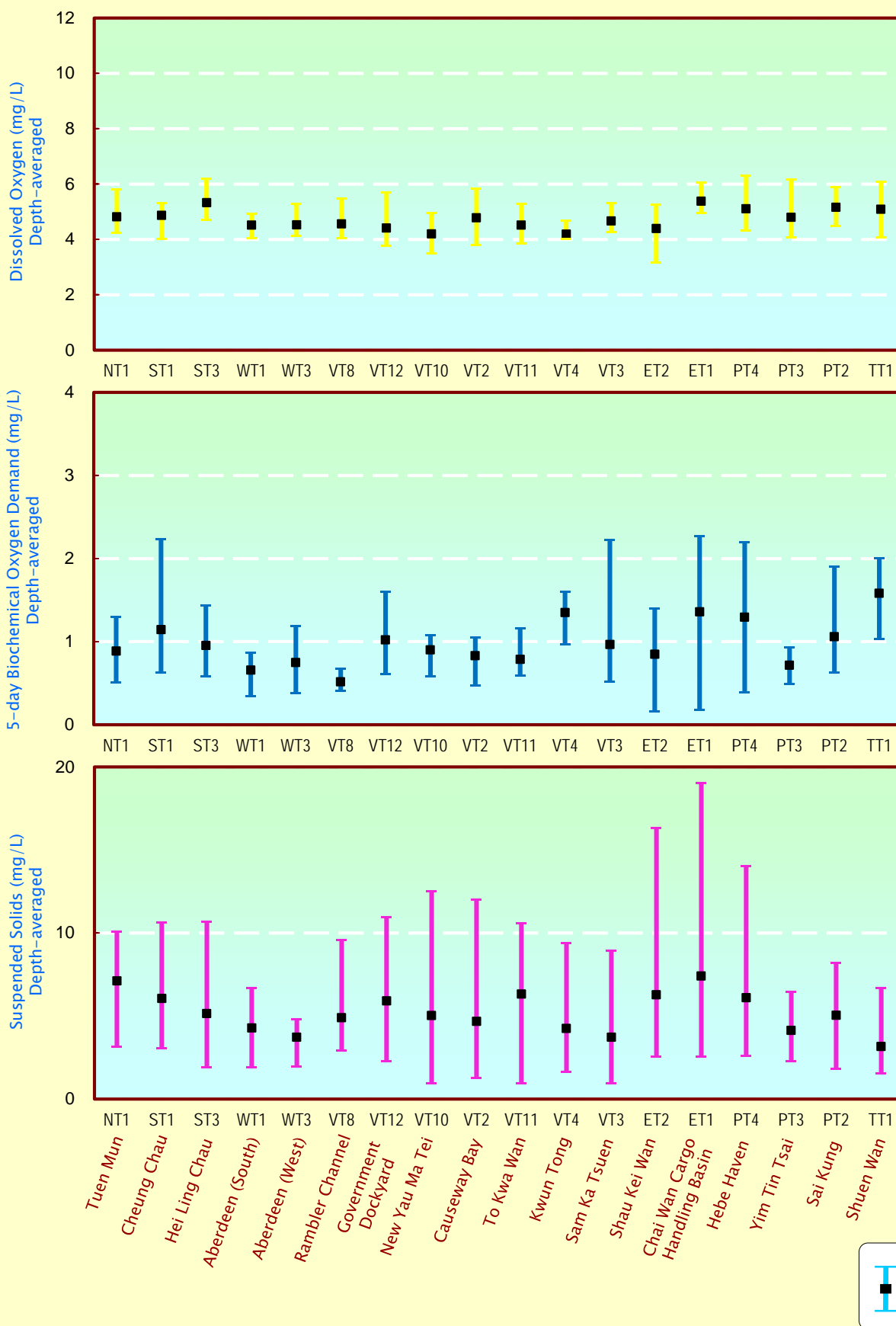
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

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

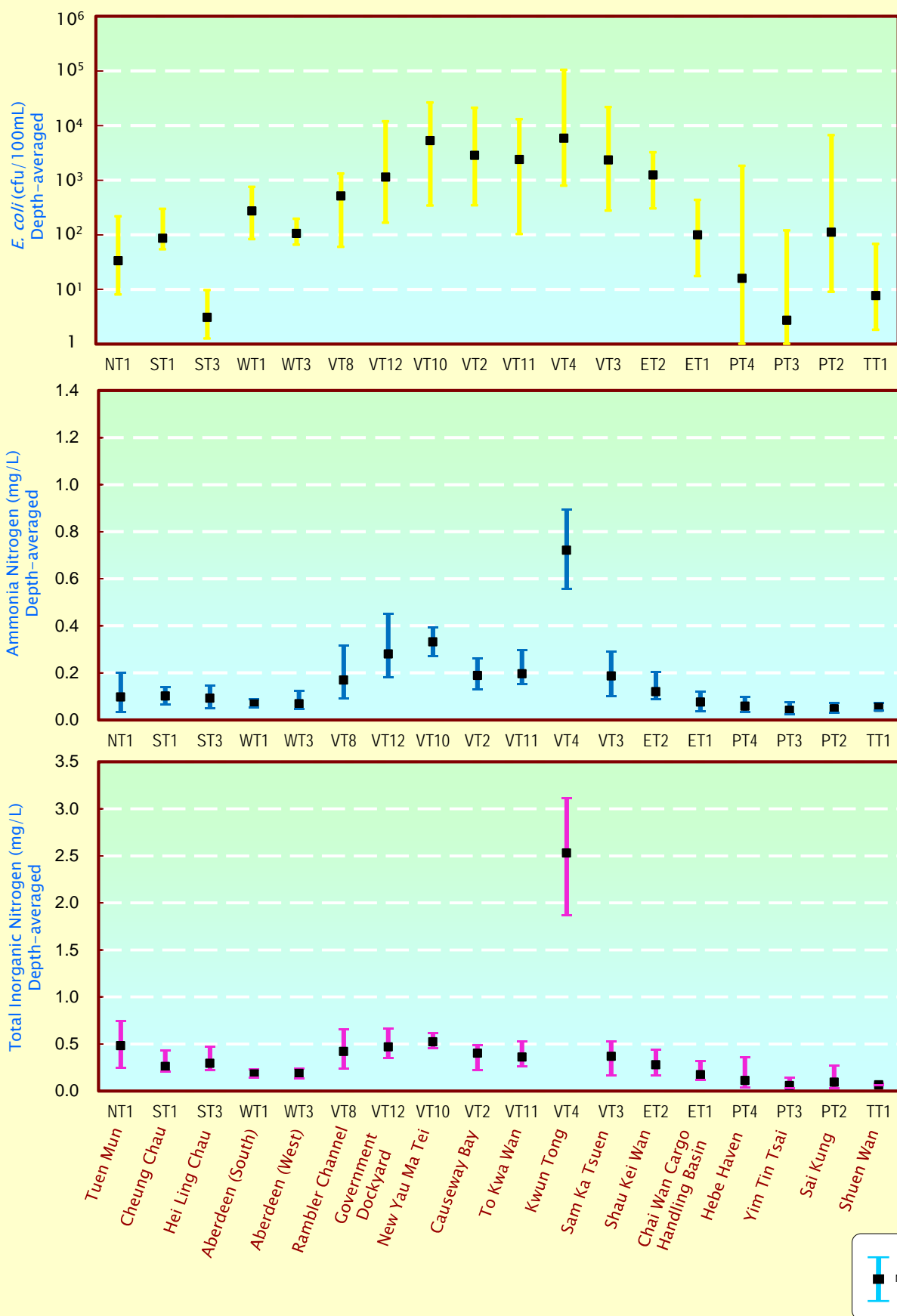
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Ben

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 2021



Water quality of typhoon shelters, sheltered anchorages and Government Dockyard in 2021 (continued)



Long-term water quality trend analyses in typhoon shelters, sheltered anchorages and Government Dockyard, 1986-2021

Monitoring Station		NT1	ST1	ST3	WT3	WT1	VT8	VT10	VT2	VT11
Monitoring Period		1986 I 2021	1986 I 2021	2000 I 2021	1986 I 2021	1986 I 2021	1986 I 2021	1993 I 2021	1986 I 2021	1994 I 2021
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 (%)	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	↘	-	-	-	-	↘	↘	-	-
Total volatile 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	↗	-	↗	-	-	↗	↗	↗	↗
	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

Long-term water quality trend analyses in typhoon shelters, sheltered anchorages and Government Dockyard, 1986-2021										
Monitoring Station		VT12	VT4	VT3	ET2	ET1	PT4	PT3	PT2	TT1
Monitoring Period		2000 I 2021	1987 I 2021	1986 I 2021	1993 I 2021	1986 I 2021	1986 I 2021	1986 I 2021	1986 I 2021	1986 I 2021
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 (%)	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	-	↘	↘	-	-	-	-	-	-
Total volatile 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	↗	↘	↘	↘	↘	-	↗	↗	↘
	Average	↗	↘	↘	↘	↘	-	↗	↗	↘
Total nitrogen (mg/L)	Surface	↗	↘	↘	↘	↘	-	↗	↗	↘
	Middle	NA	↘	NA	↘	↘	NA	↗	NA	↘
	Bottom	↗	↘	↘	↘	↘	-	↗	↗	↘
	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 2021

Parameter	Tuen Mun	Cheung Chau	Hei Ling Chau	Aberdeen (South)	Aberdeen (West)	Rambler Channel
	NT1	ST1	ST3	WT1	WT3	VT8
Number of samples	6	6	6	6	6	6
Temperature (°C)	26.2 (20.6 - 29.1)	26.6 (20.4 - 29.8)	26.4 (20.3 - 29.4)	26.4 (21.9 - 28.5)	25.8 (21.9 - 27.8)	25.9 (22.3 - 28.1)
Salinity	26.1 (20.4 - 31.8)	30.5 (27.1 - 33.0)	30.2 (26.8 - 32.9)	31.5 (29.5 - 33.1)	31.5 (29.9 - 33.2)	30.4 (28.0 - 33.0)
Dissolved Oxygen (mg/L)	4.8 (4.2 - 5.8)	4.9 (4.0 - 5.3)	5.3 (4.7 - 6.2)	4.5 (4.0 - 4.9)	4.5 (4.1 - 5.3)	4.6 (4.0 - 5.5)
	Bottom					
	4.7 (4.0 - 5.2)	4.7 (4.0 - 5.1)	5.1 (4.5 - 5.9)	4.4 (3.8 - 5.0)	4.6 (3.9 - 5.5)	3.8 (3.2 - 4.6)
Dissolved Oxygen (% Saturation)	69 (58 - 83)	72 (59 - 83)	79 (68 - 96)	67 (61 - 74)	67 (61 - 79)	67 (60 - 79)
	Bottom					
	67 (56 - 75)	69 (59 - 76)	76 (66 - 91)	66 (57 - 74)	67 (59 - 82)	55 (48 - 66)
pH	7.5 (7.1 - 7.6)	7.6 (7.5 - 8.0)	7.6 (7.5 - 8.0)	7.5 (7.3 - 7.7)	7.5 (7.1 - 7.7)	7.5 (7.3 - 7.8)
Secchi Disc Depth (m)	1.7 (1.4 - 2.4)	2.2 (1.6 - 2.7)	2.6 (1.8 - 4.3)	2.8 (2.0 - 3.9)	2.7 (2.0 - 3.2)	1.7 (1.5 - 1.9)
Turbidity (NTU)	6.9 (4.9 - 12.2)	5.6 (3.5 - 8.9)	5.4 (3.2 - 7.8)	4.7 (3.0 - 8.5)	4.9 (4.0 - 7.3)	7.3 (4.2 - 9.7)
Suspended Solids (mg/L)	7.1 (3.2 - 10.1)	6.1 (3.1 - 10.6)	5.2 (1.9 - 10.7)	4.3 (1.9 - 6.7)	3.7 (2.0 - 4.8)	4.9 (2.9 - 9.6)
5-day Biochemical Oxygen Demand (mg/L)	0.9 (0.5 - 1.3)	1.1 (0.6 - 2.2)	1.0 (0.6 - 1.4)	0.7 (0.4 - 0.9)	0.8 (0.4 - 1.2)	0.5 (0.4 - 0.7)
Ammonia Nitrogen (mg/L)	0.098 (0.036 - 0.200)	0.101 (0.065 - 0.140)	0.093 (0.048 - 0.147)	0.068 (0.052 - 0.090)	0.069 (0.046 - 0.123)	0.170 (0.091 - 0.315)
Unionised Ammonia (mg/L)	0.001 (<0.001 - 0.003)	0.002 (0.001 - 0.006)	0.002 (0.001 - 0.004)	0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.002)	0.004 (<0.001 - 0.012)
Nitrite Nitrogen (mg/L)	0.053 (0.019 - 0.073)	0.026 (0.008 - 0.052)	0.037 (0.012 - 0.069)	0.023 (0.004 - 0.044)	0.025 (0.004 - 0.049)	0.034 (0.005 - 0.049)
Nitrate Nitrogen (mg/L)	0.330 (0.143 - 0.635)	0.132 (0.060 - 0.267)	0.166 (0.082 - 0.327)	0.091 (0.044 - 0.147)	0.091 (0.037 - 0.153)	0.216 (0.068 - 0.345)
Total Inorganic Nitrogen (mg/L)	0.48 (0.25 - 0.74)	0.26 (0.21 - 0.43)	0.30 (0.22 - 0.48)	0.18 (0.14 - 0.23)	0.19 (0.13 - 0.24)	0.42 (0.24 - 0.66)
Total Kjeldahl Nitrogen (mg/L)	0.63 (0.58 - 0.68)	0.46 (0.34 - 0.58)	0.44 (0.43 - 0.44)	0.69 (0.69 - 0.69)	0.52 (0.52 - 0.52)	0.80 (0.69 - 0.92)
Total Nitrogen (mg/L)	0.83 (0.81 - 0.84)	0.56 (0.48 - 0.65)	0.57 (0.54 - 0.59)	0.74 (0.74 - 0.74)	0.58 (0.58 - 0.58)	0.91 (0.76 - 1.05)
Orthophosphate Phosphorus (mg/L)	0.011 (0.005 - 0.021)	0.007 (<0.002 - 0.014)	0.007 (<0.002 - 0.016)	0.008 (<0.002 - 0.015)	0.009 (<0.002 - 0.016)	0.018 (0.010 - 0.030)
Total Phosphorus (mg/L)	0.08 (0.06 - 0.09)	0.08 (0.05 - 0.10)	0.06 (0.04 - 0.07)	0.03 (0.03 - 0.03)	0.03 (0.03 - 0.03)	0.07 (0.04 - 0.09)
Silica (as SiO ₂) (mg/L)	1.25 (0.63 - 1.95)	0.78 (0.35 - 1.57)	0.89 (0.27 - 1.67)	0.61 (0.27 - 1.00)	0.64 (0.23 - 1.04)	1.15 (0.72 - 1.70)
Chlorophyll- <i>a</i> (µg/L)	7.0 (0.8 - 19.5)	7.8 (1.7 - 13.7)	7.7 (1.3 - 13.7)	3.9 (0.7 - 8.0)	4.1 (0.5 - 8.3)	2.5 (0.9 - 7.7)
<i>E. coli</i> (count/100mL)	33 (8 - 220)	87 (54 - 300)	3 (1 - 10)	270 (83 - 750)	110 (65 - 200)	510 (60 - 1300)
Faecal Coliforms (count/100mL)	210 (42 - 990)	210 (120 - 770)	7 (1 - 51)	770 (190 - 2300)	320 (160 - 1400)	1400 (130 - 3800)

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 2021 (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)	26.1 (22.1 - 28.3)	26.0 (22.1 - 28.2)	25.6 (21.9 - 27.8)	25.3 (21.8 - 27.9)	26.2 (22.1 - 28.4)	25.3 (21.7 - 28.0)
Salinity	29.9 (25.7 - 32.5)	30.1 (26.4 - 32.7)	30.6 (27.6 - 32.8)	31.5 (28.5 - 33.0)	28.7 (26.8 - 29.8)	31.7 (29.1 - 33.2)
Dissolved Oxygen (mg/L)	4.4 (3.8 - 5.7)	4.2 (3.5 - 5.0)	4.8 (3.8 - 5.8)	4.5 (3.9 - 5.3)	4.2 (4.0 - 4.7)	4.7 (4.3 - 5.3)
	Bottom					
	3.5 (2.7 - 4.1)	3.3 (2.5 - 4.1)	3.8 (3.2 - 4.5)	3.9 (3.2 - 4.7)	3.7 (3.3 - 4.3)	3.9 (3.4 - 4.7)
Dissolved Oxygen (% Saturation)	65 (52 - 86)	61 (51 - 71)	70 (56 - 86)	66 (56 - 76)	61 (56 - 67)	68 (62 - 76)
	Bottom					
	51 (41 - 62)	48 (38 - 57)	55 (48 - 61)	57 (46 - 67)	54 (48 - 59)	57 (49 - 65)
pH	7.4 (7.1 - 7.7)	7.4 (7.2 - 7.8)	7.5 (7.2 - 7.8)	7.5 (7.3 - 7.8)	7.4 (7.1 - 7.6)	7.5 (7.0 - 7.9)
Secchi Disc Depth (m)	2.1 (1.6 - 2.4)	1.9 (1.3 - 2.5)	1.9 (1.6 - 2.2)	2.2 (1.7 - 2.5)	2.1 (1.7 - 2.8)	2.4 (2.3 - 2.5)
Turbidity (NTU)	5.6 (3.9 - 8.1)	5.4 (3.3 - 8.0)	5.4 (3.8 - 7.6)	6.5 (3.7 - 9.4)	4.2 (3.4 - 6.4)	5.5 (3.5 - 7.5)
Suspended Solids (mg/L)	5.9 (2.3 - 11.0)	5.0 (1.0 - 12.5)	4.7 (1.3 - 12.0)	6.3 (1.0 - 10.6)	4.2 (1.6 - 9.4)	3.7 (1.0 - 9.0)
5-day Biochemical Oxygen Demand (mg/L)	1.0 (0.6 - 1.6)	0.9 (0.6 - 1.1)	0.8 (0.5 - 1.1)	0.8 (0.6 - 1.2)	1.4 (1.0 - 1.6)	1.0 (0.5 - 2.2)
Ammonia Nitrogen (mg/L)	0.281 (0.180 - 0.450)	0.332 (0.270 - 0.395)	0.189 (0.130 - 0.260)	0.197 (0.153 - 0.297)	0.722 (0.557 - 0.893)	0.188 (0.100 - 0.290)
Unionised Ammonia (mg/L)	0.005 (0.002 - 0.013)	0.005 (0.002 - 0.013)	0.003 (0.002 - 0.008)	0.004 (0.002 - 0.011)	0.009 (0.004 - 0.014)	0.004 (<0.001 - 0.012)
Nitrite Nitrogen (mg/L)	0.028 (0.013 - 0.037)	0.029 (0.011 - 0.038)	0.027 (0.008 - 0.034)	0.026 (0.009 - 0.034)	0.300 (0.240 - 0.413)	0.026 (0.005 - 0.044)
Nitrate Nitrogen (mg/L)	0.160 (0.097 - 0.235)	0.163 (0.072 - 0.285)	0.185 (0.083 - 0.285)	0.137 (0.070 - 0.207)	1.510 (0.897 - 2.270)	0.156 (0.064 - 0.195)
Total Inorganic Nitrogen (mg/L)	0.47 (0.35 - 0.66)	0.52 (0.46 - 0.62)	0.40 (0.22 - 0.49)	0.36 (0.26 - 0.52)	2.53 (1.87 - 3.11)	0.37 (0.17 - 0.52)
Total Kjeldahl Nitrogen (mg/L)	0.80 (0.67 - 0.94)	1.09 (0.88 - 1.30)	0.84 (0.59 - 1.08)	0.71 (0.61 - 0.80)	1.00 (0.95 - 1.04)	0.71 (0.47 - 0.94)
Total Nitrogen (mg/L)	0.93 (0.78 - 1.08)	1.19 (0.96 - 1.43)	0.95 (0.68 - 1.22)	0.81 (0.69 - 0.93)	2.27 (2.12 - 2.41)	0.84 (0.54 - 1.14)
Orthophosphate Phosphorus (mg/L)	0.034 (0.021 - 0.052)	0.031 (0.019 - 0.040)	0.026 (0.020 - 0.033)	0.023 (0.010 - 0.035)	0.353 (0.097 - 0.617)	0.022 (0.007 - 0.033)
Total Phosphorus (mg/L)	0.08 (0.06 - 0.10)	0.09 (0.07 - 0.12)	0.07 (0.05 - 0.09)	0.07 (0.05 - 0.08)	0.41 (0.19 - 0.64)	0.07 (0.04 - 0.10)
Silica (as SiO ₂) (mg/L)	1.06 (0.09 - 1.45)	0.98 (0.49 - 1.35)	0.99 (0.61 - 1.30)	0.78 (0.48 - 1.17)	3.27 (2.27 - 4.23)	0.80 (0.46 - 1.13)
Chlorophyll- <i>a</i> (µg/L)	5.9 (1.5 - 16.7)	2.8 (1.0 - 4.6)	2.3 (0.9 - 4.8)	2.8 (0.7 - 7.5)	5.8 (2.5 - 12.3)	2.6 (0.8 - 5.7)
<i>E. coli</i> (count/100mL)	1100 (170 - 12000)	5300 (340 - 26000)	2800 (350 - 21000)	2400 (100 - 13000)	5800 (790 - 100000)	2400 (280 - 22000)
Faecal Coliforms (count/100mL)	3300 (400 - 27000)	12000 (1200 - 60000)	6300 (860 - 53000)	5500 (250 - 25000)	15000 (3600 - 220000)	4800 (620 - 33000)

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 2021 (continued)

Parameter	Shau Kei Wan	Chai Wan Cargo Handling Basin	Hebe Haven	Yim Tin Tsai	Sai Kung	Shuen Wan
	ET2	ET1	PT4	PT3	PT2	TT1
Number of samples	6	6	6	6	6	6
Temperature (°C)	24.6 (19.8 - 26.3)	25.1 (19.8 - 27.7)	26.7 (21.4 - 29.9)	27.2 (21.7 - 30.5)	27.2 (21.9 - 30.5)	27.7 (22.6 - 32.2)
Salinity	32.3 (30.9 - 32.8)	32.1 (30.2 - 32.8)	30.1 (17.3 - 33.5)	31.8 (26.0 - 33.8)	30.9 (22.4 - 33.8)	32.3 (31.1 - 33.2)
Dissolved Oxygen (mg/L)	4.4 (3.2 - 5.3)	5.4 (5.0 - 6.1)	5.1 (4.3 - 6.3)	4.8 (4.1 - 6.2)	5.2 (4.5 - 5.9)	5.1 (4.1 - 6.1)
	Bottom					
	3.9 (1.1 - 5.6)	5.3 (4.9 - 6.1)	5.0 (4.2 - 6.3)	4.7 (3.8 - 6.7)	N/A	4.6 (3.7 - 5.7)
Dissolved Oxygen (% Saturation)	64 (47 - 77)	79 (67 - 88)	75 (68 - 90)	72 (64 - 89)	77 (69 - 92)	78 (67 - 95)
	Bottom					
	56 (16 - 82)	78 (65 - 89)	75 (64 - 90)	70 (58 - 96)	N/A	69 (55 - 80)
pH	7.5 (7.3 - 7.8)	7.7 (7.5 - 7.9)	7.6 (7.1 - 8.0)	7.6 (7.3 - 8.0)	7.7 (7.5 - 7.9)	7.6 (7.4 - 7.9)
Secchi Disc Depth (m)	3.4 (1.9 - 4.1)	2.6 (1.7 - 3.3)	2.0 (1.0 - 2.6)	2.7 (1.7 - 3.5)	2.0 (1.0 - 2.9)	2.7 (2.2 - 3.3)
Turbidity (NTU)	4.3 (3.0 - 6.9)	5.4 (2.9 - 9.6)	5.6 (2.7 - 10.0)	5.3 (2.6 - 9.1)	9.0 (2.7 - 29.5)	4.7 (2.7 - 8.6)
Suspended Solids (mg/L)	6.3 (2.5 - 16.3)	7.4 (2.5 - 19.0)	6.1 (2.6 - 14.0)	4.1 (2.3 - 6.4)	5.1 (1.8 - 8.2)	3.2 (1.5 - 6.7)
5-day Biochemical Oxygen Demand (mg/L)	0.9 (0.2 - 1.4)	1.4 (0.2 - 2.3)	1.3 (0.4 - 2.2)	0.7 (0.5 - 0.9)	1.1 (0.6 - 1.9)	1.6 (1.0 - 2.0)
Ammonia Nitrogen (mg/L)	0.120 (0.088 - 0.203)	0.076 (0.038 - 0.120)	0.059 (0.035 - 0.099)	0.041 (0.023 - 0.076)	0.048 (0.029 - 0.071)	0.054 (0.039 - 0.071)
Unionised Ammonia (mg/L)	0.002 (0.001 - 0.006)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.004)	0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.004)	0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)	0.034 (0.005 - 0.065)	0.022 (0.004 - 0.031)	0.003 (<0.002 - 0.007)	0.002 (<0.002 - 0.003)	0.002 (<0.002 - 0.004)	0.003 (<0.002 - 0.005)
Nitrate Nitrogen (mg/L)	0.126 (0.048 - 0.200)	0.076 (0.034 - 0.167)	0.049 (<0.002 - 0.250)	0.016 (<0.002 - 0.064)	0.044 (0.002 - 0.200)	0.011 (0.002 - 0.018)
Total Inorganic Nitrogen (mg/L)	0.28 (0.16 - 0.44)	0.17 (0.12 - 0.32)	0.11 (0.04 - 0.36)	0.06 (0.03 - 0.14)	0.09 (0.03 - 0.27)	0.07 (0.06 - 0.08)
Total Kjeldahl Nitrogen (mg/L)	0.37 (0.29 - 0.45)	0.31 (0.21 - 0.41)	0.66 (0.18 - 1.15)	0.60 (0.18 - 1.01)	0.57 (0.13 - 1.00)	0.64 (0.54 - 0.74)
Total Nitrogen (mg/L)	0.48 (0.35 - 0.61)	0.37 (0.25 - 0.49)	0.67 (0.18 - 1.15)	0.60 (0.18 - 1.02)	0.57 (0.14 - 1.01)	0.66 (0.55 - 0.76)
Orthophosphate Phosphorus (mg/L)	0.017 (0.006 - 0.036)	0.007 (<0.002 - 0.013)	0.009 (0.006 - 0.023)	0.006 (0.003 - 0.007)	0.007 (0.004 - 0.014)	0.005 (0.003 - 0.009)
Total Phosphorus (mg/L)	0.06 (0.05 - 0.07)	0.05 (0.04 - 0.06)	0.08 (0.05 - 0.11)	0.07 (0.04 - 0.10)	0.08 (0.05 - 0.11)	0.05 (0.03 - 0.07)
Silica (as SiO ₂) (mg/L)	0.83 (0.32 - 1.50)	0.57 (0.09 - 1.08)	1.09 (0.11 - 3.35)	0.74 (0.11 - 1.47)	0.90 (0.18 - 1.80)	0.80 (0.41 - 1.10)
Chlorophyll- <i>a</i> (µg/L)	5.0 (0.6 - 11.4)	10.2 (0.9 - 17.7)	4.2 (0.7 - 7.2)	2.1 (0.8 - 5.4)	2.8 (1.0 - 6.9)	6.4 (4.4 - 8.3)
<i>E. coli</i> (count/100mL)	1200 (300 - 3200)	99 (17 - 430)	16 (<1 - 1800)	3 (<1 - 120)	110 (9 - 6600)	8 (2 - 68)
Faecal Coliforms (count/100mL)	2800 (640 - 7800)	460 (110 - 1600)	40 (1 - 11000)	4 (<1 - 1200)	600 (46 - 26000)	19 (4 - 150)

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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. N/A (Not Applicable) indicates the measurement was not made due to shallow water.

Summary statistics of marine sediment quality of typhoon shelters, sheltered anchorages and Government Dockyard, 2017- 2021

	Tuen Mun	Cheung Chau	Hei Ling Chau	Rambler Channel	Government Dockyard	New Yau Ma Tei	Causeway Bay
Parameter	NS5	SS7	SS8	VS17	VS21	VS19	VS12
Number of samples	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	70 (4 - 97)	76 (23 - 99)	85 (3 - 98)	70 (8 - 87)	82 (2 - 99)	71 (30 - 97)	74 (23 - 98)
Electrochemical Potential (mV)	-150 (-211 - -79)	-280 (-366 - -118)	-219 (-322 - -132)	-256 (-343 - -64)	-292 (-387 - -145)	-338 (-390 - -156)	-282 (-359 - -178)
Total Solids (%w/w)	49 (35 - 58)	36 (30 - 41)	34 (31 - 37)	39 (36 - 43)	35 (28 - 42)	46 (37 - 61)	47 (37 - 64)
Total Volatile Solids (%TS)	6.7 (5.0 - 9.0)	7.8 (6.8 - 8.9)	7.8 (6.9 - 8.7)	9.2 (8.4 - 12.0)	8.1 (7.1 - 9.9)	7.7 (5.8 - 9.1)	8.1 (6.5 - 9.6)
Chemical Oxygen Demand (mg/kg)	15500 (13000 - 20000)	15800 (12000 - 25000)	12860 (9800 - 17000)	21700 (18000 - 28000)	17300 (13000 - 20000)	19400 (14000 - 26000)	21460 (9600 - 29000)
Total Carbon (%w/w)	0.8 (0.5 - 1.2)	0.6 (0.5 - 0.7)	0.5 (0.4 - 0.5)	0.9 (0.8 - 1.2)	0.6 (0.5 - 0.7)	0.8 (0.6 - 1.1)	1.0 (0.4 - 1.7)
Ammonical Nitrogen (mg/kg)	10.73 (0.13 - 23.00)	16.92 (0.19 - 28.00)	9.49 (3.60 - 17.00)	8.34 (1.50 - 15.00)	12.95 (3.60 - 41.00)	22.26 (8.60 - 35.00)	6.20 (0.92 - 14.00)
Total Kjeldahl Nitrogen (mg/kg)	460 (330 - 750)	560 (480 - 660)	530 (410 - 580)	650 (510 - 1000)	480 (370 - 610)	580 (420 - 730)	570 (300 - 790)
Total Phosphorus (mg/kg)	210 (170 - 270)	250 (180 - 340)	170 (160 - 200)	220 (200 - 240)	190 (160 - 260)	230 (180 - 280)	210 (120 - 250)
Total Sulphide (mg/kg)	40.0 (6.7 - 100.0)	102.7 (4.3 - 360.0)	42.6 (8.4 - 80.0)	172.1 (9.7 - 290.0)	80.6 (0.5 - 240.0)	117.8 (34.0 - 340.0)	179.3 (18.0 - 410.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.2 (0.2 - 0.4)	0.1 (<0.1 - 0.1)	0.2 (<0.1 - 0.2)	0.2 (0.1 - 0.3)
Arsenic (mg/kg)	10.0 (7.5 - 13.0)	10.1 (8.0 - 14.0)	9.3 (8.0 - 11.0)	12.1 (8.6 - 15.0)	10.8 (8.8 - 13.0)	8.2 (4.9 - 11.0)	9.9 (7.4 - 16.0)
Cadmium (mg/kg)	0.2 (<0.1 - 0.6)	0.2 (0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.7 (0.6 - 0.9)	0.5 (0.4 - 0.6)	0.5 (0.2 - 0.8)	0.6 (0.2 - 1.1)
Chromium (mg/kg)	34 (26 - 48)	47 (36 - 56)	38 (32 - 47)	110 (88 - 140)	48 (37 - 65)	36 (23 - 48)	48 (21 - 100)
Copper (mg/kg)	39 (23 - 57)	100 (39 - 140)	34 (27 - 43)	200 (150 - 220)	180 (150 - 220)	94 (37 - 170)	190 (65 - 580)
Lead (mg/kg)	52 (31 - 89)	52 (35 - 72)	44 (38 - 51)	86 (61 - 120)	55 (46 - 63)	56 (33 - 120)	87 (52 - 120)
Mercury (mg/kg)	0.09 (0.05 - 0.11)	0.17 (0.12 - 0.24)	0.12 (0.10 - 0.15)	0.27 (0.17 - 0.62)	0.26 (0.17 - 0.59)	0.35 (0.15 - 0.81)	0.61 (0.18 - 0.94)
Nickel (mg/kg)	19 (12 - 27)	24 (20 - 30)	30 (22 - 80)	38 (30 - 47)	24 (19 - 28)	20 (13 - 27)	21 (10 - 36)
Silver (mg/kg)	1.4 (0.3 - 9.7)	0.3 (0.2 - 0.4)	0.3 (0.2 - 0.3)	2.4 (1.9 - 3.6)	1.3 (1.1 - 1.5)	1.3 (0.5 - 3.2)	2.0 (0.7 - 2.7)
Zinc (mg/kg)	170 (98 - 260)	200 (140 - 250)	140 (110 - 180)	350 (300 - 390)	300 (230 - 430)	260 (100 - 420)	310 (170 - 510)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) ⁽³⁾	18 (18 - 18)	18 (18 - 19)	18 (18 - 18)	55 (22 - 260)	22 (18 - 29)	19 (18 - 22)	34 (18 - 89)
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(4) (6)}	130 (90 - 320)	110 (90 - 230)	120 (90 - 360)	150 (100 - 320)	120 (90 - 250)	140 (90 - 390)	910 (100 - 3800)
High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(5) (6)}	170 (35 - 650)	150 (86 - 280)	200 (40 - 1500)	940 (490 - 1800)	360 (250 - 630)	500 (130 - 1500)	10000 (150 - 46000)

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, Dibenz(a,h)anthracene, Ben

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 marine sediment quality of typhoon shelters, sheltered anchorages and Government Dockyard, 2017- 2021

	To Kwa Wan	Kwun Tong	Sam Ka Tsuen	Shau Kei Wan	Chai Wan Cargo Handling Basin	Hebe Haven	Yim Tin Tsai	Shuen Wan
Parameter	VS20	VS14	VS13	ES5	ES3	PS4	PS2	TS7
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	77 (30 - 98)	82 (13 - 98)	65 (3 - 94)	78 (1 - 100)	81 (9 - 95)	82 (18 - 97)	77 (10 - 92)	67 (5 - 91)
Electrochemical Potential (mV)	-295 (-384 - -47)	-259 (-368 - -130)	-201 (-382 - -82)	-338 (-411 - -208)	-244 (-352 - -93)	-212 (-304 - -113)	-203 (-333 - -101)	-306 (-391 - -230)
Total Solids (%w/w)	48 (35 - 72)	33 (25 - 47)	40 (29 - 55)	29 (27 - 33)	46 (36 - 53)	44 (35 - 52)	48 (37 - 53)	37 (29 - 44)
Total Volatile Solids (%TS)	8.9 (2.9 - 20.0)	10.8 (7.8 - 12.0)	9.4 (7.4 - 11.0)	10.1 (8.8 - 11.0)	8.1 (7.0 - 9.0)	9.5 (8.2 - 11.0)	9.8 (7.8 - 12.0)	9.2 (5.8 - 12.0)
Chemical Oxygen Demand (mg/kg)	21700 (8000 - 29000)	22500 (18000 - 32000)	21700 (20000 - 25000)	17200 (15000 - 20000)	22000 (18000 - 30000)	20700 (13000 - 25000)	17400 (13000 - 22000)	22600 (14000 - 28000)
Total Carbon (%w/w)	1.2 (0.5 - 3.7)	1.0 (0.7 - 1.6)	1.0 (0.7 - 1.3)	0.6 (0.5 - 0.7)	0.9 (0.8 - 1.2)	1.1 (0.8 - 1.3)	1.8 (1.1 - 2.7)	0.8 (0.8 - 0.9)
Ammonical Nitrogen (mg/kg)	14.54 (1.90 - 24.00)	27.50 (12.00 - 46.00)	9.52 (0.42 - 22.00)	32.70 (23.00 - 41.00)	3.89 (0.19 - 9.70)	5.78 (1.20 - 10.00)	7.75 (5.80 - 9.60)	6.01 (0.46 - 10.00)
Total Kjeldahl Nitrogen (mg/kg)	540 (310 - 670)	660 (460 - 930)	660 (540 - 780)	570 (410 - 720)	530 (400 - 680)	780 (650 - 1000)	780 (560 - 1300)	780 (600 - 1100)
Total Phosphorus (mg/kg)	220 (140 - 310)	250 (170 - 430)	300 (190 - 360)	180 (140 - 310)	250 (210 - 290)	210 (180 - 230)	200 (180 - 240)	200 (170 - 230)
Total Sulphide (mg/kg)	91.0 (28.0 - 140.0)	137.9 (1.7 - 350.0)	202.6 (74.0 - 350.0)	414.0 (280.0 - 620.0)	76.2 (-0.2 - 250.0)	48.1 (6.1 - 97.0)	31.8 (7.4 - 81.0)	82.3 (17.0 - 150.0)
Total Cyanide (mg/kg)	0.2 (-0.1 - 0.3)	0.3 (0.2 - 0.5)	0.3 (0.1 - 0.4)	0.1 (-0.1 - 0.2)	0.2 (-0.1 - 0.3)	0.1 (0.1 - 0.2)	0.1 (-0.1 - 0.2)	0.2 (-0.1 - 0.2)
Arsenic (mg/kg)	9.6 (5.8 - 11.0)	10.8 (8.6 - 14.0)	10.7 (8.6 - 13.0)	9.3 (7.8 - 11.0)	10.9 (9.8 - 13.0)	10.9 (7.7 - 13.0)	6.1 (4.7 - 7.6)	12.4 (6.4 - 15.0)
Cadmium (mg/kg)	0.8 (0.3 - 1.5)	1.8 (0.9 - 3.2)	0.9 (0.3 - 1.1)	0.4 (0.3 - 0.5)	0.4 (0.3 - 0.7)	0.2 (-0.1 - 0.2)	0.1 (-0.1 - 0.2)	0.4 (0.2 - 0.7)
Chromium (mg/kg)	77 (37 - 110)	190 (58 - 440)	82 (39 - 140)	52 (42 - 66)	81 (56 - 170)	26 (19 - 32)	19 (13 - 26)	25 (20 - 38)
Copper (mg/kg)	500 (150 - 980)	1300 (220 - 3500)	310 (80 - 1000)	140 (110 - 170)	240 (150 - 550)	57 (35 - 75)	16 (10 - 18)	88 (15 - 150)
Lead (mg/kg)	110 (47 - 290)	120 (92 - 200)	92 (62 - 110)	62 (57 - 71)	78 (62 - 100)	42 (36 - 47)	35 (25 - 41)	95 (44 - 110)
Mercury (mg/kg)	1.08 (0.31 - 1.70)	0.75 (0.43 - 1.30)	0.99 (0.46 - 1.60)	0.26 (0.10 - 0.45)	0.47 (0.36 - 0.90)	0.12 (0.10 - 0.15)	0.06 (-0.05 - 0.10)	0.12 (-0.05 - 0.21)
Nickel (mg/kg)	30 (15 - 46)	59 (18 - 160)	26 (16 - 40)	24 (21 - 27)	26 (21 - 49)	9 (8 - 12)	12 (6 - 16)	15 (11 - 23)
Silver (mg/kg)	3.3 (1.8 - 5.5)	6.6 (1.7 - 23.0)	2.1 (0.8 - 3.5)	1.5 (1.1 - 1.9)	7.3 (1.4 - 13.0)	0.2 (0.2 - 0.4)	<0.2 (-0.2 - -0.2)	0.3 (-0.2 - 0.5)
Zinc (mg/kg)	270 (130 - 370)	480 (300 - 820)	360 (250 - 480)	290 (220 - 370)	320 (250 - 440)	190 (110 - 330)	90 (56 - 130)	280 (110 - 380)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) ⁽³⁾	74 (18 - 150)	130 (40 - 280)	34 (18 - 55)	18 (18 - 19)	31 (18 - 53)	18 (18 - 18)	18 (18 - 18)	45 (18 - 290)
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(4) (6)}	12000 (760 - 44000)	290 (96 - 1400)	180 (110 - 550)	170 (90 - 520)	180 (110 - 580)	91 (90 - 99)	92 (90 - 94)	110 (90 - 180)
High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg) ^{(5) (6)}	120000 (5400 - 420000)	870 (450 - 1500)	650 (380 - 850)	360 (260 - 510)	540 (350 - 950)	65 (18 - 94)	36 (23 - 63)	130 (38 - 240)

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.

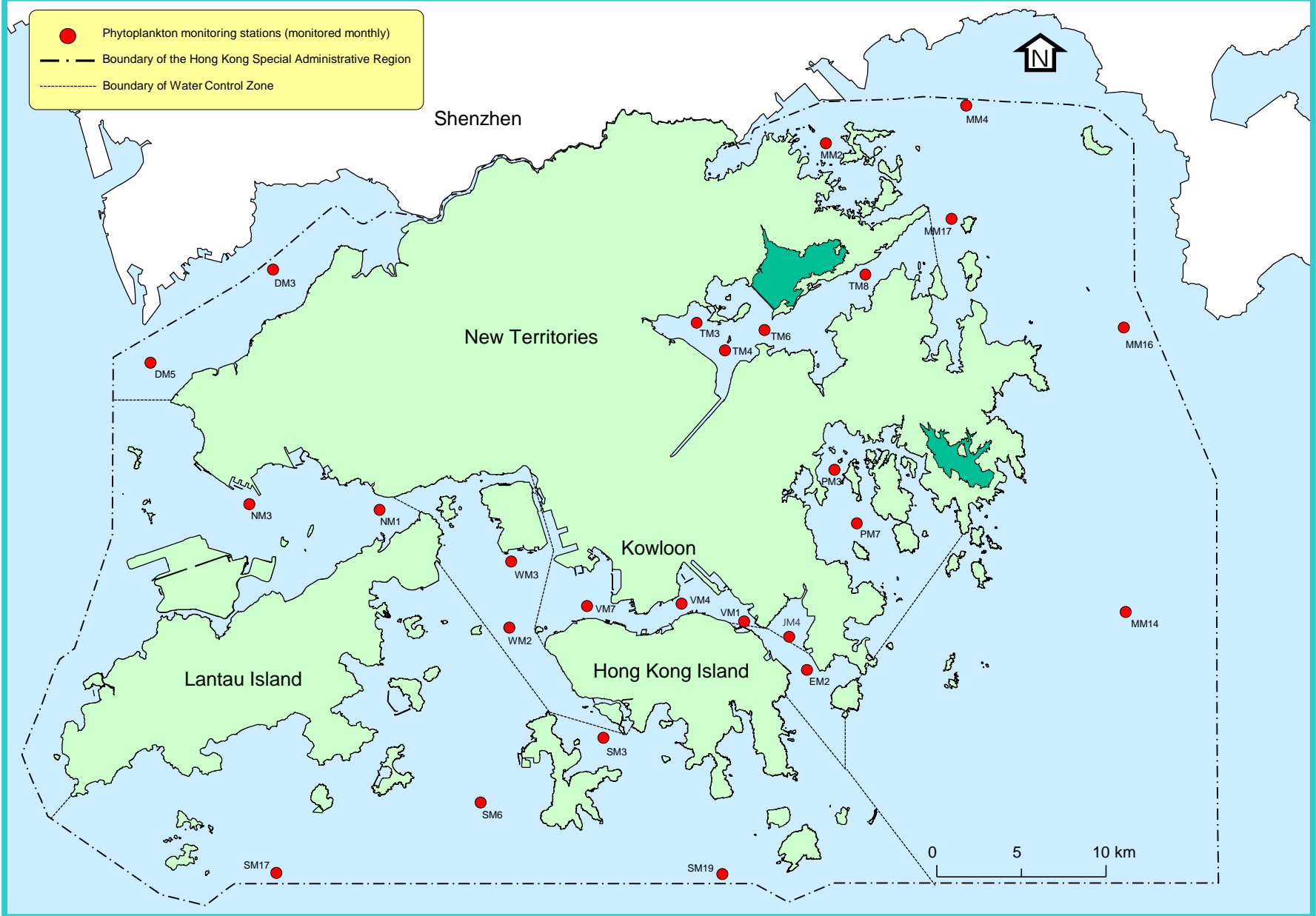
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

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

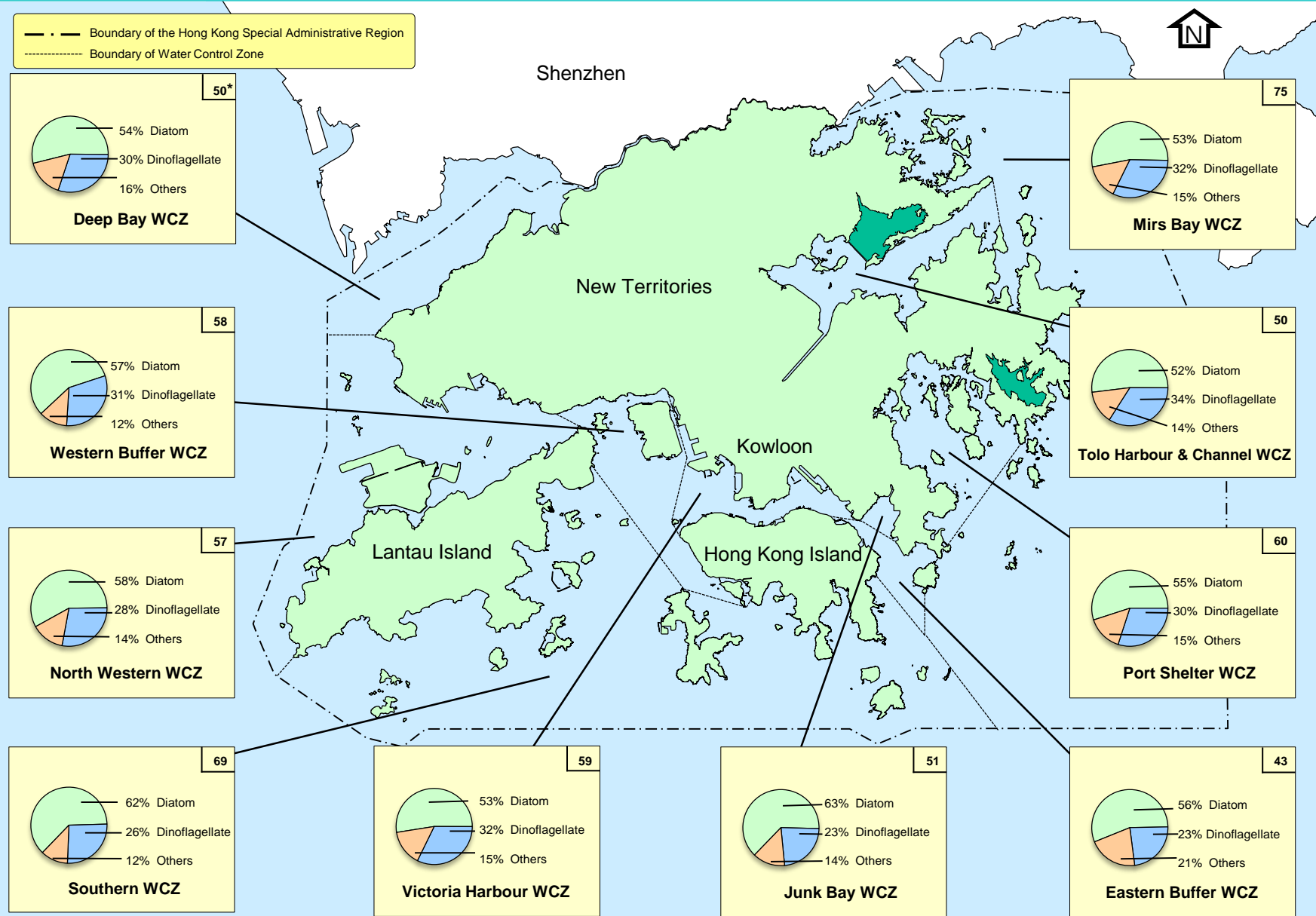
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Ben

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 marine waters

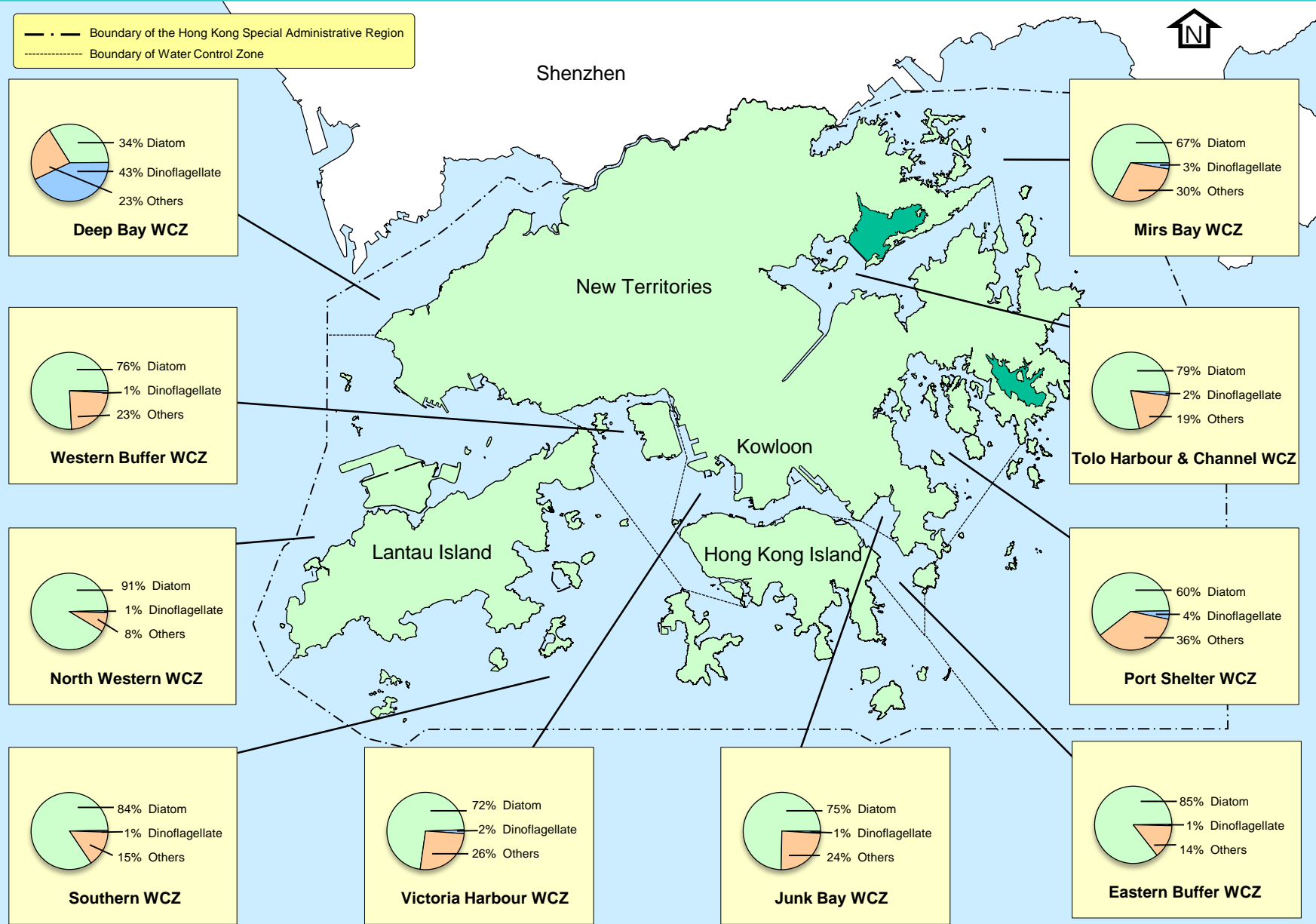


Composition (%) of phytoplankton groups in terms of total number of species in the 10 WCZs in 2021

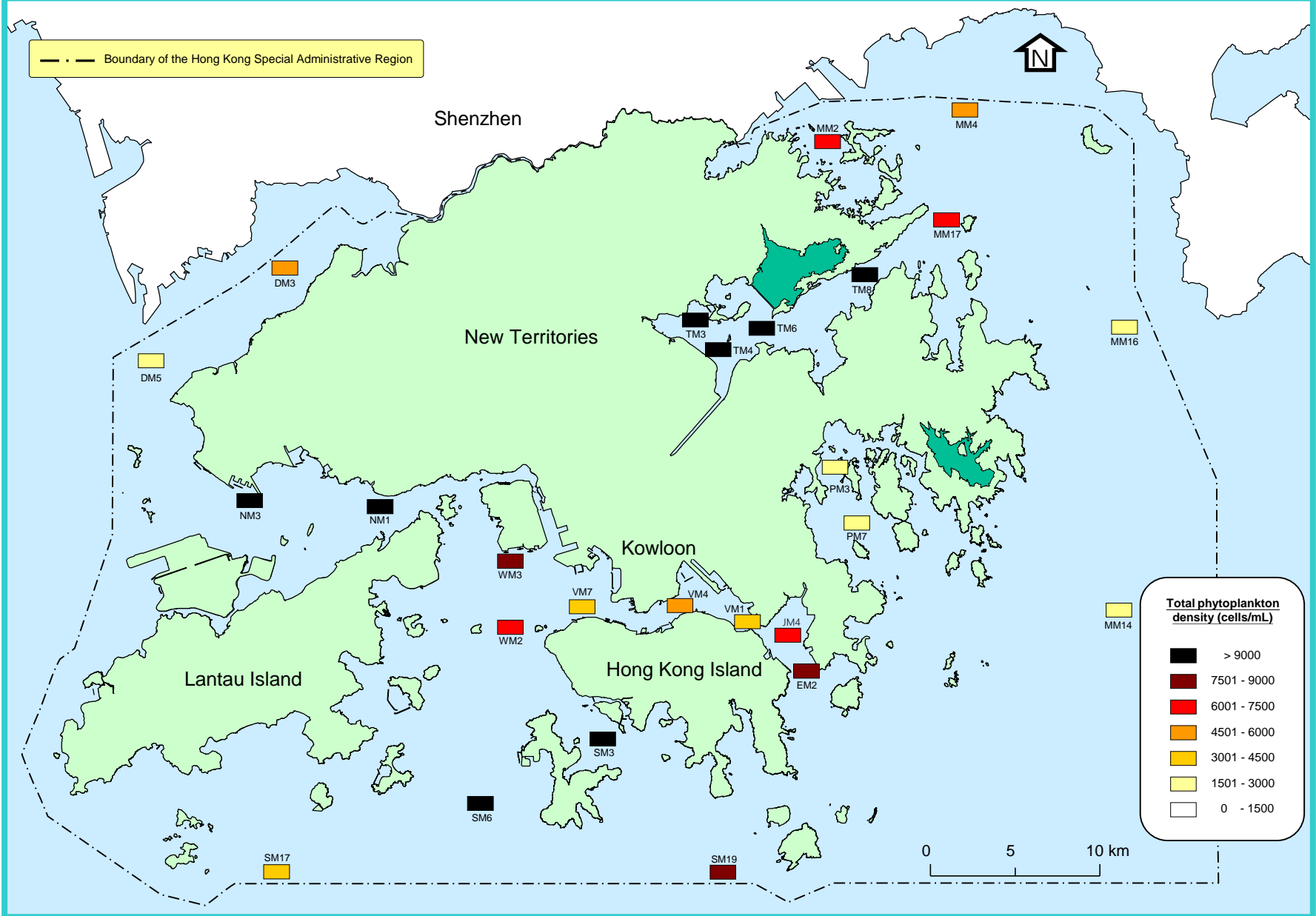


* Total number of species in the corresponding WCZ

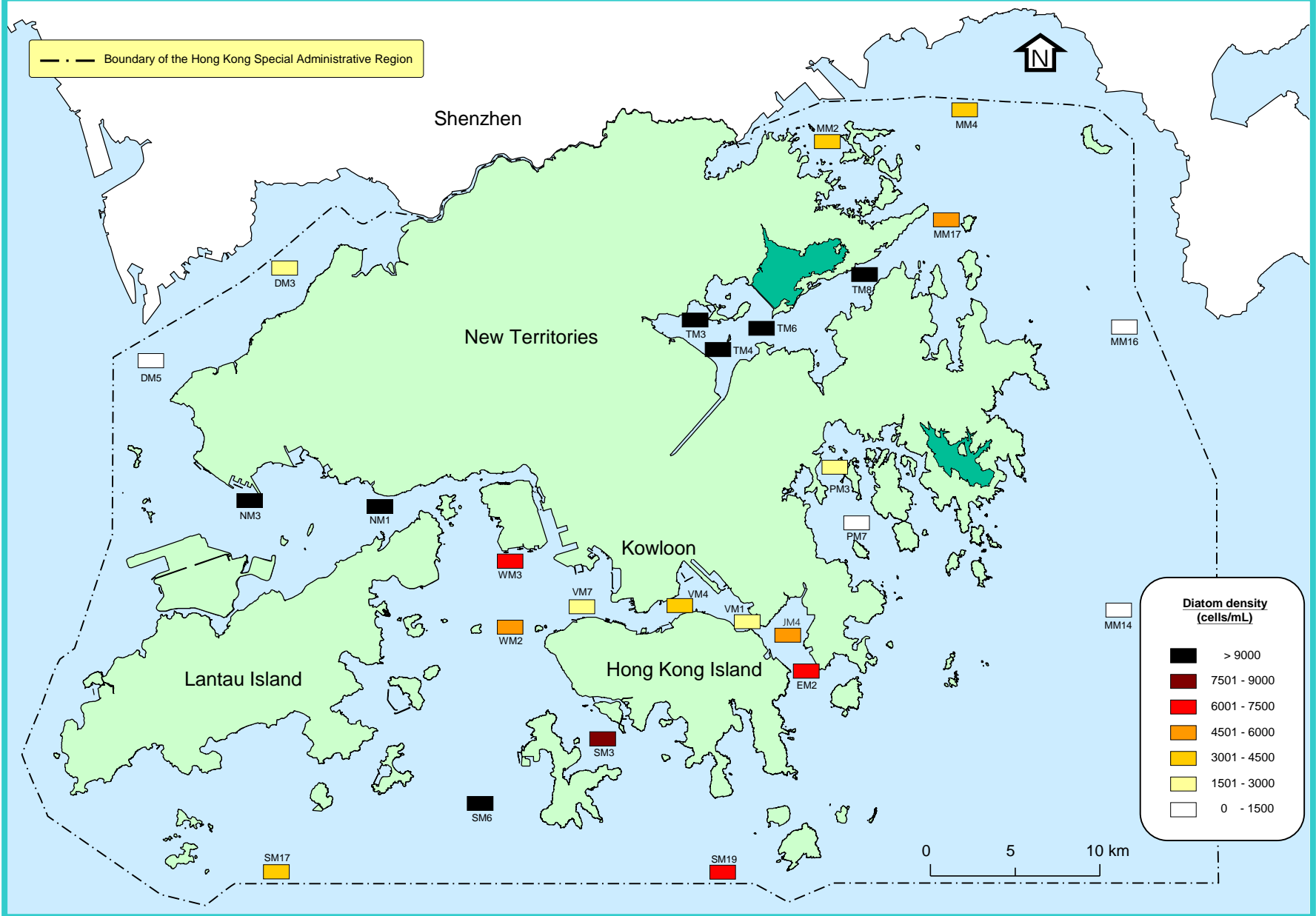
Composition (%) of phytoplankton groups in terms of total density in the 10 WCZs in 2021



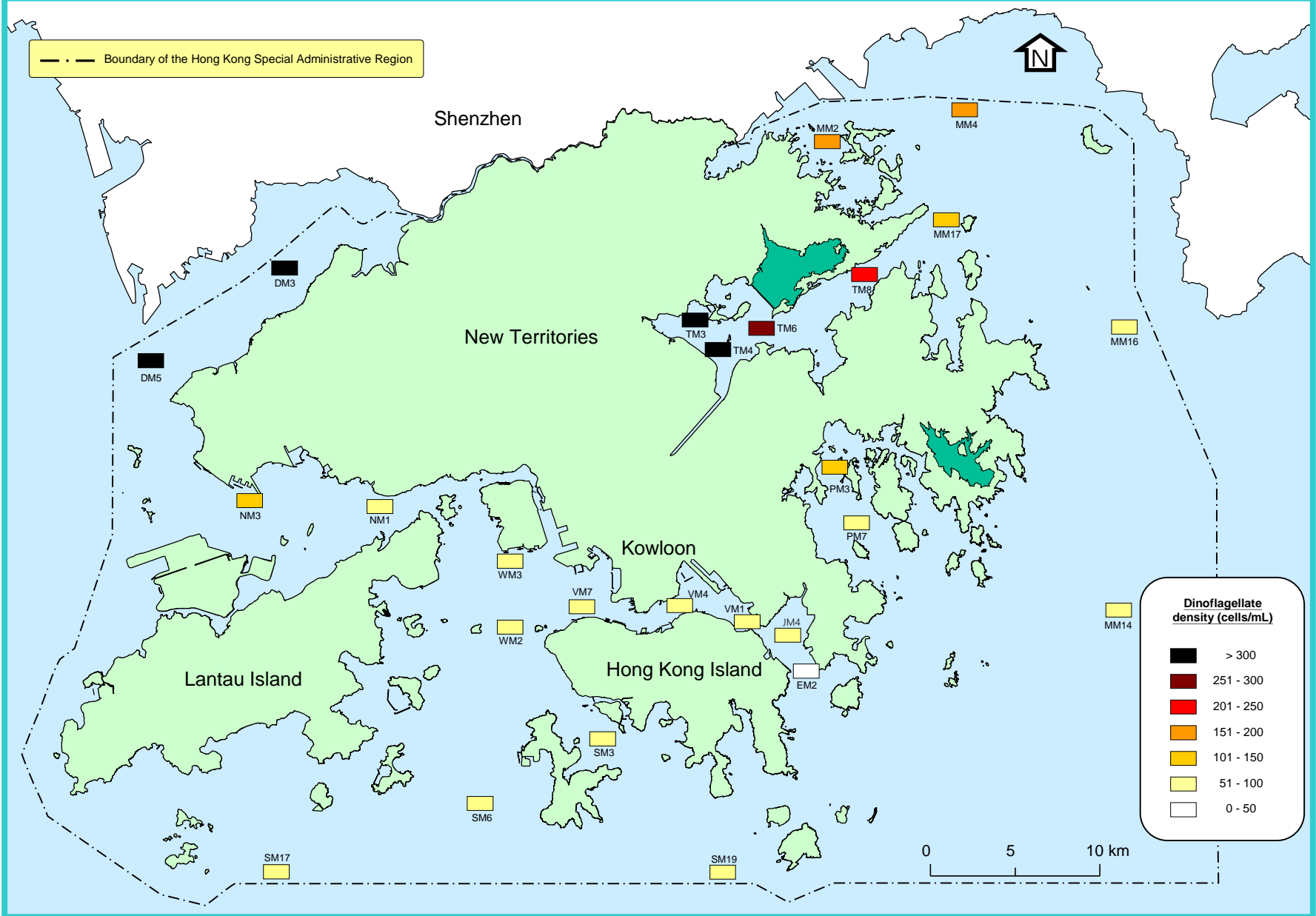
Annual mean total phytoplankton densities at 26 monitoring stations in Hong Kong waters in 2021



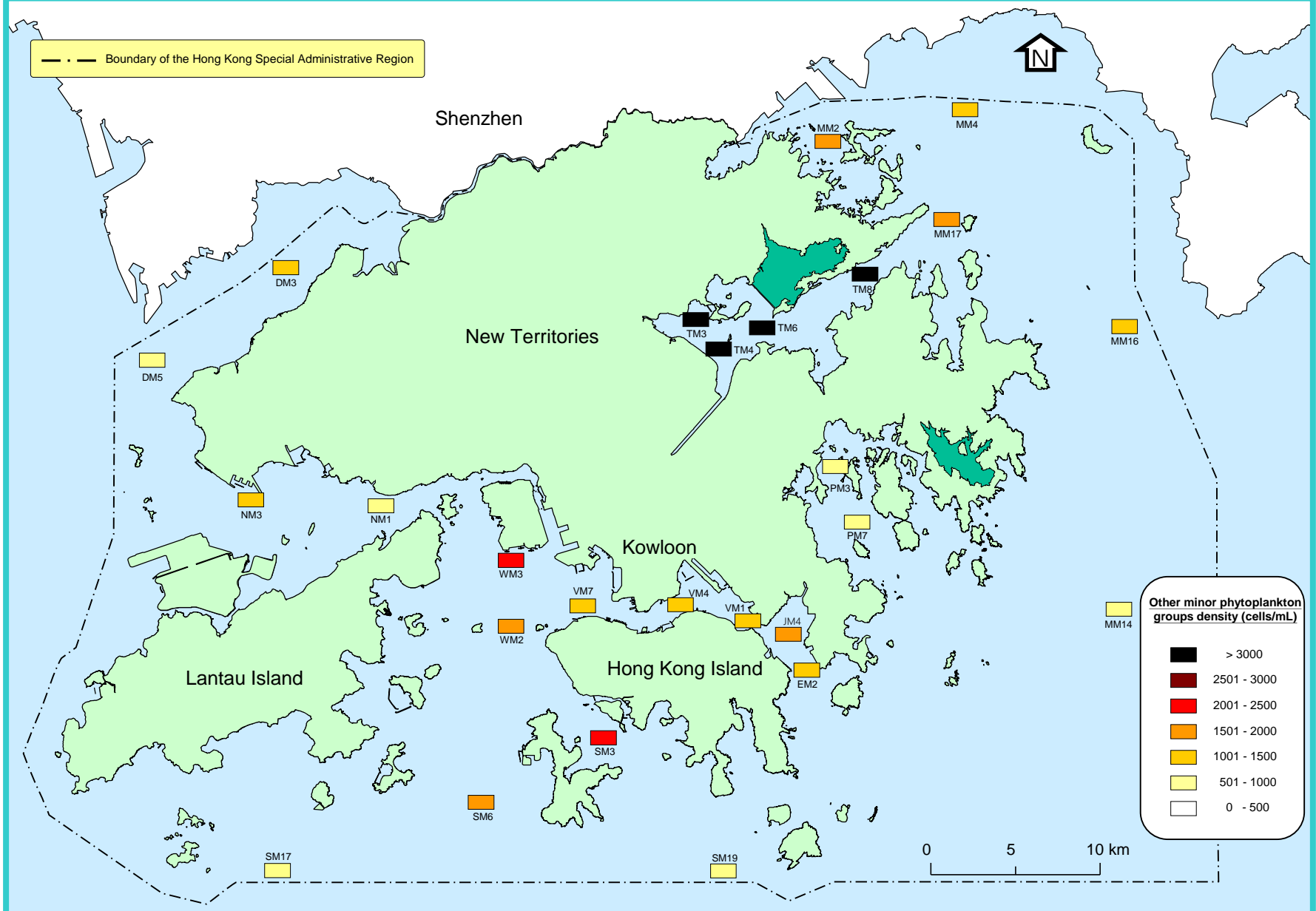
Annual mean diatoms densities at 26 monitoring stations in Hong Kong waters in 2021



Annual mean dinoflagellates densities at 26 monitoring stations in Hong Kong waters in 2021

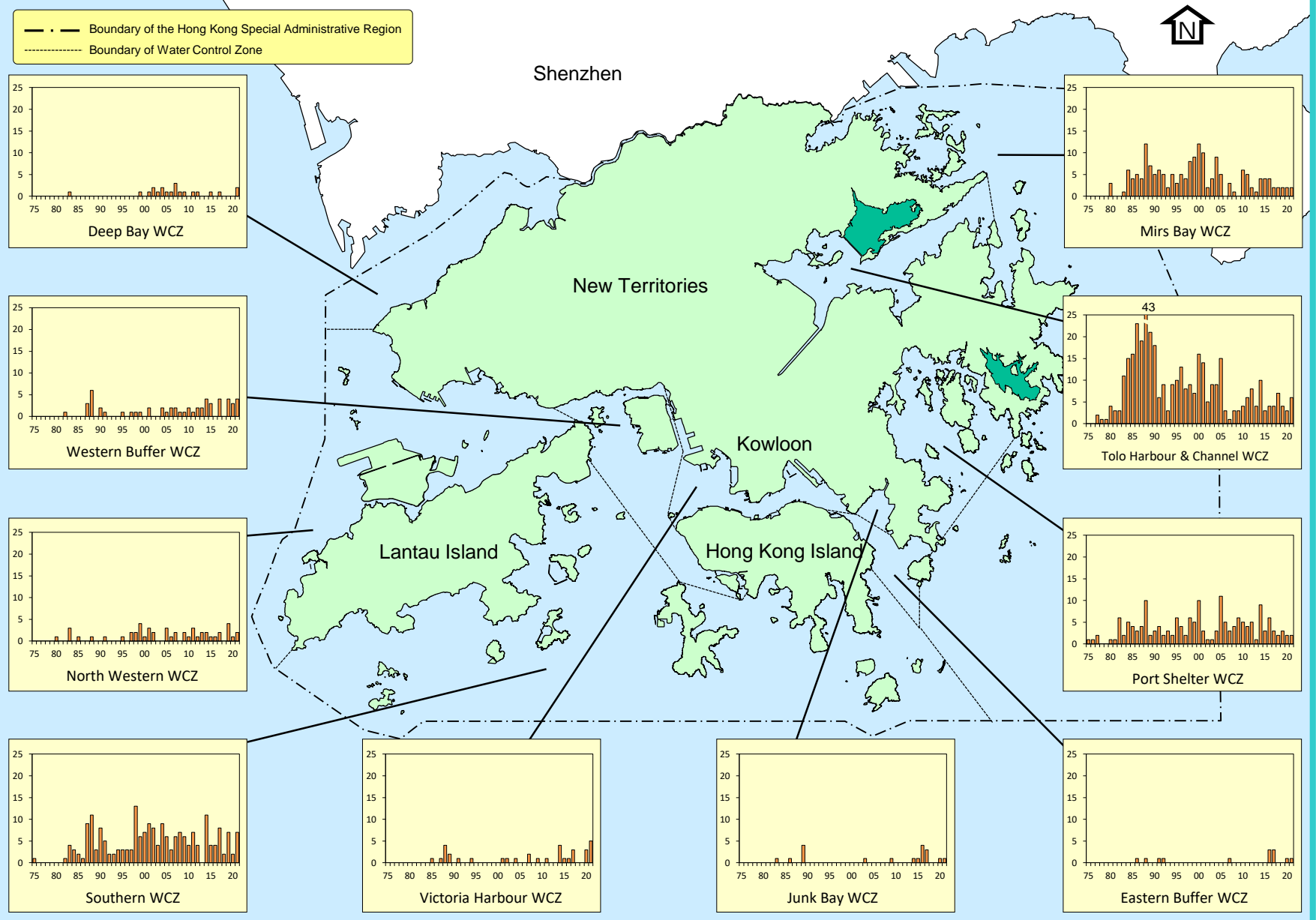


Annual mean densities of other minor phytoplankton groups at 26 monitoring stations in Hong Kong waters in 2021



Occurrence of red tides in the 10 WCZs in Hong Kong waters, 1975 - 2021

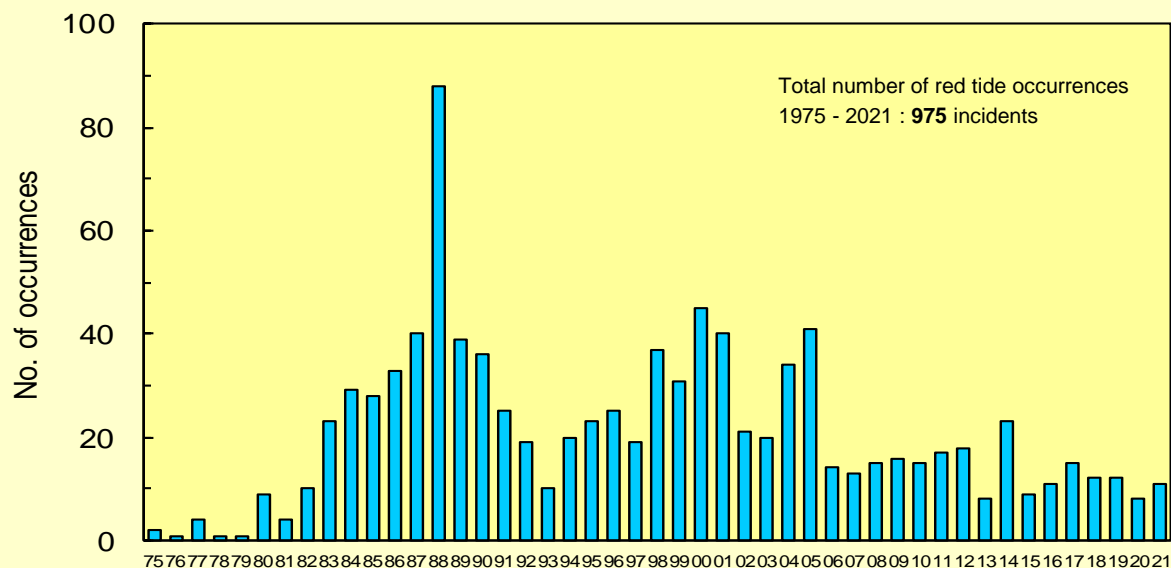
(Source: Agriculture, Fisheries and Conservation Department)



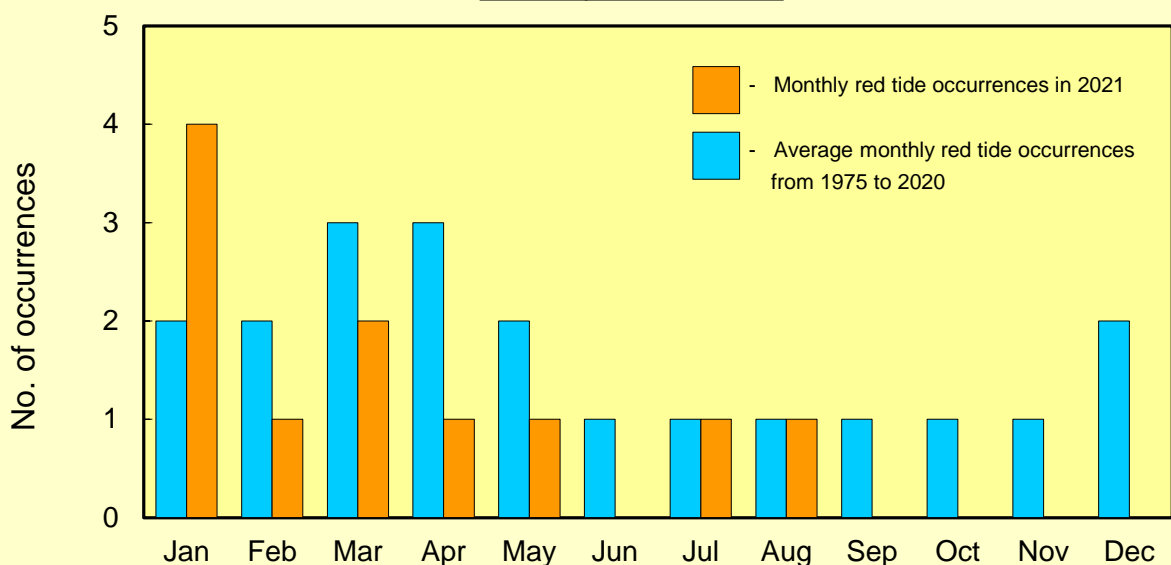
Occurrence of red tides in Hong Kong waters, 1975-2021

(Source: Agriculture, Fisheries and Conservation Department)

Yearly Distribution

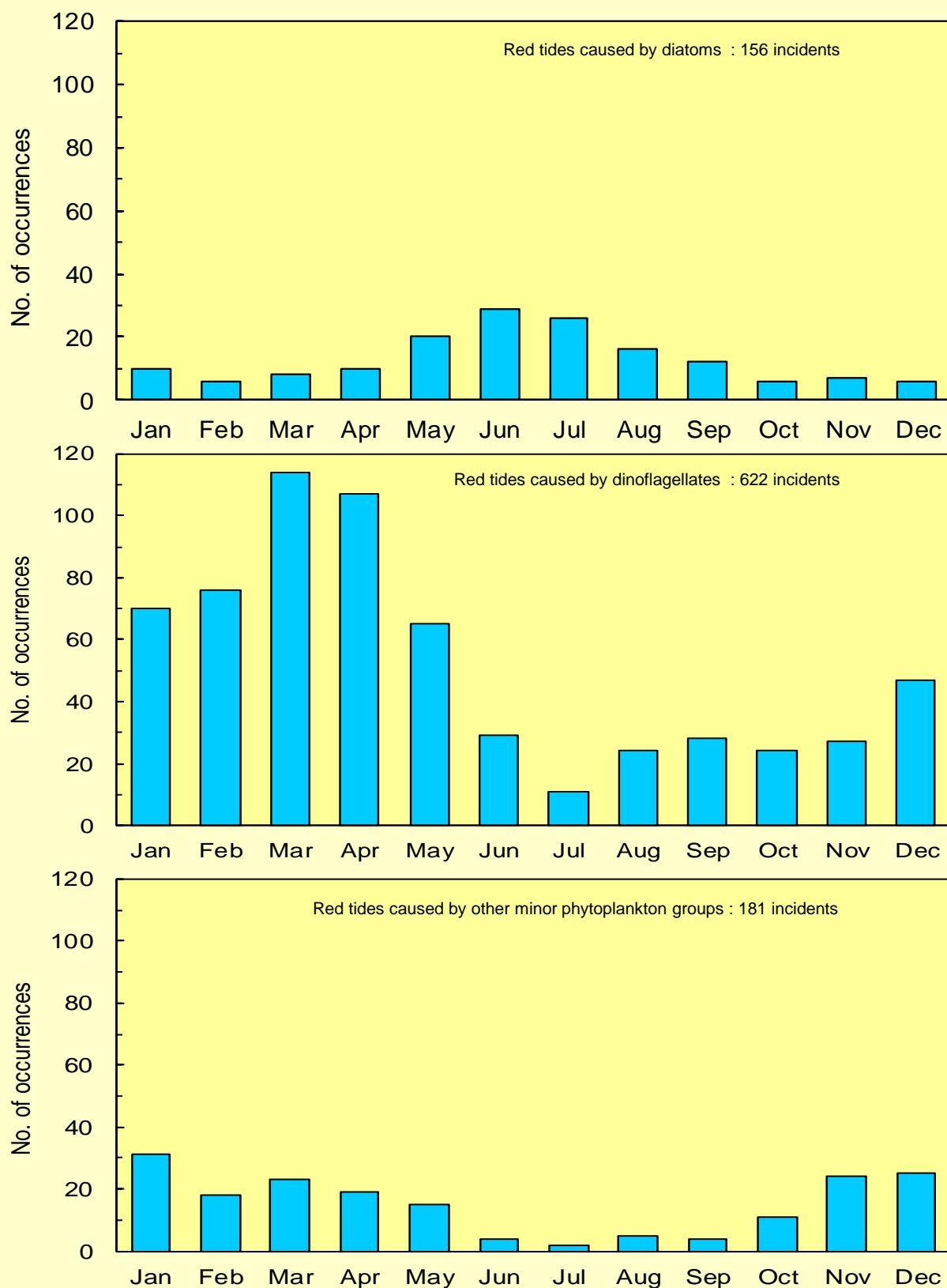


Monthly Distribution



Seasonal distribution of red tides caused by different phytoplankton groups in Hong Kong, 1975-2021

(Source: Agriculture, Fisheries and Conservation Department)



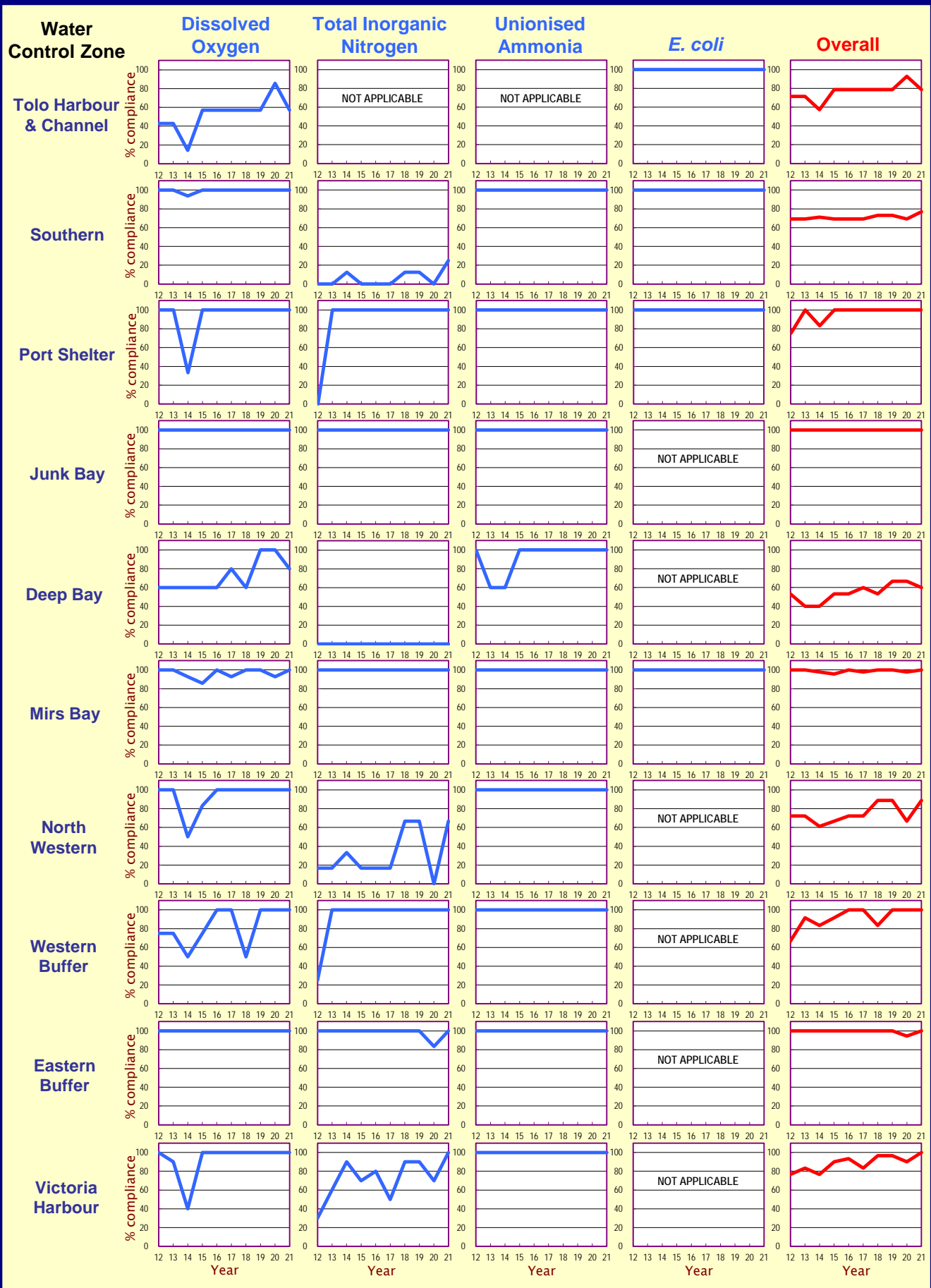
Percentage abundance of the three most dominant phytoplankton species in different WCZs in 2021

Species	% Abundance ¹	Species	% Abundance
Deep Bay WCZ		Mirs Bay WCZ	
Diatoms		Diatoms	
<i>Thalassiosira</i> spp.	52.17	<i>Dactyliosolen fragilissimus</i>	24.82
<i>Skeletonema costatum</i>	19.08	<i>Ceratoneis closterium</i>	18.50
<i>Ceratoneis closterium</i>	5.29	<i>Chaetoceros</i> spp.	15.70
Dinoflagellates		Dinoflagellates	
<i>Takayama tuberculata</i>	96.49	<i>Gymnodinium</i> spp.	45.60
<i>Gyrodinium</i> spp.	1.46	<i>Cochlodinium</i> spp.	10.15
<i>Gymnodinium</i> spp.	0.67	<i>Gyrodinium</i> spp.	10.06
Others ²		Others	
small flagellates	77.25	small flagellates	83.62
<i>Plagioselmis prolunga</i>	11.12	<i>Plagioselmis prolunga</i>	9.89
<i>Teleaulax acuta</i>	10.57	<i>Teleaulax acuta</i>	3.57
Western Buffer WCZ		Tolo Harbour & Channel WCZ	
Diatoms		Diatoms	
<i>Pseudo-nitzschia</i> spp.	30.84	<i>Ceratoneis closterium</i>	36.73
<i>Thalassiosira</i> spp.	28.72	<i>Skeletonema costatum</i>	13.01
<i>Skeletonema costatum</i>	19.27	<i>Leptocylindrus danicus</i>	11.79
Dinoflagellates		Dinoflagellates	
<i>Gymnodinium</i> spp.	51.69	<i>Gymnodinium</i> spp.	37.32
<i>Amphidinium</i> spp.	16.55	<i>Prorocentrum triestinum</i>	28.80
<i>Takayama tuberculata</i>	8.25	<i>Gyrodinium</i> spp.	6.42
Others		Others	
small flagellates	77.61	small flagellates	85.66
<i>Plagioselmis prolunga</i>	13.17	<i>Plagioselmis prolunga</i>	8.37
<i>Teleaulax acuta</i>	8.73	<i>Teleaulax acuta</i>	5.38
North Western WCZ		Port Shelter WCZ	
Diatoms		Diatoms	
<i>Thalassiosira</i> spp.	73.57	<i>Chaetoceros</i> spp.	26.31
<i>Skeletonema costatum</i>	19.08	<i>Pseudo-nitzschia</i> spp.	18.80
<i>Chaetoceros</i> spp.	2.44	<i>Ceratoneis closterium</i>	11.31
Dinoflagellates		Dinoflagellates	
<i>Gymnodinium</i> spp.	33.78	<i>Gymnodinium</i> spp.	42.40
<i>Amphidinium</i> spp.	20.11	<i>Gonyaulax</i> spp.	20.58
<i>Protoperdinium bipes</i>	12.87	<i>Amphidinium</i> spp.	9.18
Others		Others	
small flagellates	68.21	small flagellates	82.31
<i>Teleaulax acuta</i>	20.30	<i>Plagioselmis prolunga</i>	12.45
<i>Plagioselmis prolunga</i>	10.21	<i>Teleaulax acuta</i>	3.08
Southern WCZ		Eastern Buffer WCZ	
Diatoms		Diatoms	
<i>Thalassiosira</i> spp.	36.29	<i>Thalassiosira</i> spp.	45.31
<i>Pseudo-nitzschia</i> spp.	25.82	<i>Skeletonema costatum</i>	21.41
<i>Chaetoceros</i> spp.	20.56	<i>Chaetoceros</i> spp.	15.98
Dinoflagellates		Dinoflagellates	
<i>Gymnodinium</i> spp.	58.99	<i>Amphidinium</i> spp.	31.49
<i>Amphidinium</i> spp.	16.72	<i>Gymnodinium</i> spp.	23.84
<i>Gyrodinium</i> spp.	5.87	<i>Gyrodinium</i> spp.	16.01
Others		Others	
small flagellates	87.67	small flagellates	77.11
<i>Plagioselmis prolunga</i>	7.70	<i>Plagioselmis prolunga</i>	15.08
<i>Teleaulax acuta</i>	3.93	<i>Teleaulax acuta</i>	6.52
Victoria Harbour WCZ		Junk Bay WCZ	
Diatoms		Diatoms	
<i>Thalassiosira</i> spp.	63.69	<i>Thalassiosira</i> spp.	44.30
<i>Chaetoceros</i> spp.	16.68	<i>Chaetoceros</i> spp.	25.79
<i>Skeletonema costatum</i>	8.35	<i>Skeletonema costatum</i>	8.97
Dinoflagellates		Dinoflagellates	
<i>Gymnodinium</i> spp.	54.83	<i>Gymnodinium</i> spp.	64.51
<i>Amphidinium</i> spp.	16.50	<i>Amphidinium</i> spp.	13.78
<i>Gyrodinium</i> spp.	10.00	<i>Gyrodinium</i> spp.	12.93
Others		Others	
small flagellates	74.98	small flagellates	80.64
<i>Plagioselmis prolunga</i>	15.99	<i>Plagioselmis prolunga</i>	11.03
<i>Teleaulax acuta</i>	8.52	<i>Teleaulax acuta</i>	7.74

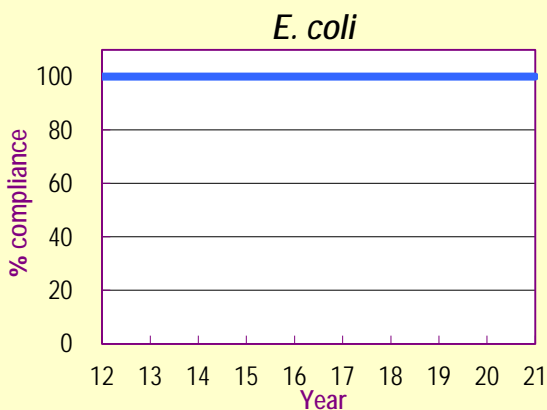
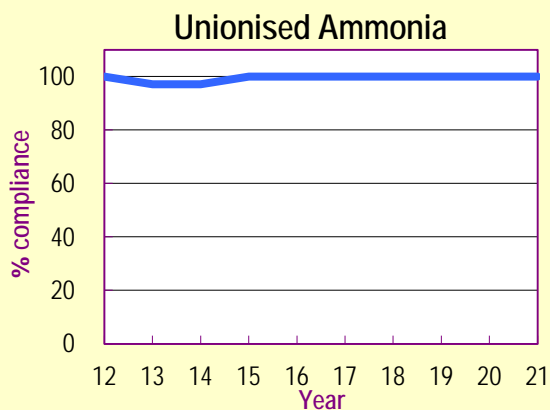
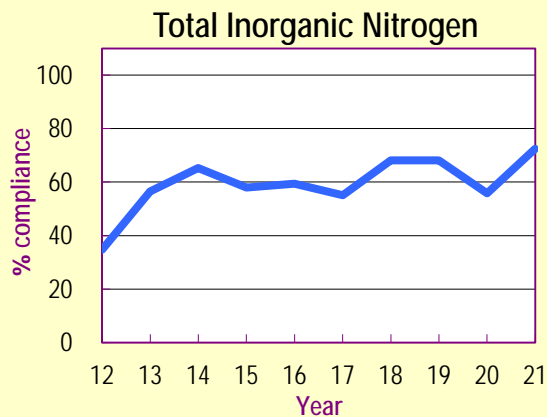
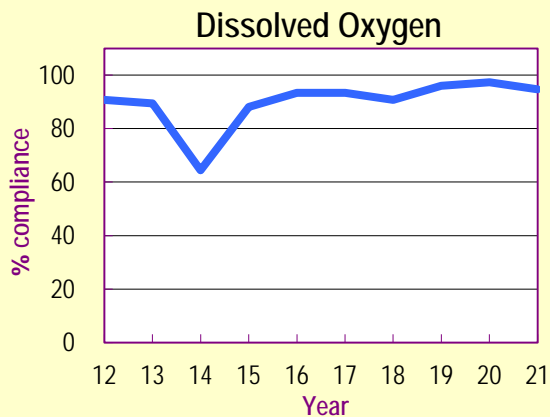
Note: 1 The % abundance of dominant species of diatoms, dinoflagellates and other minor phytoplankton groups in different WCZs.

2 Other minor phytoplankton groups.

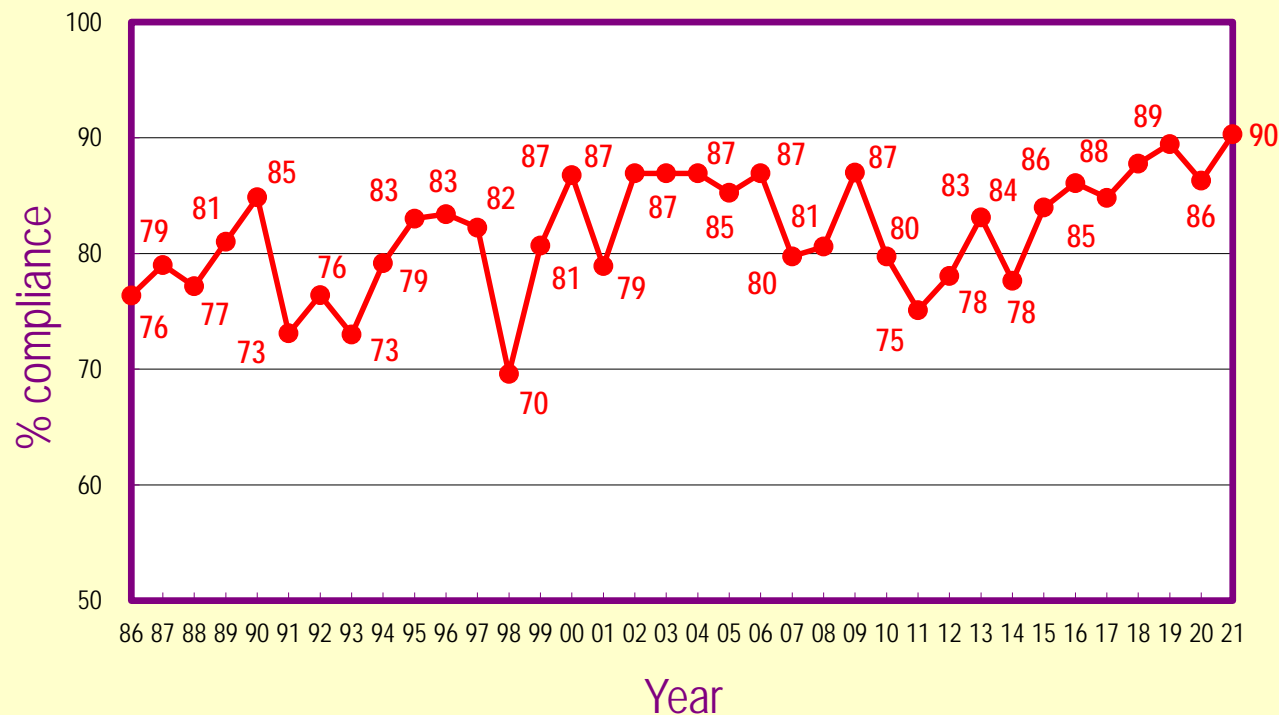
Marine WQO compliance rates for the 10 WCZs, 2012 - 2021



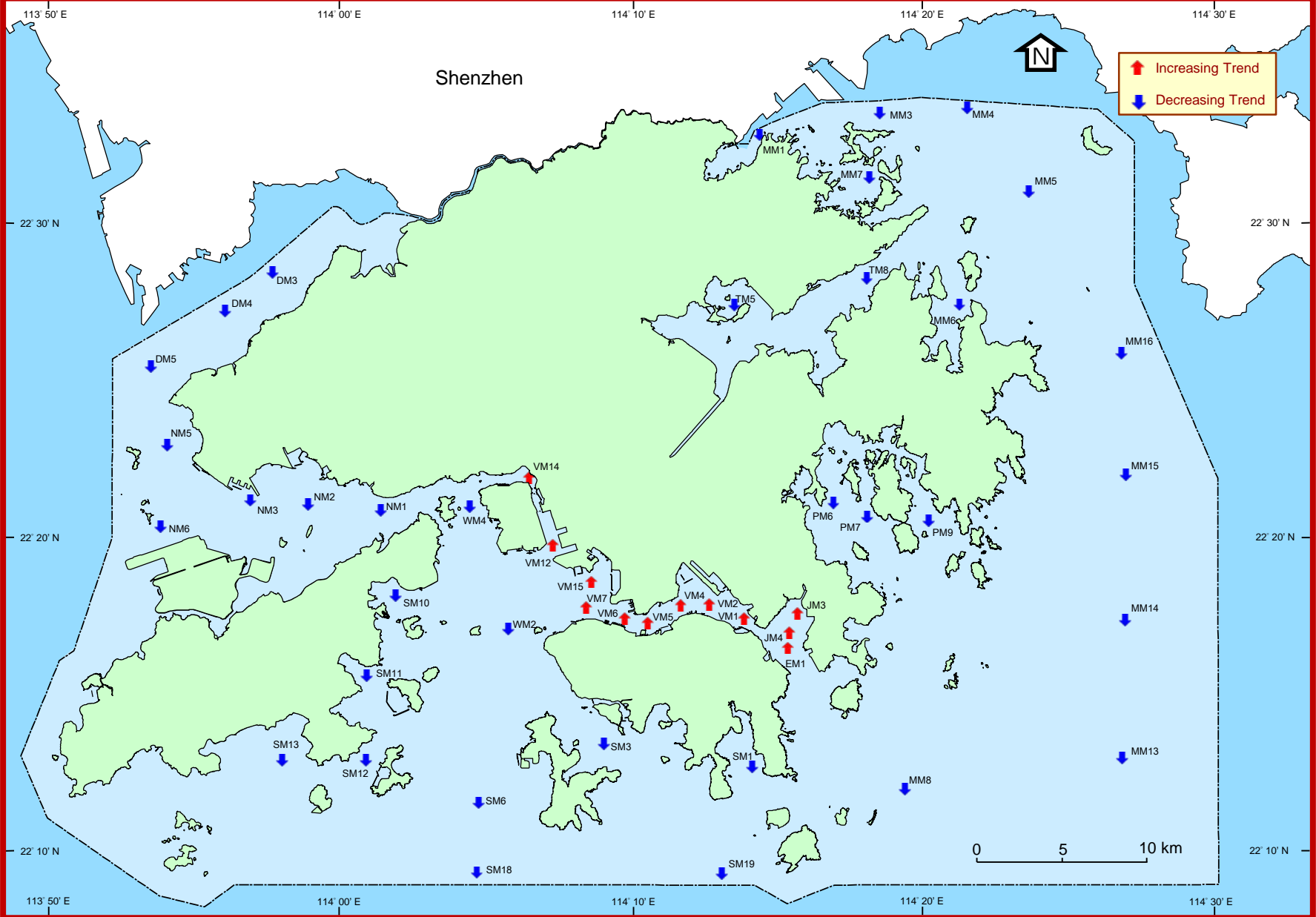
Compliance rates for key marine WQOs, 2012 - 2021



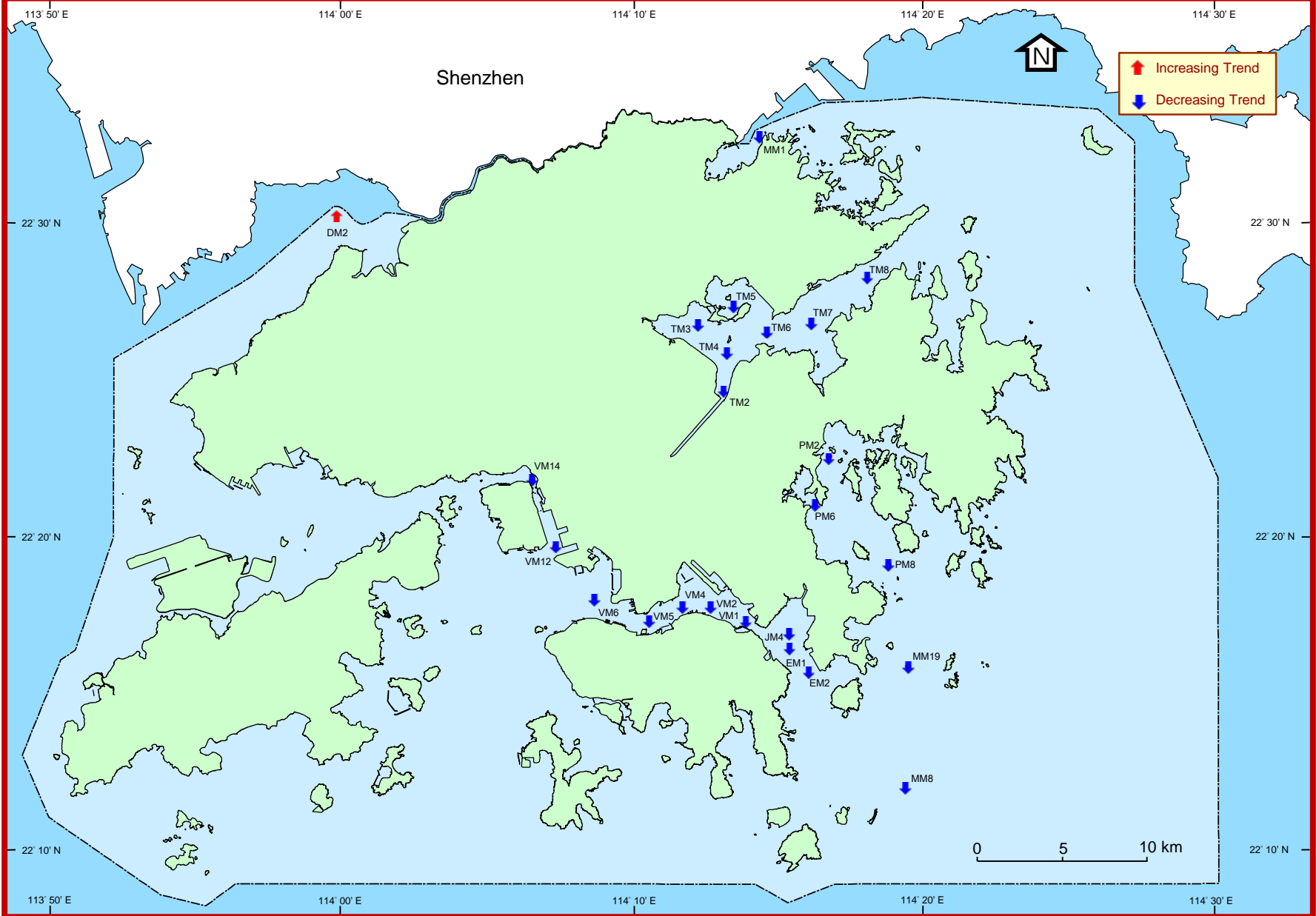
Overall compliance rates for key marine WQOs, 1986 - 2021



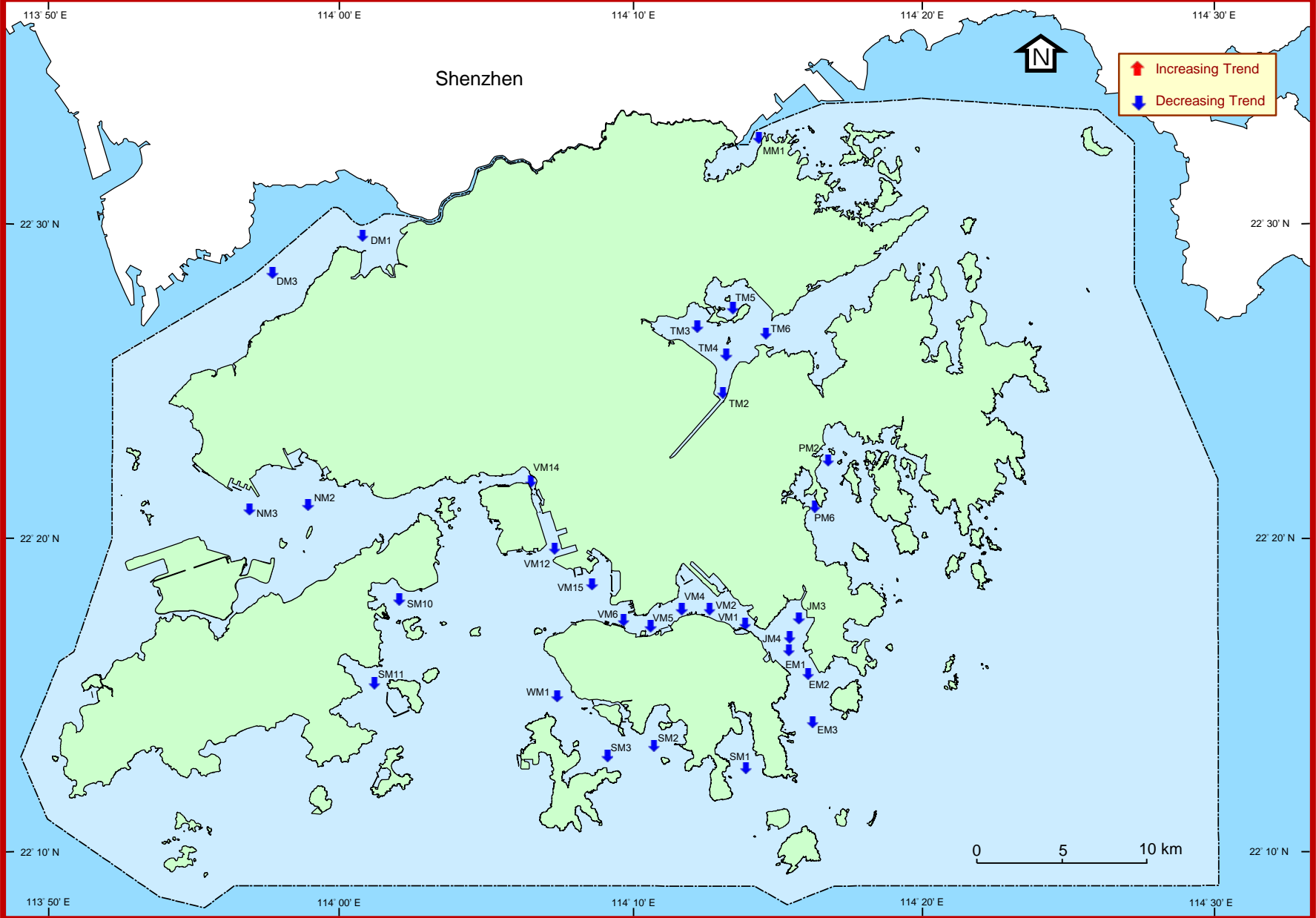
Long-term changes in dissolved oxygen levels in Hong Kong marine waters, 1986-2021



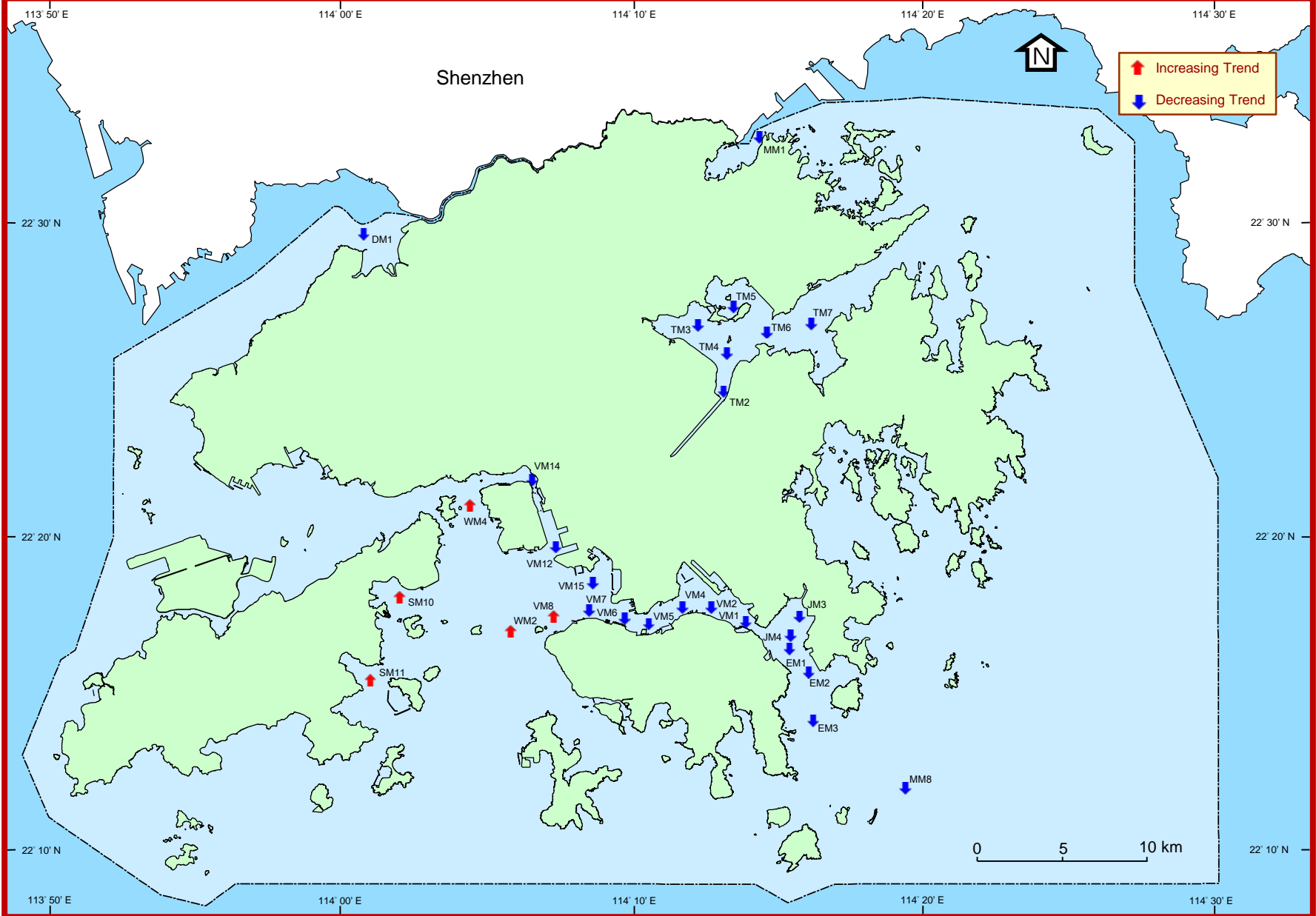
Long-term changes in 5-day biochemical oxygen demand levels in Hong Kong marine waters, 1986-2021



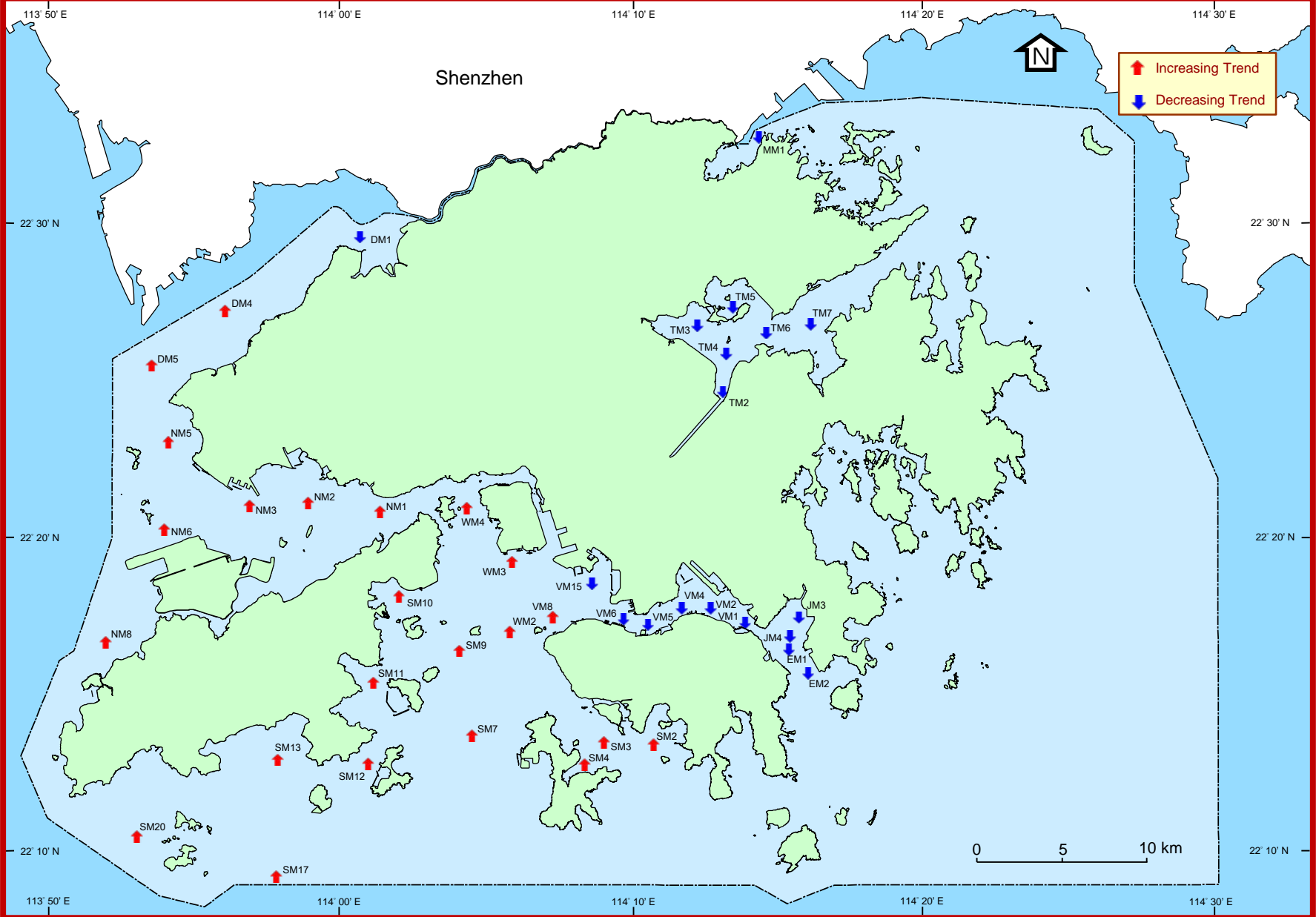
Long-term changes in *E.coli* levels in Hong Kong marine waters, 1986-2021



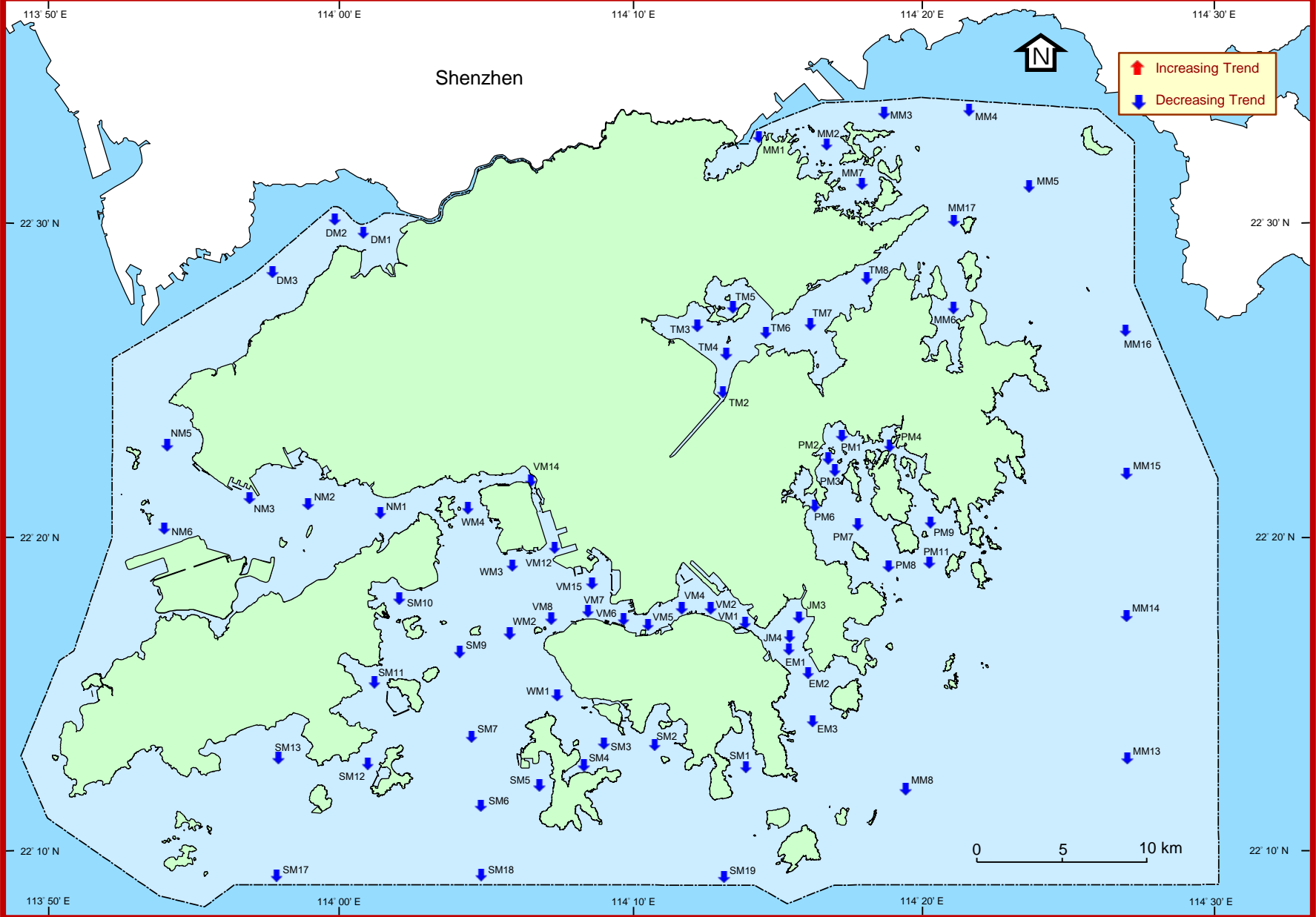
Long-term changes in ammonia nitrogen levels in Hong Kong marine waters, 1986-2021



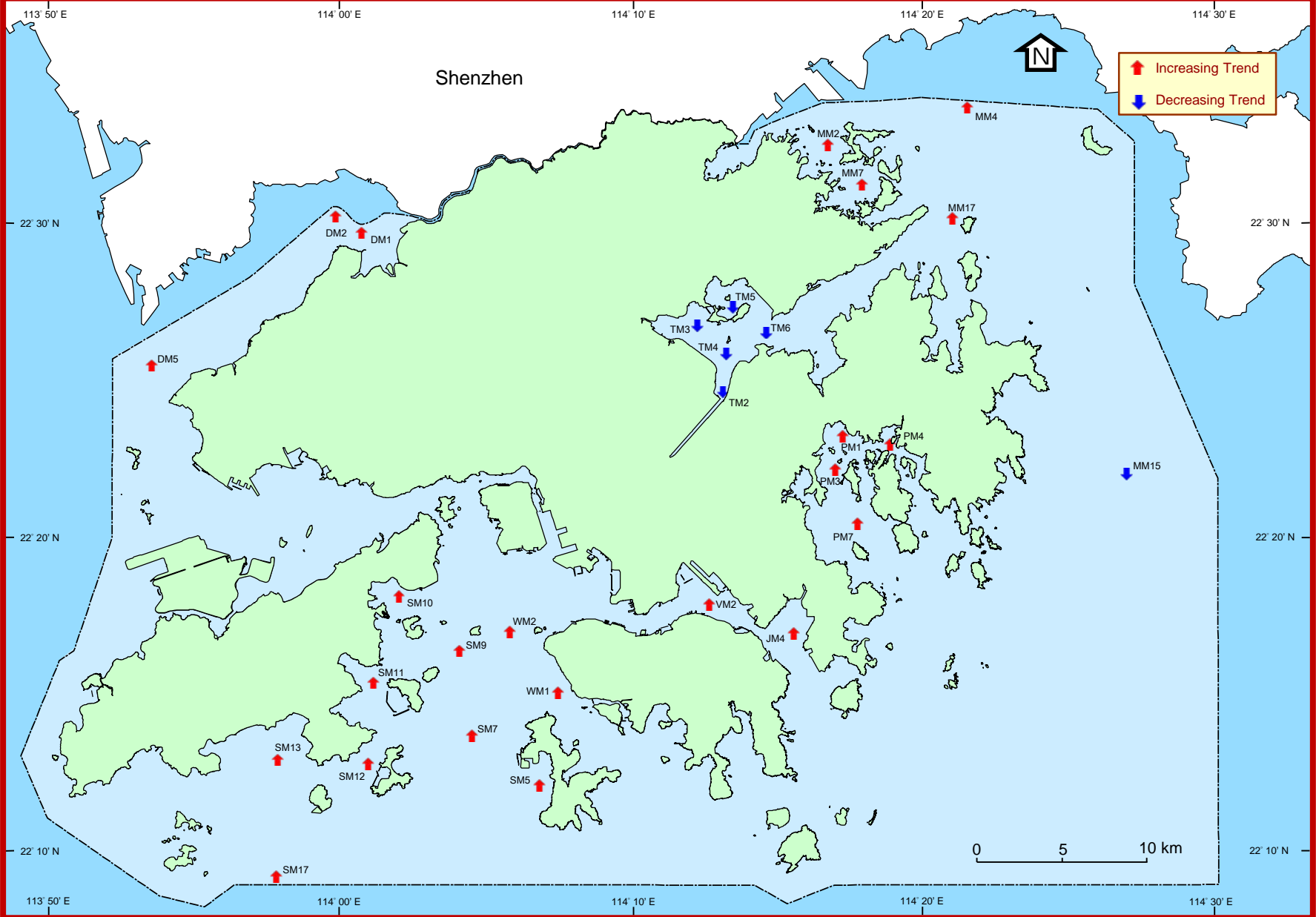
Long-term changes in total inorganic nitrogen levels in Hong Kong marine waters, 1986-2021



Long-term changes in orthophosphate phosphorus levels in Hong Kong marine waters, 1986-2021



Long-term changes in chlorophyll-a levels in Hong Kong marine waters, 1986-2021



Long-term changes in temperature in Hong Kong marine waters, 1986-2021

